COVER PAGE

Site Number:	**0978020001**
Site Name:	**Zion Site 1 Phase A Landfill**
Category:	**24D RCRA Permits Administrative Record**
Document Date:	**09/25/2025**
Permit ID:	
Permit Log:	**B-23R2**

Volume 6 of 7

THIS PAGE FOR IMAGING PURPOSES

ADMINISTRATIVE RECORD

For

Zion Site 1 Landfill, Phase A

0978020001 – Lake County

ILD980700728

Log No. B-23R2

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for

Volume 4 of 4

- Renewal Permit Application
    - Appendix E-9 through Appendix E-25
- Outtakes
    - From June 20, 2025 revisions
    - From June 6, 2025 revisions

File 0120-037-01-05
May 6, 2021

RCRA PART B POST-CLOSURE PERMIT RENEWAL APPLICATION ZION SITE 1, PHASE A LANDFILL

VOLUME II

IEPA Site No. 0978020001
ILD 980700728

Prepared For:

BFI Waste Systems of North America, LLC
26 West 580 Schick Rd.
Hanover Park, IL 60103

PREPARED BY

Weaver Consultants Group

Appendix E-9

Construction Acceptance Report, Improvements to Leachate Collection System, Zion Site 1, Phase A Landfill, December 2009

December 2009
Project No. 0120-37-30

CONSTRUCTION ACCEPTANCE REPORT

Improvements to Leachate Collection System

Zion Site 1, Phase A Landfill
Zion, Illinois
IEPA Site No. 0978020001
ILD980700728

Submitted To:
Permit Section, Bureau of Land
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, Illinois 62794-9276

Prepared For:
Mr. Jim Hitzeroth
BFI Waste Systems of North America
26 W 580 Schick Road
Hanover Park, Illinois 60133

CONSTRUCTION ACCEPTANCE REPORT
Improvements to Leachate Collection System
Zion Site 1, Phase A Landfill
0978020001 – Lake County
ILD980700728
December 2009

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LIST OF ATTACHMENTS

LIST OF FIGURES

1. INTRODUCTION

1.1 General

This report summarizes the Construction Quality Assurance (CQA) documentation prepared during installation of approximately 500 feet of the extension of leachate forcemain at Zion Landfill in Zion, Lake County, Illinois.

As-built drawings and details are included in the Figures section. Daily summary reports documenting the construction progress are included as Attachment 1. Attachment 2 contains construction photographs.

1.2 Leachate Collection System

The leachate collection system forcemain routes leachate from Site 1 Phase A to a dedicated hazardous waste storage tank. During operation and maintenance activities on the closed Site 1 unit, Weaver Boos discovered leachate flow was restricted in the northern part of the system. The forcemain extension was installed in order to allow continued flow between the northern and southern portions of the system. This will alleviate strain on the aforementioned portion of the system and allow a more efficient collection of leachate. The extension is not believed to increase the amount of leachate being removed from the site.

1.3 Report Organization

Following this summary is a brief narrative describing each of the major tasks related to the construction activities. Within each section of the narrative, references are made to the supporting documents provided in the Attachments.

2. LEACHATE LINE INSTALLATION AND CQA

2.1 Forcemain Construction

The trench for the replacement forcemain was dug beginning at extraction well EW-28. Trenching continued toward EW-2. The bottom of the trench was dug at a depth of approximately 3 feet.

The new leachate forcemain was constructed from dual-walled HPDE 4"/2" SDR 17/11 pipe. Pipe and fittings were butt-fusion welded in accordance with typical industry standards for HPDE pipe construction. Air pressure tests were conducted on the HDPE 4"/2" SDR 17/11 piping to verify the integrity of the butt-fusion welds and mechanical connections. After welding was complete, the piping was pressurized to thirty (30) pounds per square inch (psi) with an air compressor and maintained for a minimum duration of one (1) hour. Weaver Boos CQA personnel observed the air pressure testing. Completed field forms are provided in Attachment 1. A photographic log of the work is provided in Attachment 2.

The completed HDPE 4"/2" SDR 17/11 forcemain was placed in the trench. Connections were completed at EW- 2 and EW-28. Additionally the forcemain was teed into the system at extraction well EW-10. An additional tee was installed on the forcemain for future connection to EW-13.

3. CQA OFFICER-IN-ABSENTIA DESIGNATION

Throughout the duration of the project, there were times when the duties of the CQA Officer required him to be off site. During the absence of the CQA Officer, an individual was designated to exercise professional judgment in carrying out the duties of the CQA Officer as designated CQA Officer-in-Absentia. The CQA Officer assumes full personal responsibility for all inspections and reports prepared by the designated CQA Officer-in-Absentia during the absence of the CQA Officer. At various times throughout the construction of the leachate system, Greg Stewart was designated as CQA Officer-in-Absentia.

4. ENGINEERING CERTIFICATION STATEMENT

This statement is provided in accordance with 35 IAC § 811.505 (d); [Subpart E] construction quality assurance programs; documentation; acceptance reports. These regulations specify the following requirements:

1) A certification by the CQA Officer that the construction has been prepared and constructed in accordance with the engineering design;

2) As-built drawings; and

3) All daily summary reports.

The attached certification documentation is intended to fulfill these specifications.

I hereby affirm that all information contained in this Application is true and accurate to the best of my knowledge and belief.

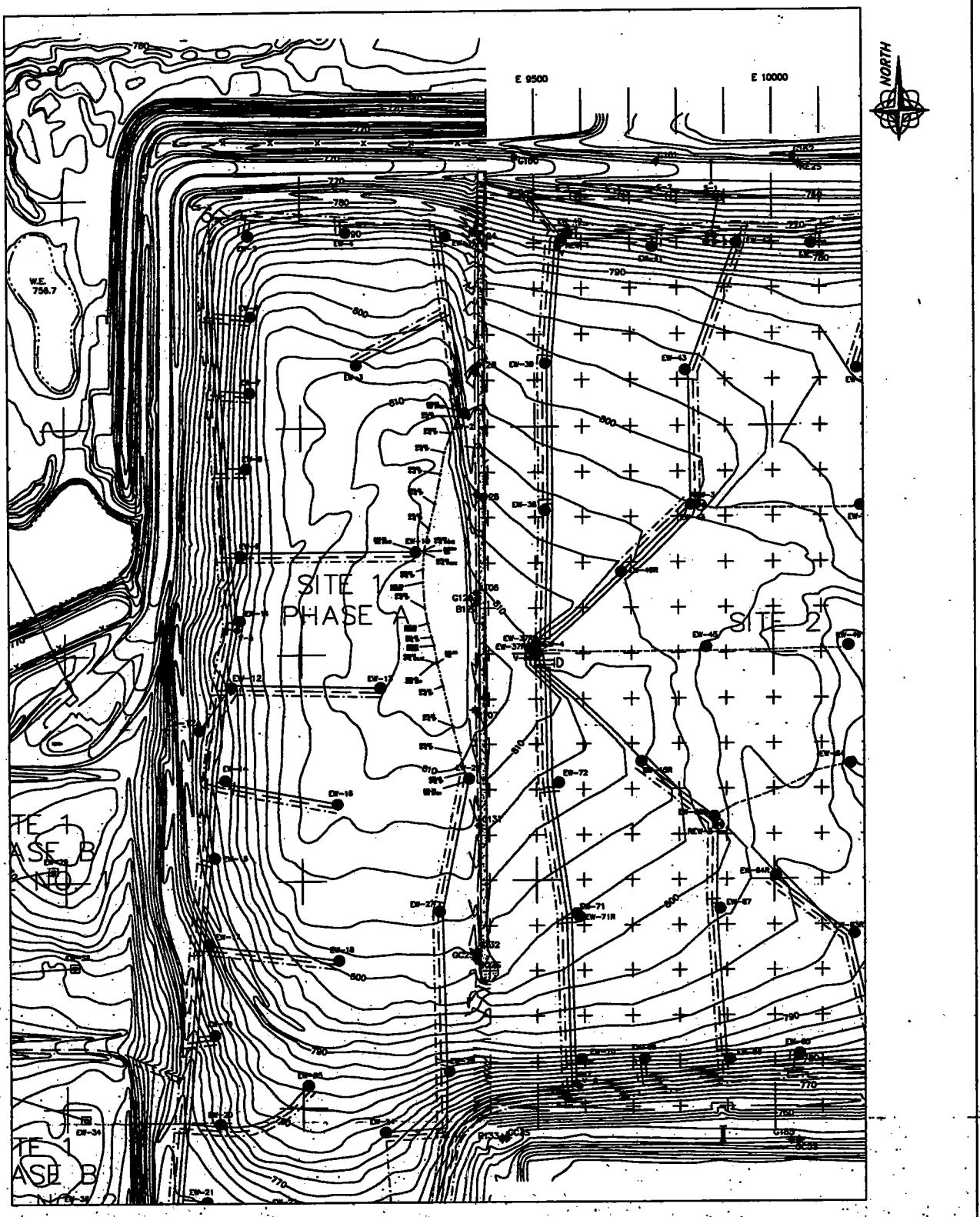
Facility: Zion Site 1 Landfill
IEPA Site No. 0978020001
ILD980700728

Component(s) or Phase(s): Forcemain Abandonment and Replacement
Piping Appurtenances

Certified by: _____ _____

Weaver Boos Consultants North Central LLC Date
Steven M. Niehoff
Illinois P.E. No. 062-053286
Project CQA Officer

FIGURES



SCALE
0 100' 200' 400'

LEGEND

- EXTRACTION WELL
- REMOTE EXTRACTION WELLHEADS
- NORTH TRENCH SUMP
- CONDENSATE SUMP
- GROUNDWATER MONITORING WELL
- GAS MONITORING PROBE
- VALVE BOX
- EXISTING GAS HEADER PIPING
- EXISTING CONDENSATE DISCHARGE PIPING
- EXISTING AIR SUPPLY PIPING
- CENTERLINE OF GAS/LEACHATE EXTRACTION TRENCH
- REROUTED LEACHATE DISCHARGE PIPING
- AS-BUILT FORCE MAIN REPAIR LINE (TOP OF PIPE ELEVATIONS)

REVISIONS		
NO.	DATE	DESCRIPTION

PREPARED FOR

FORCEMAIN REPAIR AS-BUILT
SITE 1A
ONYX ZION LANDFILL
ZION, ILLINOIS

WEAVER BOOS CONSULTANTS
300 N. MILL STREET, SUITE A, NAPERVILLE, ILLINOIS 60563
(630) 717-4949 (MAIN) (630) 717-4950 (FAX)
NAPERVILLE, IL CHICAGO, IL GRIFFITH, IN
SPRINGFIELD, IL COLUMBUS, OH DENVER, CO
SOUTH BEND, IN FORT WORTH, TX

DRAWN BY: CRW	DATE: 02/28/08	FILE: ZN000203.DWG
REVIEWED BY: GS	CAD: PROJ-0120-37	FIGURE 1

ATTACHMENT 1
Daily Summary Reports

WEAVER BOOS CONSULTANTS

2021 Timberbrook Lane,
Springfield, IL 62702
Phone: (217)787-0290 Fax: (217)787-0294

1813 North Mill Street, Suite A,
Naperville, IL 60563
Phone: (630)717-4848 Fax: (630)717-4850

Daily Summary Report

Owner: AW - Zion
Project: Site 1a Screenwall Repair
Project No.: 020 39 30 09-07
Report No:
Page: of
Date: 12-17-07 Day: Monday

Wind: Dir 77 ENE
MPH 10-20
Weather: A.M Mostly Sunny P.M. Mostly Sunny
Temp.(°F): High 28 Low 19 Rain —

Contractor(s): Ryan
Contractor Sub(s):

Summary of Daily Construction Progress and Inspections:

800AM Onsite, Met up with J.H. Andy (Grounds), & T.A.
Excavator dropped off from Barrys
Had to have excavator plow road to Site 1A due to deep snow. Trailer still got stuck.
10:30AM Set trailer, pipe arrived.
Started digging to EW 25 & hauling pipe up the hill
12:30PM lunch
1:19PM Continued moving pipe, then helped weld.
Cut 6" bolt off EW25
Having hard time digging with excavator only dug about 2'
4:15PM Wrapped up jobsite

Signature:

WEAVER BOOS CONSULTANTS

2021 Timberbrook Lane,
Springfield, IL 62702
Phone: (217)787-0290 Fax: (217)787-0294

1813 North Mill Street, Suite A,
Naperville, IL 60563
Phone: (630)717-4848 Fax: (630)717-4850

Daily Summary Report

Owner: AW Zien
Project: Site 1a Forcemain Repair
Project No.: 0120.33 30 07 07
Report No: _____
Page: _____ of _____
Date: 12.18.07 Day: Tuesday

Wind: Dir NE
MPH 7-12
Weather: A.M Cloudy P.M. Cloudy
Temp.(°F): High 26° Low 20° Rain -

Contractor(s): Ryan
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

7:00AM Onsite
Continued digging trench, slow going.
Continued welding pipe
4:30PM wrapped up for day.

Signature: _____

WEAVER BOOS CONSULTANTS

2021 Timberbrook Lane,
Springfield, IL 62702
Phone: (217)787-0290 Fax: (217)787-0294

1813 North Mill Street, Suite A,
Naperville, IL 60563
Phone: (630)717-4848 Fax: (630)717-4850

Daily Summary Report

Owner: AW Zion
Project: Site 1a Foreman Repairs
Project No.: 012087 80 0909

Report No: _____
Page: _____ of _____
Date: 12-19-07 Day: Wednesday

Wind: Dir NE
MPH 5-10

Weather: A.M Partly Cloudy P.M. Partly Cloudy
Temp.(°F): High 29 Low 21 Rain _____

Contractor(s): Ryan
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

7:00AM Onsite
Continued digging trench & welding pipe.
Dug "T"'s for Minimum line
Prepping pipe for pressure testing
4:30PM offsite

Signature: _____

WEAVER BOOS CONSULTANTS

2021 Timberbrook Lane,
Springfield, IL 62702
Phone: (217)787-0290 Fax: (217)787-0294

1813 North Mill Street, Suite A,
Naperville, IL 60563
Phone: (630)717-4848 Fax: (630)717-4850

Daily Summary Report

Owner: AW Zuck
Project: Site 1a forcemain Repair
Project No.: 020 37 30 07 07
Report No: _____
Page: _____ of _____
Date: 12.20.07 Day: Thursday

Wind: Dir SW
MPH 0-5
Weather: A.M Partly Cloudy P.M. Partly Cloudy
Temp.(°F): High 25 Low 18 Rain _____

Contractor(s): Ryan
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

7:30AM Onsite.
Switched bucket on excavator
Continued digging & welding
Project EW2 to have info.

4:30PM offsite

Signature: _____

WEAVER BOOS CONSULTANTS

2021 Timberbrook Lane,
Springfield, IL 62702
Phone: (217)787-0290 Fax: (217)787-0294

1813 North Mill Street, Suite A,
Naperville, IL 60563
Phone: (630)717-4848 Fax: (630)

Daily Summary Report

Owner: AW Zyen
Project: Site Enforcement Repair
Project No.: 020 3730 0709
Report No:
Page: of
Date: 12-21-07 Day: Fri

Wind: Dir SSW MPH 0-5
Weather: A.M Overcast P.M. Overcast
Temp.(°F): High 23° Low 15 Rain —

Contractor(s): Ryan
Contractor Sub(s):

Summary of Daily Construction Progress and Inspections:

9:30AM Onsite

Pressure tested pipe. OK - passed

Tied in well heads & timed system backup. Counter readings take before system activated & 3 hours after

Started backfilling

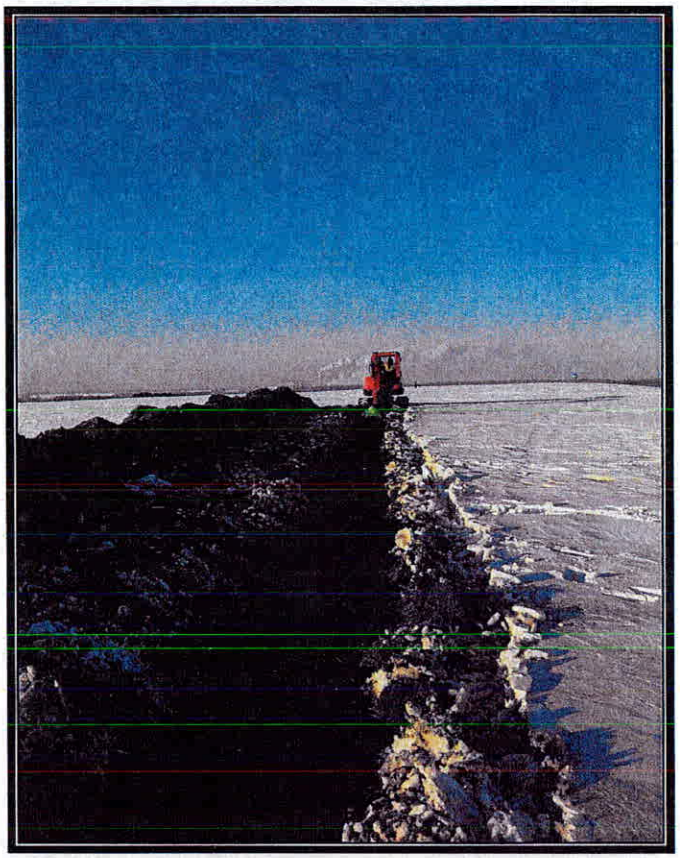
Signature:

ATTACHMENT 2
Construction Photographs

Zion Site 1 Landfill
Leachate Forcemain Replacement
Construction Photographs

WEAVER BOOS CONSULTANTS NORTH CENTRAL, LLC
2021 Timberbrook Lane • Springfield, Illinois 62702 • Phone: (217) 787-0290 • Fax: (217) 787-0294
www.weaverboos.com

Zion Site 1 Landfill
Leachate Forcemain Replacement
Construction Photographs

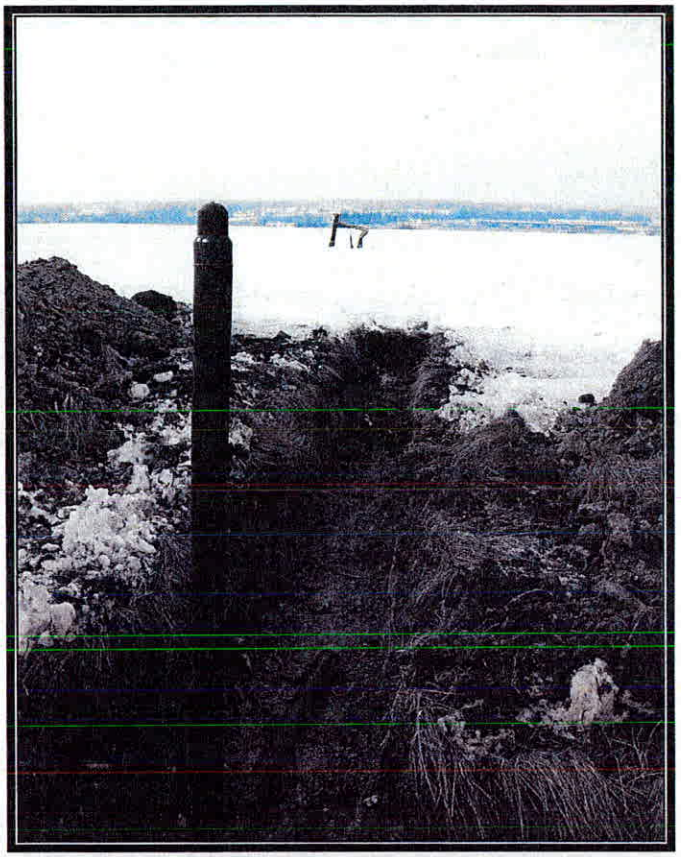


WEAVER BOOS CONSULTANTS NORTH CENTRAL, LLC
2021 Timberbrook Lane • Springfield, Illinois 62702 • Phone: (217) 787-0290 • Fax: (217) 787-0294
www.weaverboos.com

Zion Site 1 Landfill
Leachate Forcemain Replacement
Construction Photographs

WEAVER BOOS CONSULTANTS NORTH CENTRAL, LLC
2021 Timberbrook Lane • Springfield, Illinois 62702 • Phone: (217) 787-0290 • Fax: (217) 787-0294
www.weaverboos.com

Zion Site 1 Landfill
Leachate Forcemain Replacement
Construction Photographs



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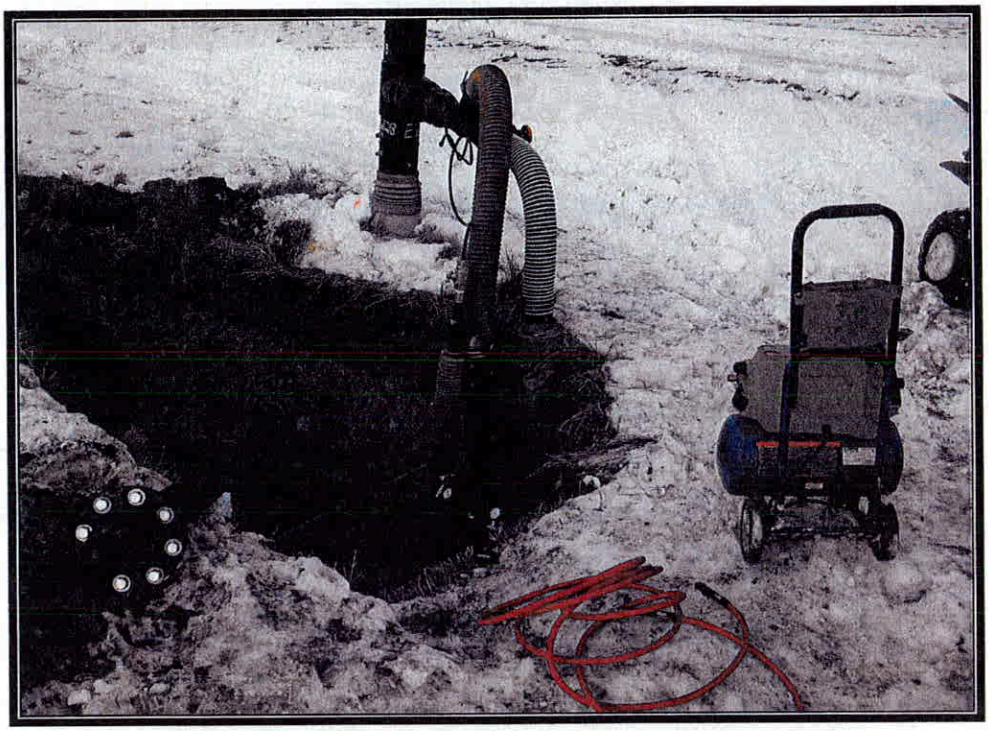
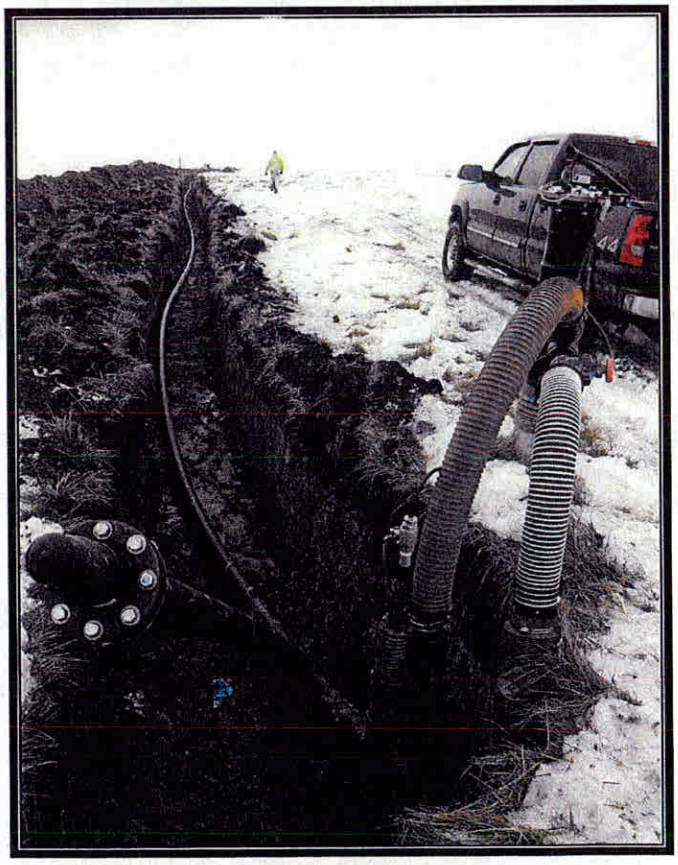
2021 Timberbrook Lane • Springfield, Illinois 62702 • Phone: (217) 787-0290 • Fax: (217) 787-0294
www.weaverboos.com

Zion Site 1 Landfill
Leachate Forcemain Replacement
Construction Photographs





WEAVER BOOS CONSULTANTS NORTH CENTRAL, LLC
2021 Timberbrook Lane • Springfield, Illinois 62702 • Phone: (217) 787-0290 • Fax: (217) 787-0294
www.weaverboos.com

Zion Site 1 Landfill
Leachate Forcemain Replacement
Construction Photographs

WEAVER BOOS CONSULTANTS NORTH CENTRAL, LLC
2021 Timberbrook Lane • Springfield, Illinois 62702 • Phone: (217) 787-0290 • Fax: (217) 787-0294
www.weaverboos.com

Zion Site 1 Landfill
Leachate Forcemain Replacement
Photographs After Cover Replacement (September 20, 2008)

WEAVER BOOS CONSULTANTS NORTH CENTRAL, LLC
2021 Timberbrook Lane • Springfield, Illinois 62702 • Phone: (217) 787-0290 • Fax: (217) 787-0294
www.weaverboos.com

Appendix E-10

Construction Acceptance Report, February 2012

February xx, 2012
Project No. 0120-37-01

CONSTRUCTION ACCEPTANCE REPORT

Installation of Replacement Leachate Forcemain
Class 1 Modification

Zion Site 1A Landfill
Zion, Illinois
0978020001 – Lake County
ILD980700728

Submitted To:
Solid Waste Branch Manager
Permit Section, Bureau of Land
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, Illinois 62794-9276

Prepared For:
Mr. Jim Hitzeroth
BFI Waste Systems of North America, LLC
26 W 580 Schick Road
Hanover Park, Illinois 60133

Prepared By:

WEAVER
BOOS
CONSULTANTS

February xx, 2012
Project No. 0120-37-01-03

Mr. Steve Nightingale, P.E.
Division of Land Pollution Control
Manager of Permit Section
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P. O. Box 19276
Springfield, Illinois 62794-9276

Re: Class 1 Modification
Installation of Replacement Leachate Forcemain
Zion Site 1A Landfill
0978020001 – Lake County
RCRA Permit No. B-23R

Dear Mr. Nightingale:

On behalf of our client, BFI Waste Systems of North America, LLC. (BFI), and pursuant to 35 Illinois Administrative Code (IAC) 703.281, **Weaver Boos Consultants** *(Weaver Boos)* submits a request for a Class 1 modification to replace a portion of the leachate extraction system in the Zion Site 1A Landfill with functionally equivalent components (e.g., pipes and valves). Zion Site 1A is a hazardous waste unit that is under post-closure care.

A blockage situation was discovered during routine operation and maintenance activities in October 2010 in the leachate forcemain in the southern portion of Site 1A. The inability to pump leachate from that area of the landfill unit was an emergency situation so efforts were undertaken to identify and attempt to address the issue. Attempts to jet the line and remove the blockage were unsuccessful. At the time, Terra Engineering & Construction Corp. (Terra), a construction contractor experienced in installing landfill leachate management systems was on-site completing a project for the Veolia ES Zion Landfill. In order to address the emergency situation of the forcemain blockage, BFI contracted Terra to install a replacement forcemain. A dual-contained line was installed which would prevent leachate buildup within the system that could pose a threat to human health and the environment and a release to the environment. The line was installed to replace the line serving extraction wells EW-20 through EW-28 and

•2021 Timberbrook Lane • Springfield, Illinois 62702 •
Phone: (217) 787-0290 • Fax: (217) 787-0294
www.weaverboos.com

replaced the existing forcemain that was below the final cover. The existing forcemain was disconnected and the lines capped off during installation of the new forcemain.

The replacement line does not substantially alter permit conditions or reduce the capacity of the facility to adequately protect human health and the environment. The repairs have not resulted in any additional or different management practices, different design of the leachate collection system, or different leachate detection system. It merely allowed the system to continue pumping leachate from the south side of the unit while seeking to prevent any future blockage.

Weaver Boos is following up this response action with a request for a permit modification, along with documentation of the construction quality assurance (CQA) oversight provided during the repair activities. A CQA report is attached. As-built drawings and details of the replacement forcemain are included as Drawing Nos. 1 and 2 in Attachment 6. Also included are permit application forms, daily summary reports, construction photographs, air pressure test reports, and geomembrane repair documentation. Notice will also be provided to all persons on the facility mailing list pursuant to 35 IAC 703.281.

Should you have any questions or need any further information, please do not hesitate to call.

Sincerely,
Weaver Boos Consultants, LLC

John Bossert, P.E.
Senior Project Manager

Attachments: See Table of Contents

cc: Mr. James Moore, IEPA
Mr. James Hitzeroth, BFI Waste Systems of North America, LLC

CONSTRUCTION ACCEPTANCE REPORT
INSTALLATION OF REPLACEMENT LEACHATE FORCEMAIN

ZION SITE 1A LANDFILL

0978020001 – Lake County
ILD980700728
RCRA Permit No. B-23R

February 2012

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Attachments:

1 – RCRA Permit Application Forms
2 - Daily Summary Reports
3 - Construction Photographs
4 – Air Pressure Test Report
5 – Geomembrane Repair Documentation
6 – Record Drawings
CQM Drawing No. 1 - Leachate Forcemain Relocation Plan
CQM Drawing No. 2 - Details

1.0 INTRODUCTION

1.1 General

This report summarizes the Construction Quality Assurance (CQA) documentation prepared during installation of approximately 1910 feet of replacement leachate forcemain at Zion Site 1A Landfill in Zion, Lake County, Illinois. Work was performed in accordance with draft RCRA Permit Log No. B-23R issued on May 20, 2011.

RCRA Permit Application Forms are included as Attachment 1. Daily summary reports documenting the construction progress are included as Attachment 2. Attachment 3 contains construction photographs. Air Pressure Test Results are included as Attachment 4. Geomembrane Repair Documentation is included in Attachment 5. As-built details of the new forcemain and the connections to extraction wells and tie-in points are shown on Drawings 1 and 2 in Attachment 6.

1.2 Leachate Collection System

The leachate collection system forcemain routes leachate from Site 1A to a dedicated hazardous waste storage tank. During operation and maintenance activities on the closed Site 1A unit, a blockage was discovered in the forcemain, and approximately 2720 feet of the forcemain needed to be replaced. The new section of forcemain which is the subject of this report has been constructed to replace the clogged line.

1.3 Report Organization

Following this summary is a brief narrative describing each of the major tasks related to the construction activities. Within each section of the narrative, references are made to the supporting documents provided in the Attachments.

2.0 LEACHATE LINE INSTALLATION AND CQA

2.1 Forcemain Installation

Replacement forcemain piping was installed to dual-extraction wells EW-20, EW-21, EW-22, EW-23, EW-24, EW-25, EW-26, EW-27, and EW-28. The new forcemain was connected to the existing forcemain at EW-21 and at the forcemain cleanout between EW-19 and EW-20.

The new leachate forcemain was constructed from dual-walled HPDE 4"/2" SDR 17/11 pipe. Pipe and fittings were butt-fusion welded in accordance with typical industry standards for HPDE pipe construction. Air pressure tests were conducted on the HDPE 4"/2" SDR 17/11 piping to verify the integrity of the butt-fusion welds and mechanical connections. After welding was complete, the piping was pressurized to ten (10) pounds per square inch (psi) with an air compressor and maintained for a minimum duration of one (1) hour. CQA personnel observed the air pressure testing. Completed field forms are provided in Attachment 3.

The trench for the forcemain piping was excavated approximately 2 feet deep. The trenches were backfilled with the soil excavated from the trenches. Polyurethane sheet insulation was placed on both sides of the trench and approximately 6" from the ground surface, and a warning ribbon was placed above the insulation.

Details of the tie-in configurations are shown on Drawing No. 2. Detail 5/2 shows the connection of the replacement forcemain to the existing cleanout riser. An existing valve adjacent to the cleanout riser was also removed, and the existing forcemain was capped on both sides. The pipe designated as "A" in Detail 5/2 is the same line as the pipe designated as "A" in Detail 6/2, which indicates that the existing line between the cleanout location and EW-21 was abandoned by capping at both ends. The pipe designated as "B" in Detail 6/2 was capped near EW-21 at each contributing well EW-22 through EW-28, which indicates that the existing line upstream of EW-21 was also properly abandoned. Detail 6/2 also indicates that the discharge line from the existing leachate forcemain manhole was connected to the replacement forcemain near EW-21.

2.2 Cap Replacement

The final cover was repaired around the capped pipes to existing conditions. The material that was removed from the compacted soil cover was replaced and recompacted in lifts to restore the compacted soil cover to its original grade.

The geomembrane liner was damaged between EW-26 and EW-27. The geomembrane was repaired in two locations by placing a patch of 40 mil LLDPE material over the holes and extrusion welding it to the existing geomembrane liner, using generally accepted industry practices, which include heat-tacking the patch in-place, grinding the surface of the edge of the patch and the existing liner (to remove oxidation and roughen the surface), and welding the patch to the liner by extruding a bead of molten LLDPE at the edge of the patch. Extrusion welds were non-destructively tested using a vacuum box in accordance with generally accepted industry practices. In order to expose the liner for repairs, the drainage geocomposite was laid back from the repair area. Upon completion of the vacuum box testing, the geocomposite drainage layer was replaced over the repaired membranes, and soil was then placed over the geocomposite and carefully compacted with the excavator.

3.0 CONCLUSION

Based upon the data presented in this CQA report, as well as the observations of the CQA monitoring personnel, installation of the replacement forcemain is complete. The work has been constructed as depicted in the Leachate Forcemain Relocation Plan and Details (Drawings 1 and 2), which are included in this report.

4.0 CQA OFFICER-IN-ABSENTIA DESIGNATION

Throughout the duration of the project, there were times when the duties of the CQA Officer required him to be off site. During the absence of the CQA Officer, an individual was designated to exercise professional judgment in carrying out the duties of the CQA Officer as designated CQA Officer-in-Absentia. The CQA Officer assumes full personal responsibility for the performance of all inspections and reports prepared by the designated CQA Officer-in-Absentia during the absence of the CQA Officer. At various times throughout the construction of the replacement system, Scott Chafer and Frank Remington were designated as CQA Officers-in-Absentia.

_____ _____

John Bossert, P.E.
CQA Officer

Date

5.0 CERTIFICATIONS

The signature of the authorized representative for BFI Waste Systems of North America, LLC and the certification of the Registered Professional Engineer from Weaver Boos Consultants are provided as follows:

5.1 Signatory to Construction Quality Assurance Report (*35 IAC 702.126*)

Facility Name: BFI Waste Systems of North America, LLC. – Zion Site 1A Landfill

IEPA Site Code: LPC No. 0978020001

USEPA ID No.: 980700728

Permit Log No.: B-23R

Permit Modification: Class 1 Modification – Installation of Replacement Leachate Forcemain

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Date: February _____, 2012

_____

Signature of Authorized Representative for Operator

Name: Bryan Zimmerman

Title: _____

Date: February _____, 2012

_____

Signature of Authorized Representative for Owner

Name: James Rooney

Title: _____

5.2 Registered Professional Engineer Certification (*35 IAC 703.182*)

Facility Name: BFI Waste Systems of North America, LLC. – Zion Site 1A Landfill

IEPA Site Code: LPC No. 0978020001

USEPA ID No.: 980700728

Permit Log No.: B-23R

Permit Modification: Class 1 Modification – Installation of Replacement Leachate Forcemain

This statement is provided in accordance with 35 IAC § 703.182 specifying that *certain technical data, such as design drawings, and specifications and engineering studies, must be certified by a registered professional engineer.*

The attached certification documentation is intended to fulfill these specifications.

Facility:	Zion Site 1A Landfill
Component(s) or Phase(s):	Installation of Replacement Leachate Forcemain

Certified by:_____ February _____, 2012

Weaver Boos Consultants
John Bossert, P.E.
Illinois P.E. No. 062-050455
Project CQA Officer

SEAL

Expires: 11/30/13

ATTACHMENT 1

Application Forms

Illinois
Environmental
Protection Agency

Bureau of Land
1021 North Grand Avenue East
Box 19276
Springfield, IL 62794-9276

Certification of Authenticity of Official Forms

This form must accompany any application submitted to the Illinois EPA Bureau of Land, Division of Land Pollution Control, Permit Section on forms other than the official copy printed and provided by the Illinois EPA. The only allowed changes to the form are in spacing, fonts, and the addition of the information provided. Any additions must be underlined. The forms would not be considered identical if there is any change to, addition or deletion of words on the form or to the language of the form.

The same individuals that sign the application form it accompanies must sign the following certification.

I hereby certify under penalty of law that I have personally examined, and am familiar with the application form or forms and all included supplemental information submitted to the Illinois EPA herewith, and that the official Illinois Environmental Protection Agency application form or forms used herein is or are identical in all respects to the official form or forms provided by the Illinois EPA Bureau of Land Permit Section, and has not or have not been altered, amended, or otherwise modified in any way. I further certify under penalty of law that any attached or included electronic data version of the application form or forms complies with the official Illinois EPA's Electronic version thereof, and is or are identical in all respects to the official electronically downloadable form or forms provided by the Illinois EPA Bureau of Land Permit Section, and has not or have not been altered, amended or otherwise modified in any way.

_____ _____
Owner Signature (date)

_____
Title

_____ _____
Operator Signature (date)

_____
Title

_____ _____
Engineer Signature (date)
(if necessary)

Subscribed and Sworn to Before Me,
a Notary Public in and for the
above-mentioned County and State.

_____
Notary Public

My Commission Expires: _____ [Notary Seal]

jab\043432i.doc

Illinois
Environmental
Protection Agency

Bureau of Land
1021 North Grand Avenue East
Box 19276
Springfield, IL 62794-9276

RCRA Permit Application Form LPC-PA23

This form must be used for any permit application for a hazardous waste management facility regulated in accordance with RCRA, Subtitle C, including all requests to modify an existing permit. One original and three (3) copies, of all permit applications must be submitted. Attach the original and appropriate number of copies of a cover letter, any necessary plans, specifications, reports, forms, (e.g., corrective action certification form), and any other certifications etc. to fully support and describe the activities or modifications being proposed. Attach sufficient information to demonstrate compliance with all applicable regulatory requirements. Applications without this form will be deemed incomplete. Please refer to the RCRA checklist and decision guide documents for further guidance. For RCRA corrective action, this form should only be used if requesting an actual modification to a RCRA permit. A RCRA Corrective Action Certification form should be used in all other instances.

Note: Permit applications which are hand-delivered to the Bureau of Land, Permit Section must be delivered to 1021 North Grand Avenue East between the hours of 8:30 a.m. to 5:00 p.m., Monday through Friday (excluding State holidays).

Please type or print all information legibly.

I. SITE IDENTIFICATION

Site # (Illinois EPA): 0978020001 USEPA ID Number: ILD980700728
Site Name: Zion Site 1A Landfill
Physical Site Location (street, road, etc.): 701 Green Bay Road
City, Zip Code: Zion, IL 60099 County: Lake
Existing RCRA Permit (if applicable): Log No B-23-M-28

II. OWNER/OPERATOR IDENTIFICATION

	OWNER	OPERATOR
Name:	Veolia ES Zion Landfill	BFI Waste Systems of North America, LLC.
Address:	701 Green Bay Road	13832 South Kostner Avenue
	Zion, IL 60099	Crestwood, IL 60445
Contact Name:	Mr. James Lewis	Mr. James Hitzeroth
Phone #:	(847) 731-5110	(630) 894-5001

III. PERMIT APPLICATION IDENTIFICATION

APPLICATION TYPE:
- ☐ New Part B Permit
- ☐ Part B Permit Renewal
- ☑ Class 1 Modification
- ☐ Class 1* (prior approval required) Modification
- ☐ Class 2 Modification
- ☐ Class 3 Modification
- ☐ Additional information to supplement application Log Number _____

APPLICATION TYPE cont.:
- ☐ Remedial Action Plan Permit (RAPP)
- ☐ Sig RAPP Modification
- ☐ Non Sig RAPP Modification
- ☐ Major UIC Modification
- ☐ Minor UIC Modification

THIS APPLICATION INVOLVES:
- ☐ Storage
- ☐ Treatment
- ☑ Disposal
- ☐ Incineration
- ☐ Groundwater
- ☐ Corrective Action
- ☐ UIC Class I
- ☐ UIC Class V

DESCRIPTION OF THIS PERMIT REQUEST: (Include a brief narrative description here.)
Submittal of permit modification and Construction Quality Assurance report for replacement of section of leachate forcemain for Site 1A.

IL 532-2792
LPC 625

This Agency is authorized to require this information under Illinois Revised Statutes, 1979, Chapter 111 1/2, Section 1039. Disclosure of this information is required under that Section. Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

IV. **SIGNATURES** Original signatures required. Signature stamps or applications transmitted electronically or by facsimile are not acceptable. All applications shall be signed by the person in accordance with 35 IAC 702.126(a).

Please check the box of the appropriate certification.

OWNER

☑ I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Alternative owner certification. For remedial action plans (RAPs) permit under Subpart H of 35 IAC 703, the owner may choose to make the following certification instead of the certification above.

☐ Based on my knowledge of the conditions of the property described in the RAP and my inquiry of the person or persons that manage the system referenced in the operator's certification, or those persons directly responsible for gathering the information, the information submitted is, upon information and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owner Name (Printed or Typed): _____

Owner Signature: _____ Title: _____ Date: _____

OPERATOR

I certify under penalty of law that this document and all attachment were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information.

Operator Name (Printed or Typed): _____

Operator Signature: _____ Title: _____ Date: _____

NOTARY: (Required for both owner and operator signatures)

Subscribe and sworn before me this _____ day of _____, _____.

Notary Signature: _____ Notary Seal:

My commission expires on: _____

ENGINEER

I certify under penalty of law that this document and all attachment were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information.

Engineer Name (Printed or Typed): John Bossert, P.E.

Engineer Signature: _____ Illinois License No.: 062-050455

Expiration Date of License: 11/30/13

Engineer Address: Weaver Boos Consultants
2021 Timberbrook Lane
Springfield, Illinois 62702

Engineer Seal:

Engineer Phone No. 217-787-0290

All information submitted as part of the Application is available to the public except when specifically designated by the Applicant to be treated confidentially as a trade secret or secret process in accordance with Section 7(a) of the Environmental Protection Act, applicable Rules and Regulations of the Illinois Pollution Control Board and applicable Illinois EPA rules and guidelines.

ATTACHMENT 2

Daily Summary Reports

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: SCOTT CHAFER
Contractor's Rep: L. I.
Signed: Scott Chafer

Date: 11/2/10
Day: TUESDAY
Page: 1 of 1
Report No.: 1

RESIDENT INSPECTION REPORT

Weather Conditions	Temperature Low	Temperature High	Sky	Rain	Snow	Project Site Conditions
	34	51	CLEAR	N/A	N/A	Dry / Muddy

Field Book No.: VOL-1 Page #s:

Contractor(s) on Site:
TERRA

Report of Observation of Work and Comments:

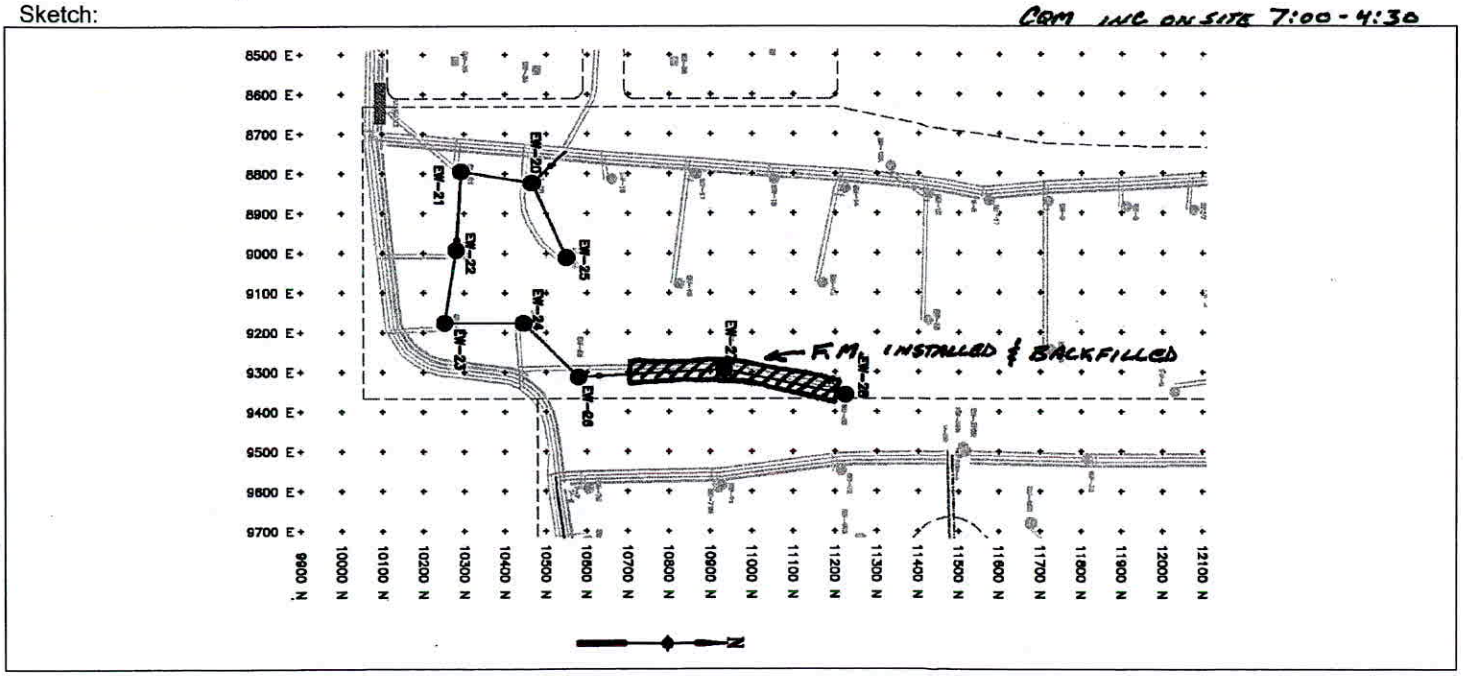
TERRA INSTALLED 2"x4" DUEL CONTAINED FORCE MAIN FROM POINT #39 TO POINT #28

PIPE TRENCH WAS EXCAVATED 8' DEEP, 2" POLYURETHANE SHEET INSULATION WAS PLACED ON EACH SIDE OF THE TRENCH AND ALSO ON THE TOP PER DETAIL 3/2A, WARNING RIBBON WAS PLACED 6" BELOW THE TOP OF GROUND.

* TERRA HIT LINER AT POINT #27, COVER SOILS WERE ONLY 1.5' DEEP, TERRA WILL REPAIR LINER WHEN LINER CREW IS ON SITE FOR THE REST OF THE LINER REPAIRS

TERRA ON SITE 7:00-4:30
CQM INC ON SITE 7:00-4:30

Sketch:



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: SCOTT CHAFER
Contractor's Rep: L. J.

Date: 11/2/10
Day: TUESDAY
Page: 1 of 1
Report No.: 1

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

Number of Men:
Foreman 1
Operators 1
Laborers 1

Equipment:
1-JOHN DEERE 270LC EXCAVATOR
1-JOHN DEERE 644D LOADER

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: SMC
Contractor's Rep: L.I
Signed: Scott Chapin

Date: 11/4/10
Day: THURSDAY
Page: 1 of 1
Report No.: 2

RESIDENT INSPECTION REPORT

Weather Conditions	Temperature Low	Temperature High	Sky	Rain	Snow	Project Site Conditions
	29	50	CLOUDY	N/A	N/A	Dry / Muddy

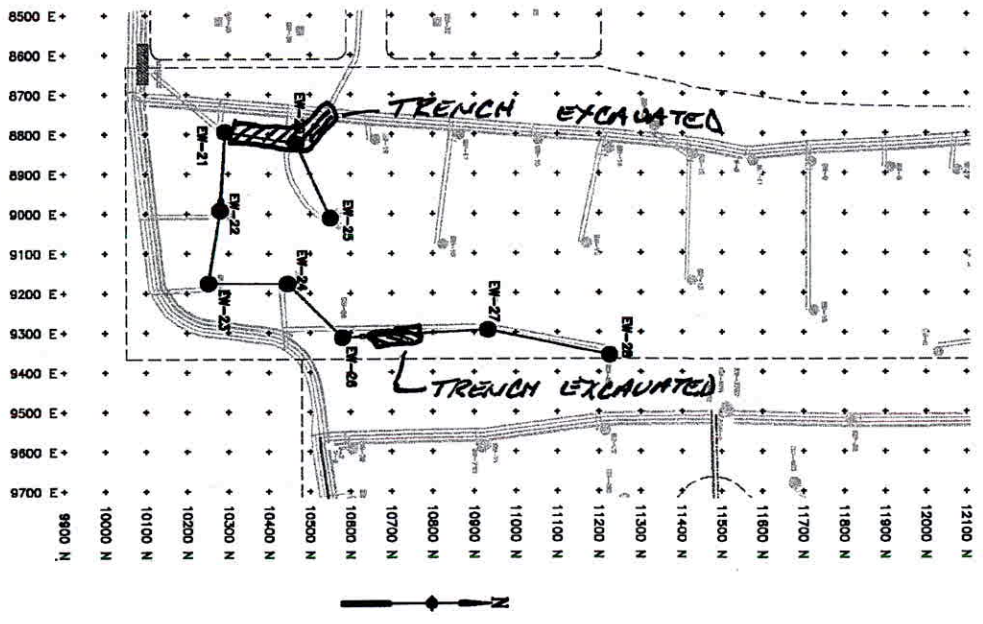
Field Book No.: VOL - 1 Page #s:

Contractor(s) on Site:
TERRA

Report of Observation of Work and Comments:
TERRA EXCAVATED 2' TRENCH FOR THE 2"x4" F.M. TRENCH WAS EXCAVATED FROM POINT # 28 TO #27 AND ALSO FROM POINT #1 TO #9

TERRA ON SITE 12:00-4:00
CQM ON SITE 12:00-4:00

Sketch:



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: SMC
Contractor's Rep: L. I.

Date: 11/4/10
Day: THURSDAY
Page: 1 of 1
Report No.: 2

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

Number of Men:
Foreman 1
Operators 1
Laborers 1

Equipment:
1-JOHN DEERE EXCAVATOR

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: L. I
Contractor's Rep: SCOTT CHAFER
Signed: Scott Chafer

Date: 11/5/10
Day: FRIDAY
Page: 1 of 1
Report No.: 3

RESIDENT INSPECTION REPORT

Weather Conditions	Temperature Low	Temperature High	Sky	Rain	Snow	Project Site Conditions
	41	25	P-CLOUDY	N/A	N/A	(Dry) / Muddy

Field Book No.: VOL- 1 Page #s:

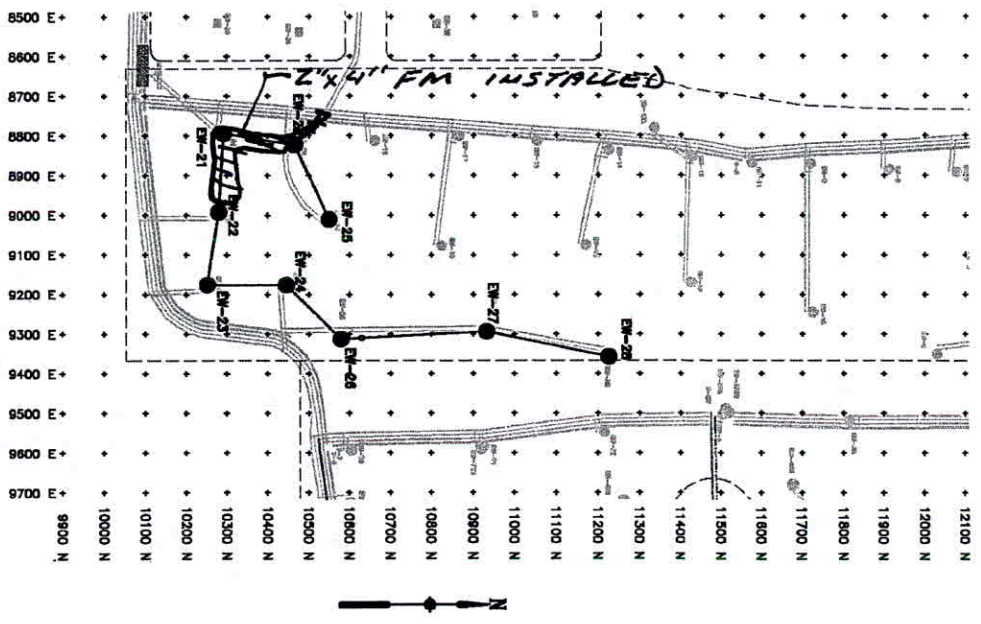
Contractor(s) on Site:
TERRA

Report of Observation of Work and Comments:

TERRA EXCAVATED FROM PT # 9 TO #13
TERRA INSTALLED 2"x 4" FM. FROM PT # 1 TO PT # 13 W/ CLEAN OUTS

TERRA PLACED THE 2" INSULATION ON THE SIDES AND THE TOP OF THE TRENCH, PIPE WAS BACKFILLED WITH THE SAME MATERIAL THAT THE TRENCH WAS EXCAVATED

Sketch:



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep:
Contractor's Rep:

Date:
Day:
Page: of
Report No.:

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

Number of Men:
Foreman
Operators
Laborers

Equipment:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: WFR
Contractor's Rep:
Signed:

Date: 11-8-10
Day: MONDAY
Page: 1 of 1
Report No.: 04

RESIDENT INSPECTION REPORT

Weather Conditions	Temperature		Sky	Rain	Snow	Project Site Conditions
	Low	High				
	36°	56°	PC	0	0	~~Dry~~ / Muddy

Field Book No.: Page #s:

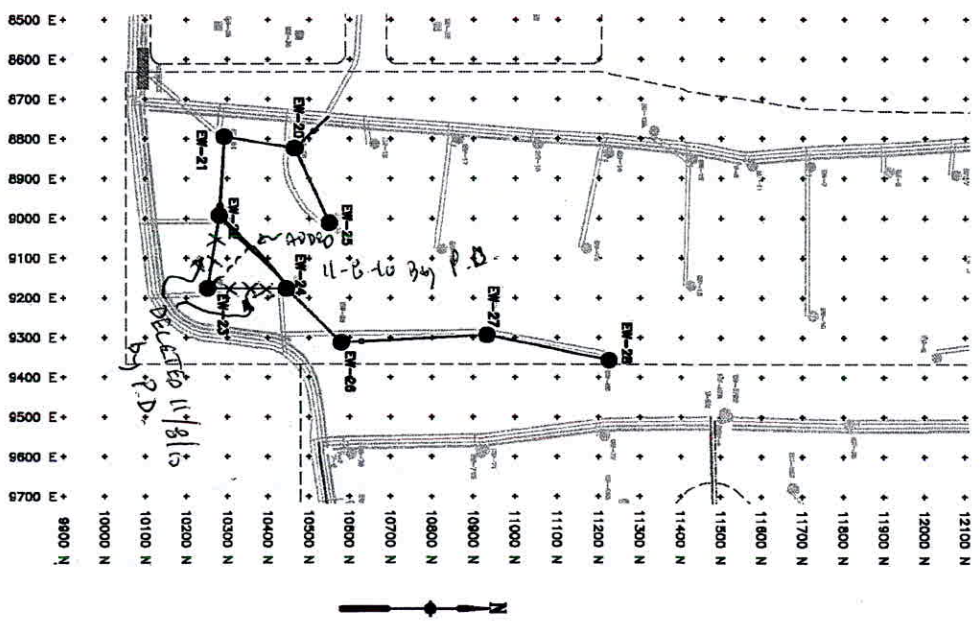
Contractor(s) on Site:
TERRA

Report of Observation of Work and Comments:

TERRA EXCAVATED TRENCH TO TOP OF EXISTING GEOCOMPOSITE TO SET CLEANOUT @ EW-22 & THEN BEGAN BACKFILL ON TRENCH STARTING @ ~PT #9. 2" STYROFOAM BOX SIDES PLACED & BACKFILLED. STYROFOAM TOP & CAUTION TAPE PLACED & REMAINDER OF TRENCH FILLED TO > EXISTING ELEVATIONS (SURFACE). TERRA BEGAN INSTALLING CLEANOUT @ WK 22 @ ~1015. (PT #13) CONTRACTOR CONTINUED WITH TRENCH EXCAVATION BTWN EW-22 & EW-24. DELETION OF FORCEMAIN BTWN EW-22 & 23 & EW-23 & 24 DELETED AS PER PAT DROSSART (CQM). "T" INSTALLED @ ~100' NORTH OF EW-22 FOR TIE-IN TO EW-23 INSTEAD. FORCEMAIN INSTALLED TO EW-23 @ 1430 & REMAINDER OF DAY SPENT BACKFILLING TRENCH.

TERRA ON-SITE = 0700-1630
CQM ON-SITE = 0700-1630

Sketch:



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep:
Contractor's Rep:

Date:
Day:
Page: of
Report No.:

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

Number of Men:
Foreman
Operators
Laborers

Equipment:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: WFR
Contractor's Rep:
Signed:

Date: 11-9-10
Day: TUESDAY
Page: 1 of 1
Report No.: 05

RESIDENT INSPECTION REPORT

Weather Conditions	Temperature		Sky	Rain	Snow	Project Site Conditions
	Low	High				
	38	65°	CLR/PC	0	0	~~Dry~~ / Muddy

Field Book No.: Page #s:

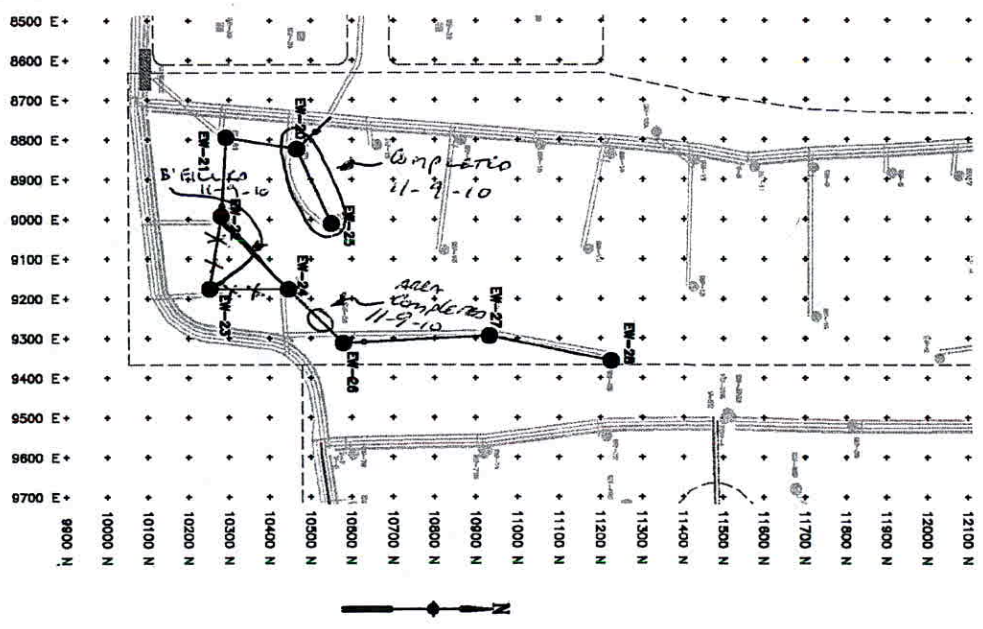
Contractor(s) on Site:
TERRA

Report of Observation of Work and Comments:

TERRA & CQM ON-SITE @ ~0700. CONTRACTOR BEGAN EXCAVATION OF 2'x4' FM TRENCH BTWN EW-20 & EW-25. PIPE INSTALLED & WELDED TO EXISTING "T" @ EW-20. TRENCH BACKFILL BEGAN @ ~1000. BACKFILL COMPLETED BY ~1220. TERRA THEN COMPLETED TRENCHING & PIPE INSTALL IN ~100' AREA BTWN EW-24 & EW-26 NOT COMPLETED ON 11-8-10. BACKFILL IN THIS AREA COMPLETED BY ~1430. TERRA BEGAN BACKFILL ON TRENCH ~~BEGIN~~ TO EW-23 @ ~1440. STYROFOAM INSTALLED IN TRENCH & BACKFILL PLACED OVER PIPE. STYROFOAM TOPPER PLACED & FILL PLACED TO MATCH EXISTING ELEVATIONS. CONTRACTOR COMPLETED WORK FOR TODAY @ ~1630. LEFT S.I.R. AT THIS TIME.

TERRA = 0700 TO 1630
CQM = 0700 TO 1630

Sketch:



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep:
Contractor's Rep:

Date:
Day:
Page: of
Report No.:

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

Number of Men:
Foreman
Operators
Laborers

Equipment:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: WFR
Contractor's Rep: LUKE/CORY
Signed:

Date: 11-10-10
Day: WEDS.
Page: 1 of 1
Report No.: 06

RESIDENT INSPECTION REPORT

Weather Conditions	Temperature		Sky	Rain	Snow	Project Site Conditions
	Low	High				
	40°	63°	PC	0	0	Dry / Muddy

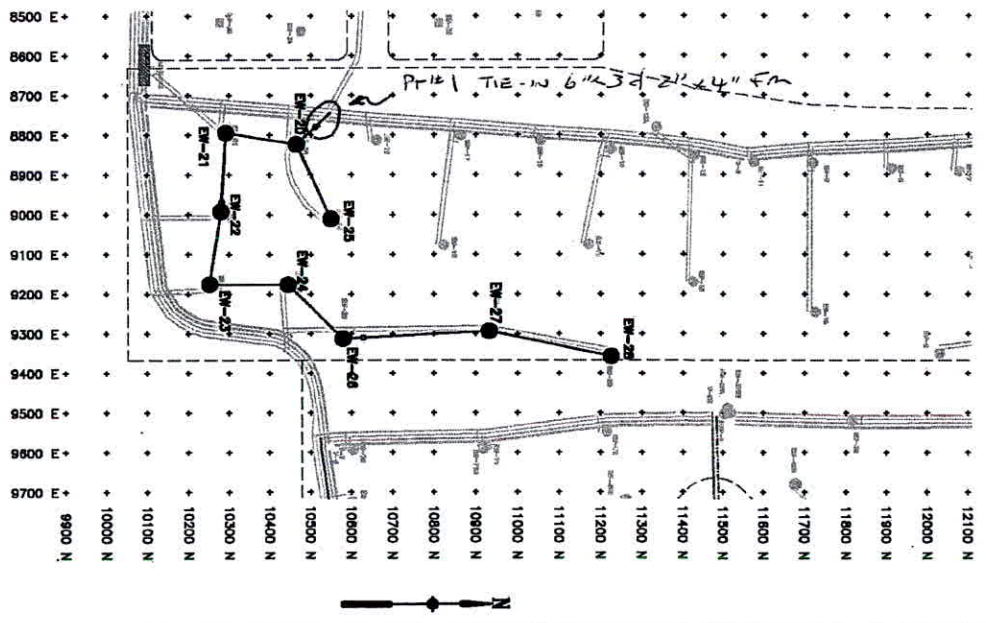
Field Book No.: Page #s:

Contractor(s) on Site:
TERRA

Report of Observation of Work and Comments:

ON-SITE @ ~0650. ATTENDED TERRA SAFETY MTG. TERRA BEGAN EXCAVATING EXISTING SOIL COVER TO EXPOSE GEOCOMPOSITE @ TIE-IN W/ 6"x3" EXISTING FORCE MAIN @ PT #1. EXISTING GEOCOMPOSITE FOUND @ 2.5' BELOW EXISTING GROUND ELEVATIONS. ~10'x25' AREA EXCAVATED TO ALLOW FOR GEOCOMPOSITE TO BE CUT OPEN, LAID BACK, & TO CONTINUE EXCAVATION TO EXISTING FM. EXCAVATION EXTENDED TO 20'x30' @ ~1300 AS NO EXISTING PIPE HAD BEEN LOCATED. THIS AREA WAS EXCAVATED TO ~17' BELOW EXISTING GROUND ELEVATION. DECISION MADE BY PAT DROSSART (CQM) TO ALLOW TERRA TO TIE IN TO AN EXISTING 4"Ø2" C.O. ~40' EAST OF PLAN LOCATION. HOLE WAS FILLED TO GEOCOMPOSITE IN 3 LIFTS & COMPACTED W/ HOE BUCKET (TESTING ON BACK SIDE THIS REPORT). GEOCOMPOSITE REPAIRED & PROTECTIVE COVER PLACED & GRADED TO MATCH EXISTING ELEVATIONS. ALL WORK COMPLETED BY ~1635. LEFT SITE FOR TODAY AT THIS TIME.

Sketch:



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep:
Contractor's Rep:
Date:
Day:
Page: of
Report No.:

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

DD = 122.2
WD = 137.6
%M = 12.6
%C = 100.2
} 122.0 pcf Max D

WD = 137.7
DD = 121.7
%M = 13.1
%C = 99.8
} "

WD =
DD = 117.4
%M = 14.0
%C = 96.2
} "

Number of Men:
Foreman
Operators
Laborers

Equipment:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: FRANIC REMINGTON
Contractor's Rep: CORY
Signed:

Date: 11-11-10
Day: THURSDAY
Page: 1 of 1
Report No.: 7

RESIDENT INSPECTION REPORT

Weather Conditions	Temperature		Sky	Rain	Snow	Project Site Conditions
	Low	High				
	42°	65°	MC	~~Ø~~	Ø	(Dry) / Muddy

Field Book No.: Page #s:

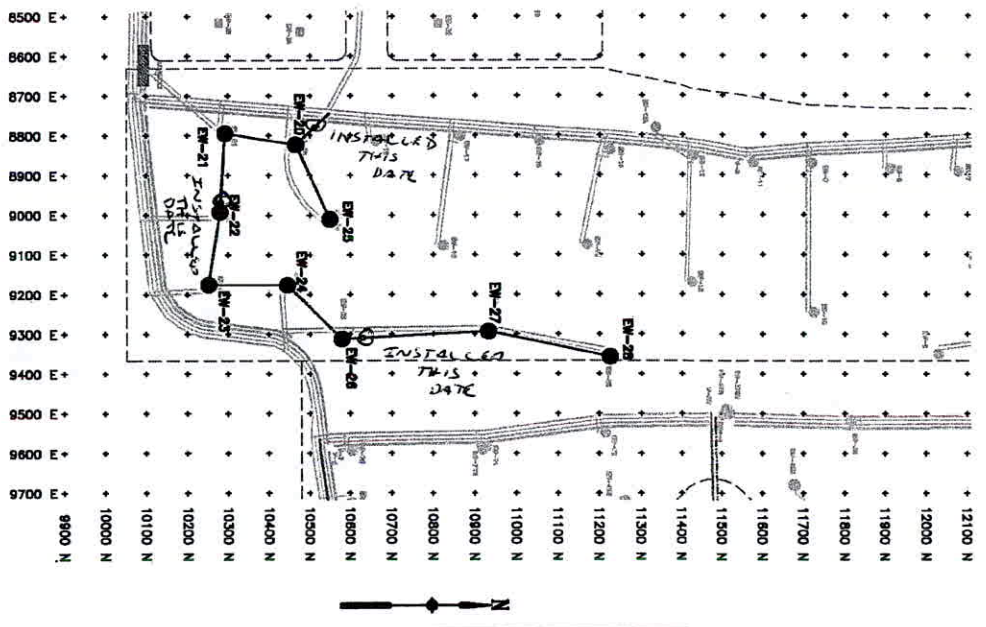
Contractor(s) on Site:
TERRA

Report of Observation of Work and Comments:

ON-SITE @ 0700. TERRA ON-SITE WELDING CLEANOUTS FOR 4"x2" FORCEMAIN. WELDING COMPLETED @ ~ 1200. CONTRACTOR INSTALLED CLEANOUTS AT REQUIRED LOCATIONS (POINT #'S 18, 3, 27). AIRTESTING OF ENTIRE FORCEMAIN TO BE COMPLETED TOMORROW (11-12-10), ALONG WITH CONNECTION TO EXISTING FORCEMAIN. REMAINED ON-SITE OBSERVING CONTRACTOR ACTIVITIES UNTIL ~ 1600. CONTRACTOR STOPPED WORK FOR TODAY & LEFT SITE AT THIS TIME.

TERRA = 0700 - 1600
CQM = 0700 - 1600

Sketch:



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep:
Contractor's Rep:

Date:
Day:
Page: of
Report No.:

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

Number of Men:
Foreman
Operators
Laborers

Equipment:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: WFR
Contractor's Rep: Cory
Signed:

Date: 11-12-10
Day: FRIDAY
Page: 1 of 1
Report No.: 08

RESIDENT INSPECTION REPORT

Weather Conditions	Temperature		Sky	Rain	Snow	Project Site Conditions
	Low	High				
	40°	55°	MC	TRACE	0	(Dry) / Muddy

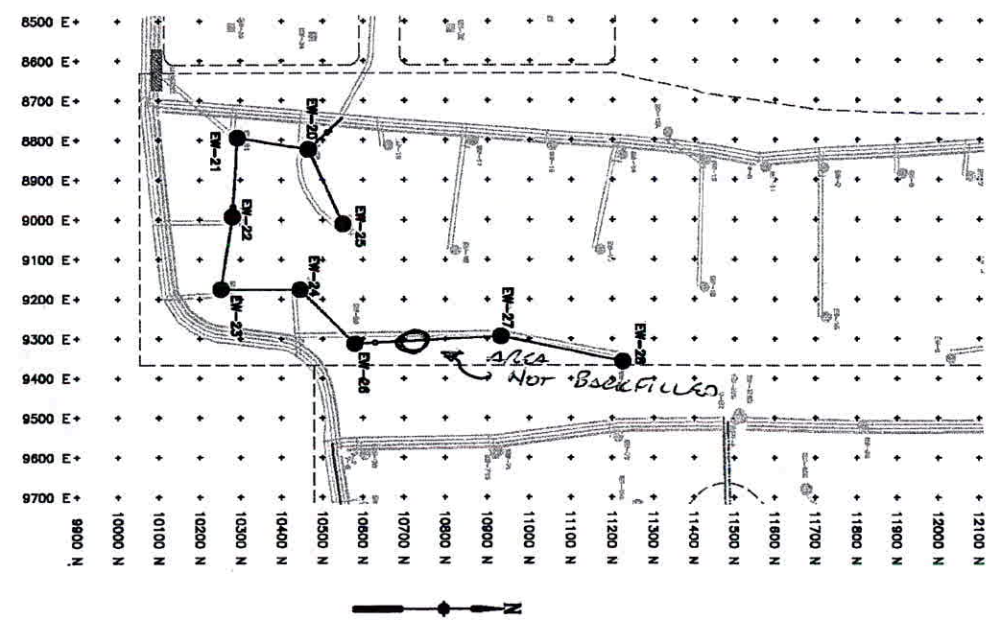
Field Book No.: Page #s:

Contractor(s) on Site:
TERRA

Report of Observation of Work and Comments:

ON-SITE @ ~0800 AS PER TERRA FOREMAN CORY. CONTRACTOR BEGAN WELDING WITNESS PIPE CAPS AT ~0730 PRIOR TO AIR TESTING FORCE MAIN. AIR TESTING STARTED @ 0811 @ 10.5 PSI. & ENDED @ 0911 WITH NO LOSS OF PRESSURE. TERRA THEN EXCAVATED FOR TIE-IN TO 4"x2" FM (EXISTING). REMAINING SECTIONS OF FM NOT BACKFILLED COMPLETED TODAY & ALL AREAS GRADED TO MEET/MATCH EXISTING ELEVATIONS. TERRA COMPLETED WORK @ ~1300 & LEFT SITE FOR THE WEEKEND. REMAINED ON SITE TO STAKE WELL OFFSETS. LEFT SITE @ ~1500. ONE SECTION OF FM BACKFILL NOT COMPLETED DUE TO REPAIRS TO GEOMEMBRANE NOT COMPLETED.

Sketch:



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep:
Contractor's Rep:

Date:
Day:
Page: of
Report No.:

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

Number of Men:
Foreman
Operators
Laborers

Equipment:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: FRANK REMINGTON
Contractor's Rep: CHUCK / CORY (TERRA)
Signed:

Date: 11-15-10
Day: MONDAY
Page: 1 of 1
Report No.: 1

RESIDENT INSPECTION REPORT

Weather Conditions	Temperature Low	Temperature High	Sky	Rain	Snow	Project Site Conditions
	30°	51°	PC	0	0	Dry / Muddy

Field Book No.: Page #s:

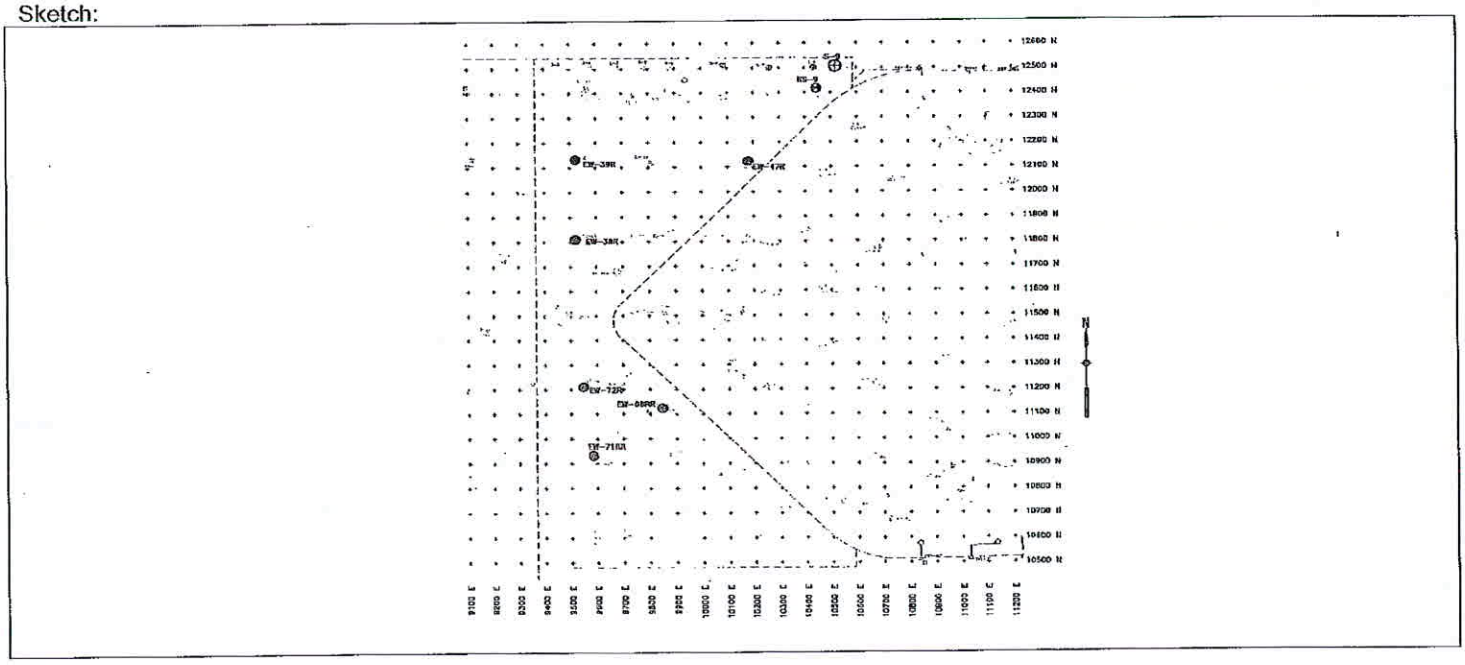
Contractor(s) on Site:
TERRA

Report of Observation of Work and Comments:

ON-SITE @ 0700 - ATTENDED CONSTRUCTION/TAILGATE MTG w/TERRA TO DISCUSS WORK PLANS. TERRA BEGAN TIE-IN @ 2010 FOREMAN TO EXISTING SYSTEM @ ~0730. 4" & 90° BEND WELDED TO EXISTING 4"x2" RISER & CONNECTED TO 2010 FM. REMAINDER OF DAY SPENT CONNECTING FM TO WELL HEADS @ EW-20, 21, 22, 24, 25, 26 & EW-27. EW-23 NOT CONNECTED TO FOREMAN AS NO PUMP HAS BEEN INSTALLED IN THIS WELL. CONTRACTOR COMPLETED WORK FOR TODAY @ ~1630. LEFT SITE AT THIS TIME.

TERRA - 0700 TO 1630
CQM - 0700 TO 1630

Sketch:



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep:
Contractor's Rep:

Date:
Day:
Page: of
Report No.:

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

Number of Men:
Foreman
Operators
Laborers

Equipment:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: WTR
Contractor's Rep: Luke McCoy (TERRA)
Signed:

Date: 11-16-10
Day: TUESDAY
Page: 1 of 1
Report No.: 09

RESIDENT INSPECTION REPORT

Weather Conditions	Temperature		Sky	Rain	Snow	Project Site Conditions
	Low	High				
	36°	53°	PC	0	0	~~Dry~~ / Muddy

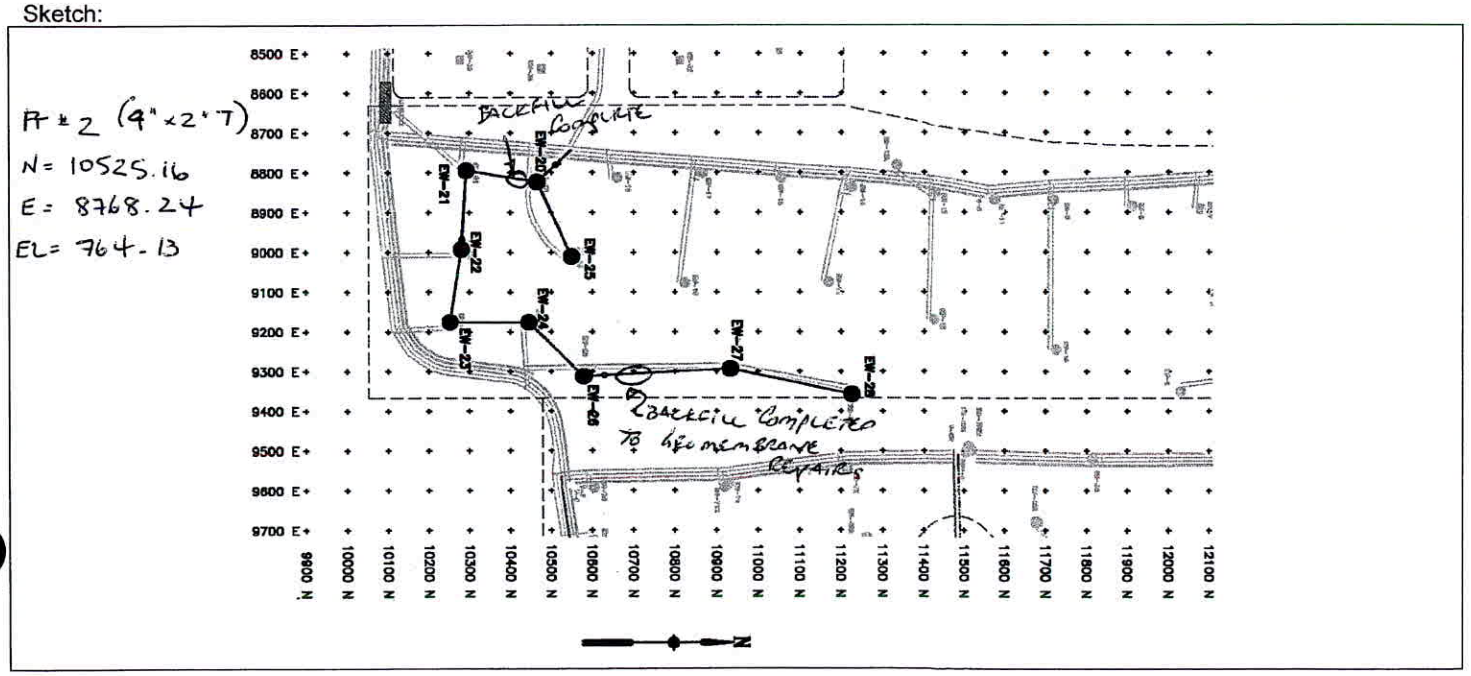
Field Book No.: Page #s:

Contractor(s) on Site:
TERRA

Report of Observation of Work and Comments:

TERRA/CQM ON-SITE @ 0700. WAS INFORMED THAT TERRA WILL COMPLETE BACKFILL OF REMAINING FORCEMAIN TODAY (BTWN EW-21 & EW-20 & EW-26 & 27) AFTER 4"x2" CLEANOUT (PT #2) LOCATED BY SURVEY. TERRA LEFT SITE @ ~0715 TO P/U MORE STYROFOAM & RETURNED TO SITE @ ~0800. ~~CLEANOUT~~ TEE LOCATED BY SURVEY & REMAINING TRENCH BACKFILLED. TERRA CREW MOVED TO VEOLIA PORTION OF SITE TO BEGIN CONSTRUCTION OF FORCEMAIN (3") & AIRLINES.

Sketch:



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep:
Contractor's Rep:

Date:
Day:
Page: of
Report No.:

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

Number of Men:
Foreman
Operators
Laborers

Equipment:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: WFR
Contractor's Rep: TERRA (CHIP)
Signed:

Date: 11/24/10
Day: WED S
Page: 1 of 1
Report No.: 5

RESIDENT INSPECTION REPORT

Weather Conditions	Temperature Low	Temperature High	Sky	Rain	Snow	Project Site Conditions
	29°	39°	OVERCAST	PM	TRACE	(Dry) / Muddy

Field Book No.: Page #s:

Contractor(s) on Site:
TERRA

Report of Observation of Work and Comments:

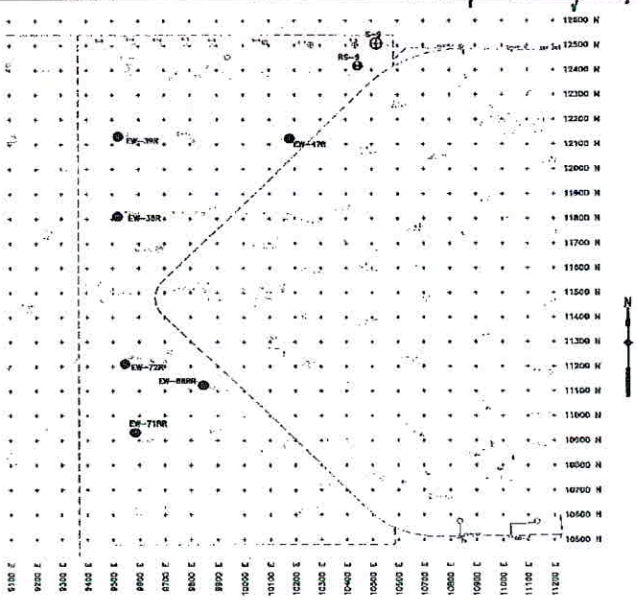
ON SITE @ ~0620. TERRA MOVED DRILL RIG TO EW-71RR & BEGAN DRILLING @ ~0630 AT REVISED LOCATION. NO PROBLEMS W/EXCESSIVE LIQUID ENCOUNTERED & DRILLING WAS COMPLETED BY ~0800. WELL PIPE SET & GRAVEL PACK PLACED TO ~12" ABOVE PERFORATIONS. 4' BENTONITE SEAL PLACED & HYDRATED. BOREHOLE THEN FILLED W/ SAND TO ~36" BELOW MEMBRANE & 2ND BENTONITE SEAL PLACED & HYDRATED. CONTRACTER BACKFILLED REMAINDER OF BORING & GRADED TO MATCH EXISTING ELEVATIONS. ALL WORK ON EW-71RR COMPLETED BY ~0930 & RIG WAS MOVED NEAR EW-68RR. NO DRILLING ON THIS WELL WAS COMPLETED TODAY AS TERRA WILL NEED TO CONTRUCT BENCH FOR DRILL RIG.

* The geomembrane was patched by AEG at Repair locations R1 and R2 between EW-26 and EW-27.

PED 2/23/12

Sketch:

WASTE LOADS
EW-71RR 2



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: SMC
Contractor's Rep: Luke Iverson
Signed: Scott Chapin

Date: 4/15/11
Day: FRIDAY
Page: 1 of 1
Report No.: 15

RESIDENT INSPECTION REPORT

Weather Conditions	Temperature		Sky	Rain	Snow	Project Site Conditions
	Low	High				
	40	55	P-cloudy	N/A	N/A	Dry

Field Book No.: Vol. 1 Page #s:

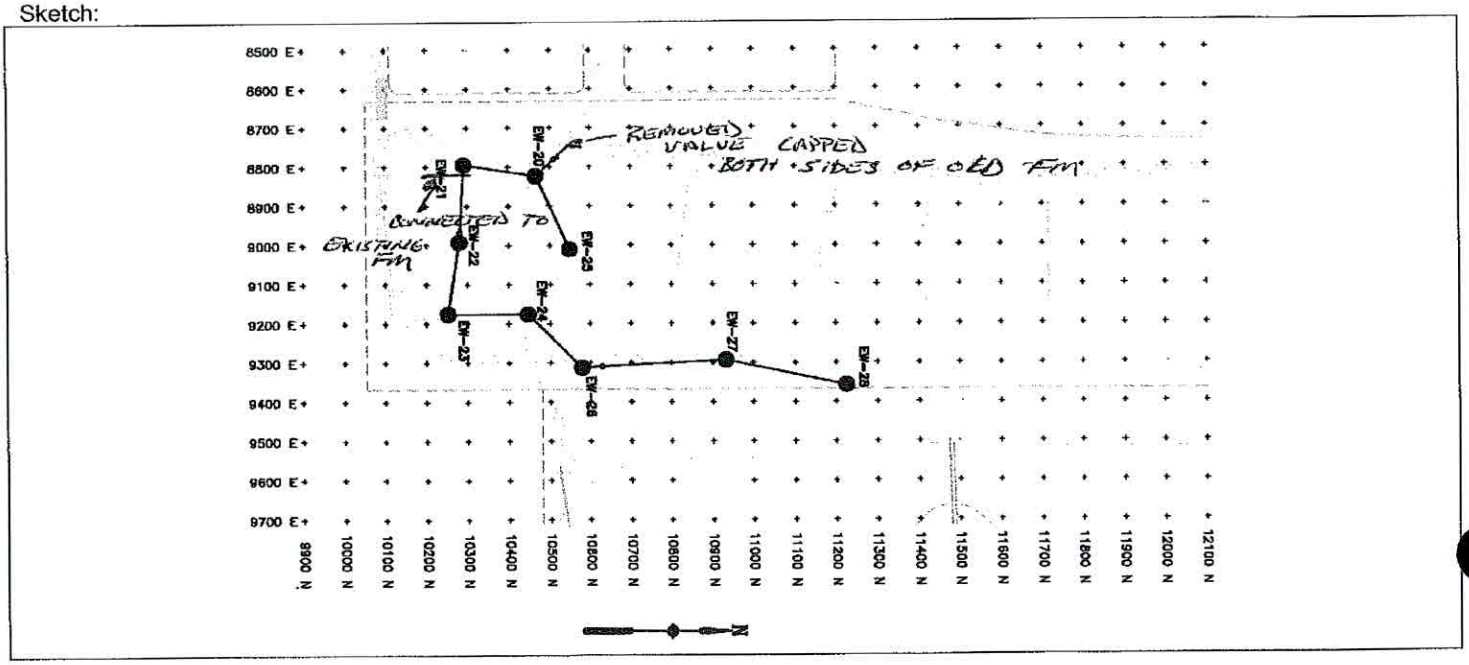
Contractor(s) on Site:
Terra

Report of Observation of Work and Comments:

TERRA EXCAVATED TO SOUTH VALVE @ THE CONNECTION (PT # 1) AND REMOVED THE VALVE AND CAPPED BOTH SIDES OF THE EXISTING FM.

TERRA CONNECTED THE EXISTING FM @ LINE BY EW-21 TO THE NEW FM, AND CAPPED THE OLD LINE

Sketch:



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic – Zion Landfill
Project: LFG/Leachate System Repairs
Engineer's Rep: SMC
Contractor's Rep: Luke Iverson
Signed: Scott Cole

Date: 5/12/11
Day: THURSDAY
Page: 1 of 1
Report No.: 16

RESIDENT INSPECTION REPORT

Weather Conditions	Temperature		Sky	Rain	Snow	Project Site Conditions
	Low	High				
	39	54	P-cloudy	N/A	N/A	Dry

Field Book No.: Vol. 1 Page #s:

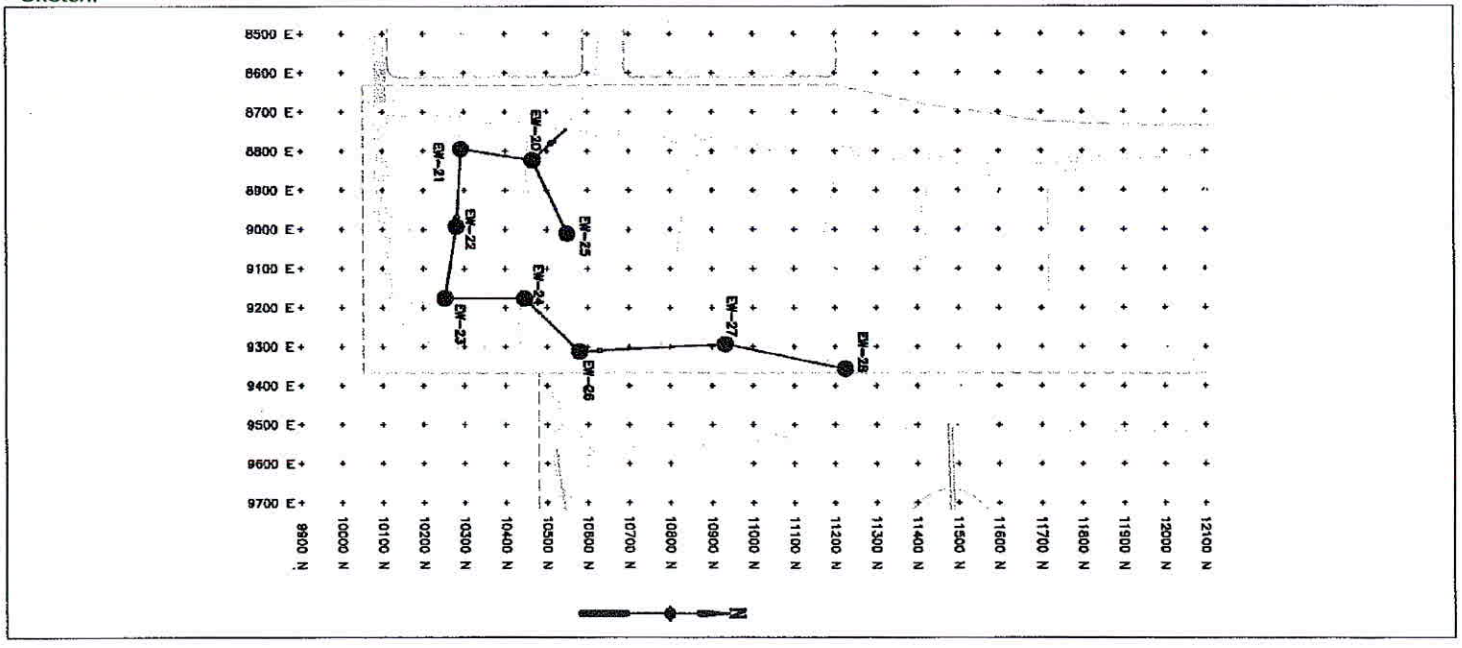
Contractor(s) on Site:
Terra

Report of Observation of Work and Comments:

TERRA ON SITE INSTALLING THE CORRECT EM HOOK UPS TO THE WELL HEADS

TERRA WILL BE BACK TO FINISH THE HOSE CLAMP & FIX SOME OF THE KANNA FLEX WHEN THERE PARTS COME IN.

Sketch:



ATTACHMENT 3

Construction Photographs

By:	**Scott Chafer**	Subject:	**BFI Zion**	Sheet No:	1 of 3
	Frank Remington				
Date:	See below			Job No:	**0120-37-01**

Photograph # 1
Excavation trench for replacement forcemain.

Photograph # 2
Placing insulation and backfilling trench.

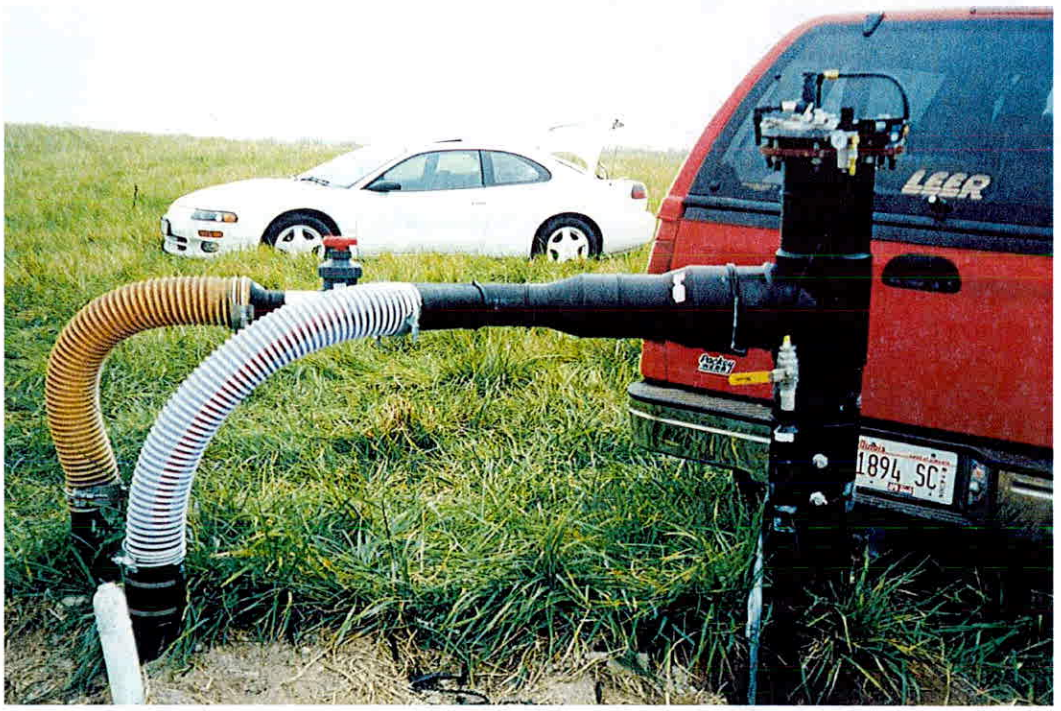
By:	**Scott Chafer** **Frank Remington**	Subject:	**BFI Zion**	Sheet No:	2 of 3
Date:	See below			Job No:	**0120-37-01**

Photograph # 3
Installing forcemain cleanout.

Photograph # 4
Pressure testing forcemain pipe.

By:	**Scott Chafer** **Frank Remington**	Subject:	**BFI Zion**	Sheet No:	3 of 3
Date:	See below			Job No:	**0120-37-01**

Photograph #5
Forcemain tie-in to north forcemain cleanout.



Photograph #6
Typical connection to new forcemain.

ATTACHMENT 4

Air Pressure Testing Results

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax (920) 465-3913

Client: Republic - Zion Landfill **Date:** 11-12-10
Project: LFG/Leachate System Repairs **Day:** Friday
Engineer's Rep: WFR **Page:** 1 of 2
Contractor's Rep: TERRA / Luke **Job No.:**

PIPELINE TEST FORM

Location: (Bldg. to Bldg., Struct. to Struct., M.H. to M.H., Sta. to Sta., etc.)
Main Line (0+00 - 15+53); To EW-23 (0+00 - 1+44); To EW-25 (0+00 - 2+17)

Description: (Material and Line Usage, Example: PVC-Sanitary, Di-Water, etc.)
2" Forcemain Pipe

Type of Test: (Air, Hydrostatic, Infiltration, Exfiltration, Other)
Air

Test Pressure Per Spec. 10psi (PSI, Gal/Day, etc.)

Test Results: (Fill in Applicable Section)

	AIR	Hydrostatic		
Start Pressure:	10.5 psi		GAL/DAY	GAL/HR.
End Pressure:	10.5 psi			
Time:	0811 - 0911			

Comments: (Pass)/Fail (Circle One)
1 Hour

Signatures:
Contractor Rep: Patrick E Dronet 2/23/12
Engineer/Owner Rep: Patrick E Dronet 2/23/12
Date Test Performed: 11-12-10

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax (920) 465-3913

Client: Republic - Zion Landfill **Date:** 11-12-10
Project: LFG/Leachate System Repairs **Day:** Friday
Engineer's Rep: WFR **Page:** 2 of 2
Contractor's Rep: TERRA/Luke **Job No.:**

PIPELINE TEST FORM

Location: (Bldg. to Bldg., Struct. to Struct., M.H. to M.H., Sta. to Sta., etc.)
Main Line (0+00 - 15+53); To EW-23 (0+00 - 1+44);
To EW-25 (0+00 - 2+17)

Description: (Material and Line Usage, Example: PVC-Sanitary, Di-Water, etc.)
4" Casing Pipe

Type of Test: (Air, Hydrostatic, Infiltration, Exfiltration, Other)
Air

Test Pressure Per Spec. 10 psi (PSI, Gal/Day, etc.)

Test Results: (Fill in Applicable Section)

	AIR	Hydrostatic		
Start Pressure:	10.5 psi		GAL/DAY	GAL/HR.
End Pressure:	10.5 psi			
Time:	1015 - 1115			

Comments: (Pass)/Fail (Circle One)
1 Hour

Signatures:
Contractor Rep: Patrick E Dronet 2/23/12
Engineer/Owner Rep: Patrick E Dronet 2/23/12
Date Test Performed: 11-12-10

ATTACHMENT 5

Geomembrane Repair Documentation

SUMMARY OF FIELD TEST RESULTS FOR GEOMEMBRANE TRIAL WELD SAMPLES

VEOLIA ES ZION LANDFILL
LEACHATE FORCEMAIN RELOCATION

JANUARY 2011

SINGLE EXTRUSION WELD

Date Sampled	Preweld Number	Machine Number	Welder ID	Machine Temp (°F)	Time	Ambient Temp. (°F)	Average Tension (ppi)* Peel	Shear
11/24/10	SW-1	6098	DS	520	8:30 AM	38	93	112
Average:							**93**	**112**
Project Requirements:							**>44**	**>60**

*Values are the average of 3 peel and 3 shear samples tested on the field tensiometer.

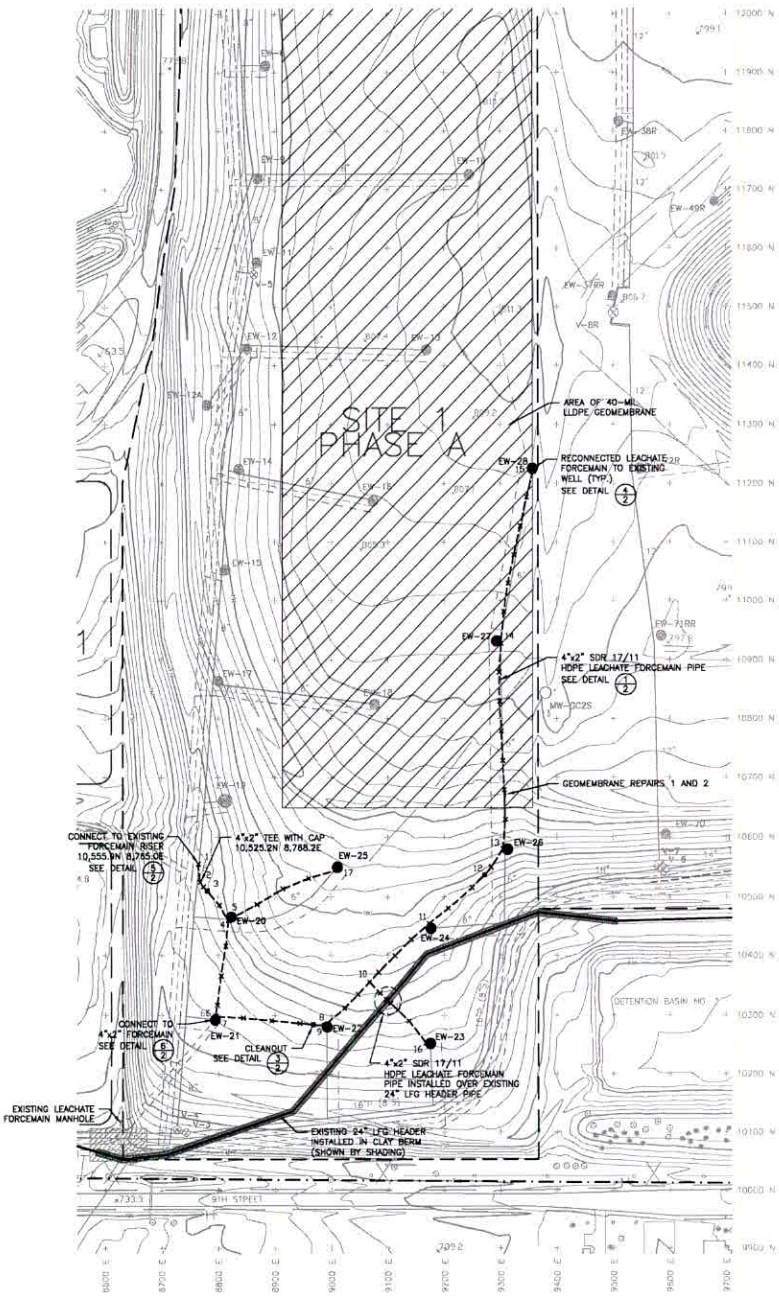
SUMMARY OF GEOMEMBRANE REPAIRS FOLLOWING INSTALLATION

VEOLIA ES ZION LANDFILL LEACHATE FORCEMAIN RELOCATION

Repair Number	Date Repaired	Time Repaired	Seam/Panel Number	Machine Number	Welder ID	Coordinates North	Coordinates East	Description of Damage	Type of Repair	Vacuum Tested Y/N	Checked By:
R1	11/24/10	8:45 AM	40-mil Cover	6098	DS	10675	9308	Repair	1' x 2' Patch	Yes	WFR
R2	11/24/10	8:50 AM	40-mil Cover	6098	DS	10669	9308	Repair	1' x 1' Patch	Yes	WFR

ATTACHMENT 6

As-Built Drawings



LEGEND

- CELL PHASING LIMIT
- PERMITTED WASTE LIMITS SITE 1A
- PROPERTY BOUNDARIES
- GAS HEADER PIPE
- LEACHATE FORCEMAIN PIPE
- CONDENSATE DISCHARGE PIPE
- HORIZONTAL LFG WELL PIPE
- AIR SUPPLY PIPE
- EXISTING GEOMEMBRANE
- 2010 ASBUILT LEACHATE FORCEMAIN PIPE
- LFG VALVE
- CD-3 — CONDENSATE SUMP
- EW-46 — GAS/LEACHATE EXTRACTION WELL
- PEW-1 — REMOTE EXTRACTION WELLHEAD
- S-1 — NORTH TRENCH SUMP
- GMP-27 — GAS MONITORING PROBE
- MW-GT19 — GROUNDWATER MONITORING WELL
- CIP — LEACHATE RECIRCULATION/LFG WELLHEAD
- CEW-5R — LEACHATE CLEANOUT RISER
- EW-27 — RECONNECT GAS/LEACHATE EXTRACTION WELL
- CLEANOUT AND WITNESS PIPE

NOTES:

1. TOPOGRAPHICAL MAP PREPARED FROM AERIAL SURVEY PERFORMED BY MARTINEZ CORPORATION ON MARCH 18, 2010. CONTOUR INTERVAL IS 2 FEET AND ELEVATIONS ARE U.S.G.S MEAN SEA LEVEL DATUM.
2. FACILITIES HORIZONTAL CONTROL IS BASED ON ASSUMED SITE GRID SYSTEM.
3. LEACHATE FORCEMAIN WAS RECONNECTED TO EXISTING LFG WELLS EW-20, EW-21, EW-22, EW-23, EW-24, EW-25, EW-26, EW-27, AND EW-28.

2010 LFG/LEACHATE SYSTEM REPAIRS

Control Point No.	Description	Station (Ft.)	Coordinates North	Coordinates East	Top of Pipe Elevation (Ft.)
2" x 4" Forcemain Header					
1	Tie-in to Existing	0+00	10555.9	8765.0	763.34
2	2" x 4" Tee (Future Connection)	0+31	10525.2	8768.2	764.13
	2" x 4" HDPE Pipe	0+39	10517.8	8774.3	764.95
3	2" x 4" Cleanout and Witness Pipe	0+49	10510.7	8780.9	765.50
	2" x 4" HDPE Pipe	0+82	10486.3	8802.5	767.32
4	2" x 4" Tee at Riser to EW-20	1+13	10460.0	8818.0	767.66
5	2" x 4" Tee to EW-25	1+14	10459.3	8818.2	767.66
	2" x 4" HDPE Pipe	1+57	10416.3	8813.6	765.21
	2" x 4" HDPE Pipe	2+07	10367.0	8805.2	762.40
	2" x 4" HDPE Pipe	2+57	10317.7	8798.5	761.05
6	2" x 4" 90° Bend	2+76	10299.1	8794.8	760.64
7	2" x 4" Tee at Riser to EW-21	2+78	10298.8	8796.3	760.70
	2" x 4" HDPE Pipe	3+25	10295.6	8844.3	761.48
	2" x 4" HDPE Pipe	3+76	10291.1	8894.4	762.55
	2" x 4" HDPE Pipe	4+26	10286.3	8944.2	763.88
8	2" x 4" Cleanout and Witness Pipe	4+50	10284.3	8967.9	764.37
9	2" x 4" Tee at Riser to EW-22	4+70	10283.2	8987.4	764.76
	2" x 4" HDPE Pipe	5+17	10312.4	9023.6	767.68
	2" x 4" HDPE Pipe	5+50	10335.7	9047.4	769.81
10	2" x 4" Tee to EW-23	5+79	10356.5	9067.7	771.29
	2" x 4" HDPE Pipe	6+02	10372.5	9083.8	772.33
	2" x 4" HDPE Pipe	6+42	10399.8	9112.6	773.57
	2" x 4" HDPE Pipe	6+82	10427.2	9141.4	774.14
11	2" x 4" Tee at Riser to EW-24	7+24	10454.3	9173.3	775.41
	2" x 4" HDPE Pipe	7+67	10481.0	9207.4	775.51
	2" x 4" HDPE Pipe	8+22	10516.0	9249.6	775.92
12	2" x 4" Cleanout and Witness Pipe	8+53	10537.5	9271.8	776.93
	2" x 4" HDPE Pipe	8+71	10550.9	9283.7	777.89
13	2" x 4" Tee at Riser to EW-26	9+07	10580.6	9304.5	781.17
	2" x 4" HDPE Pipe	9+57	10629.7	9309.0	787.15
	2" x 4" HDPE Pipe	10+07	10679.6	9308.9	790.92
	2" x 4" HDPE Pipe	10+57	10729.4	9304.4	795.26
	2" x 4" HDPE Pipe	11+07	10779.4	9301.7	797.42
	2" x 4" HDPE Pipe	11+57	10829.5	9298.5	798.82
	2" x 4" HDPE Pipe	12+07	10879.3	9297.8	799.97
14	2" x 4" Tee at Riser to EW-27	12+56	10928.2	9301.6	800.69
	2" x 4" HDPE Pipe	13+09	10981.1	9306.1	801.91
	2" x 4" HDPE Pipe	13+58	11029.8	9313.8	803.14
	2" x 4" HDPE Pipe	14+08	11078.6	9324.2	804.09
	2" x 4" HDPE Pipe	14+58	11127.6	9335.3	804.90
	2" x 4" HDPE Pipe	15+08	11176.4	9346.7	805.72
15	2" x 4" 90° Bend at Riser to EW-28	15+53	11219.7	9358.5	806.61
2" x 4" Lateral to EW-23					
10	2" x 4" Tee to EW-23	0+00	10356.5	9067.7	771.29
	2" x 4" HDPE Pipe	0+28	10338.2	9086.5	770.23
	2" x 4" HDPE Pipe	0+41	10327.7	9097.4	774.05
	2" x 4" HDPE Pipe	0+51	10320.8	9109.2	773.61
	2" x 4" HDPE Pipe	0+68	10309.5	9117.7	767.95
	2" x 4" HDPE Pipe	0+98	10290.2	9137.8	766.03
16	2" x 4" 90° Bend at Riser to EW-23	1+44	10252.9	9167.6	763.65
2" x 4" Lateral to EW-25					
5	2" x 4" Tee to EW-25	0+00	10459.3	8818.2	767.66
	2" x 4" HDPE Pipe	0+58	10487.9	8868.8	774.07
	2" x 4" HDPE Pipe	1+11	10514.3	8914.6	778.00
	2" x 4" HDPE Pipe	1+80	10531.6	8980.1	780.07
17	2" x 4" 90° Bend at Riser to EW-25	2+17	10547.7	9015.1	781.44

RELEASE	DATE:	BY:
Project Review		
5		
4		
3		
2		
1		

NO.	DATE:	BY:
DESCRIPTION		
REVISIONS		

BFI Waste Systems™
BFI Waste Systems of NA, LLC.

CQM, INC.
Engineering, Surveying, Material Testing
2323 Technology Drive
Green Bay, WI 54311

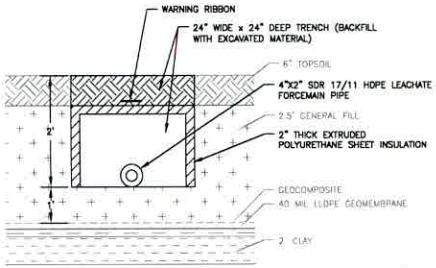
Leachate Forcemain Relocation Plan

Construction Documentation Drawings
Site 1A and 2
Elon Landfill
Elon, Illinois

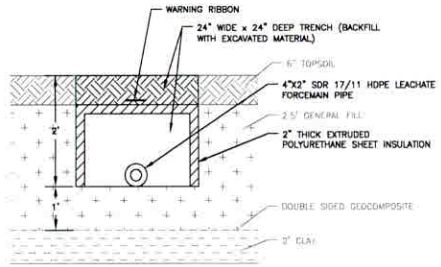
DRAWN BY: WBE
DATE: May 201
SCALE: 1"=100'

DRAWING NO.
1

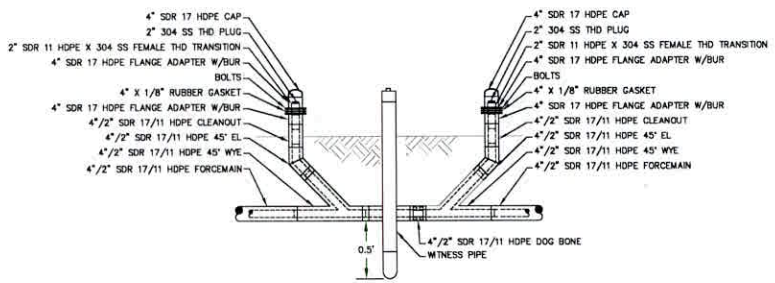
R002159



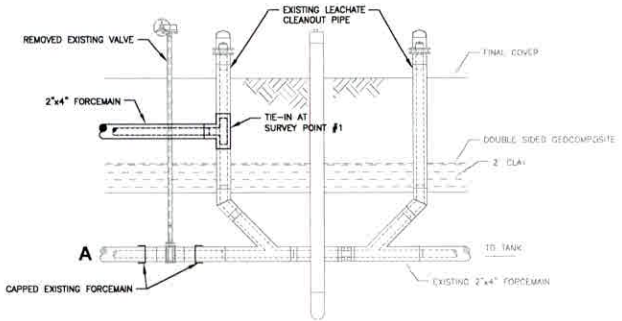
1/2 TRENCH INSIDE GEOMEMBRANE AREA
NOT TO SCALE



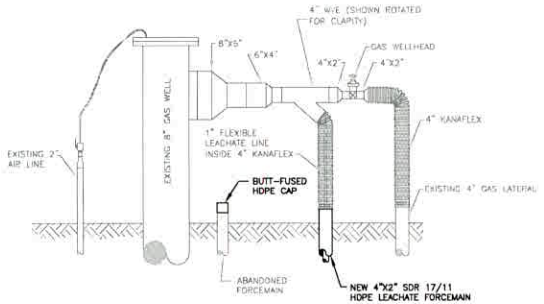
2/2 TRENCH OUTSIDE GEOMEMBRANE AREA
NOT TO SCALE



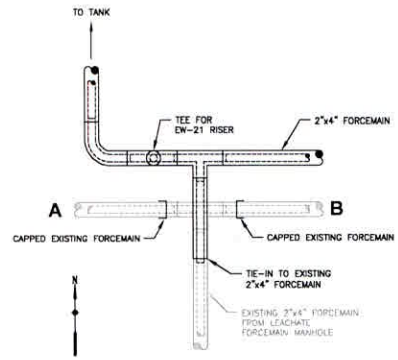
3/2 CLEANOUT DETAIL
NOT TO SCALE



5/2 TIE-IN TO EXISTING FORCEMAIN
NOT TO SCALE



4/2 TYPICAL LEACHATE CONNECTION AT EXISTING LFG WELL
NOT TO SCALE



6/2 TIE-IN TO EXISTING FORCEMAIN NEAR EW-21
NOT TO SCALE

RELEASE	DATE:	BY:
Project Review		
6		
4		
3		
2		
1		
NO.	DATE:	BY:
DESCRIPTION		
REVISIONS		

BFI Waste Systems™
BFI Waste Systems of NA, LLC.

CQM, INC.
Engineering-Surveying-Material Testing
2079 Continental Drive
Green Bay, WI 54311

Details

Construction Documentation Drawings
Site 1A and 2
Zion Landfill
Zion, Illinois

DRAWN BY: NGG
DATE: May 2011
SCALE: N.T.S.
DRAWING NO. 2

R 002160

Appendix E-11

Construction Acceptance Report, February 2016

Weaver Consultants Group

February 2, 2016

Illinois Environmental Protection Agency
Bureau of Land #33
1021 N. Grand Ave. East
PO Box 19276
Springfield, IL 62794-9276
Attn: Mr. Kevin Lesko

Re: Construction Acceptance Report
Leachate Forcemain Replacement
Zion Site 1 Landfill
0978020001 – Lake County
ILD 980700728
Project No.: 0120-037-01

Dear Mr. Lesko:

On behalf of operator, BFI Waste Systems of North America, LLC (BFI), Weaver Consultants Group North Central, LLC (WCG) is herein submitting the attached Construction Acceptance Report for the above referenced facility. This report is being submitted pursuant to our October 30, 2015 letter providing notification that the leachate forcemain was going to be replaced.

We trust that the enclosed information is sufficient for your current needs. If you should have any questions, please feel free to contact me or Mr. Jim Hitzeroth of BFI at (630) 894-5001.

Sincerely,

Weaver Consultants Group North Central, LLC

Michael B. Maxwell, LPG
EPG Chicago Operations Manager

Enclosure: Construction Certification Report

Cc: Mr. Jim Hitzeroth, BFI (w/ encl.)

January 29, 2016

Project No.: 0120-037-10-15

CONSTRUCTION ACCEPTANCE REPORT

ZION SITE 1, PHASE A LANDFILL

ZION, ILLINOIS

Zion, Illinois

LPC# NO. 0978020001

ILD 980700728

PREPARED BY

Weaver Consultants Group

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

1 INTRODUCTION

1.1 General

The following report summarizes the Construction Quality Assurance (CQA) documentation prepared during installation of approximately 625 feet of leachate forcemain at the Zion Landfill, Site 1A in Zion, Lake County, Illinois. The Zion Site 1A Landfill is a closed RCRA Subtitle C Landfill. The facility is regulated under Hazardous Waste Management RCRA Post-Closure Permit ILD 980700728, Log No. B-23R-M-5, issued September 30, 2011.

1.2 Leachate Collection System

The existing leachate collection system forcemain routes landfill leachate from Site 1 Phase A of the Zion Landfill to a dedicated hazardous waste storage tank located near the southwest corner of the facility. A facility diagram showing the Leachate and Gas Collection System is presented in the Figures Section as **Figure A-1**. During the course of routine operation and maintenance activities, restricted leachate flow was recently discovered within a section of east-west trending piping between Site 1B Cell No. 1 and Site 1B Cell No. 2. After repeated attempts at clearing the blockage(s) via jetting, it was eventually decided that this section of forcemain would be abandoned and replaced.

Notification of the impending construction work was provided to Illinois EPA in letters from Weaver Consultants Group on behalf of the permittee, dated October 30 and November 3, 2015. Copies of these correspondences are provided in **Appendix A**.

1.3 Report Organization

Following this summary is a brief narrative describing each of the major tasks related to the construction activities. Within each section of narrative, references are made to attached supporting documents. An as-built drawing is included in the **Figures** Section of the following report. Daily Summary Reports documenting the progress of construction and supporting survey data are included in **Appendix B**. **Appendix C** contains photographs illustrating the progress of construction.

2 LEACHATE LINE INSTALLATION AND CQA

2.1 Forcemain Construction

Prior to mobilization of the construction crew, the location of the existing leachate forcemain was surveyed and staked in the field. This stake out survey occurred on October 29, 2015.

The forcemain that was replaced was vacuumed out at the beginning of the field activities on November 3, 2015. The trench for the replacement forcemain was dug beginning at the east clean out riser shown on the attached **Figure 1** and extending to the west tie in shown on **Figure 1**. The bottom of the trench was dug at a depth approximately 3 feet below ground surface. The old forcemain was capped at both the east and west ends and decommissioned in place. Photographs illustrating the construction process are presented in **Appendix C**.

The new leachate forcemain was constructed from 3" x 6" dual contained HDPE pipe. The pipe and fittings were butt-fusion welded in accordance with typical industry standards for HDPE pipe construction. Air pressure tests were performed on both the 3" and 6" welded pipe to verify the integrity of the butt-fusion welds and mechanical connections. After the welding was complete, the each pipe was pressurized to fifty (50) pounds per square inch (psi) with an air compressor and maintained for a minimum duration of one (1) hour. The results of the air pressure testing are documented on the Pipeline Test Forms presented in **Appendix B**. After the pressure tests were completed, the portions of the pipe that were penetrated for the testing apparatus were cut off and discarded.

The completed 3" / 6" dual contained pipe was subsequently placed in the trench. The east end of the new leachate forcemain was connected at the east clean out riser (labeled leachate forcemain tie-in on Sheet 1 included with the WCG November 3, 2015 letter included in **Appendix A**). The western end of the new forcemain was connected to the existing forcemain east of the western clean out risers (labeled 4" witness pipe on **Figure 1**) on the east side of road. The field documentation indicates that a total of 624 feet of forcemain were replaced. The top of the pipe was surveyed in the trench (see survey results in **Figures**). The trench was backfilled with excavated soils and compacted, as needed. Lastly, the backfilled trench was seeded and covered with straw to minimize potential future erosion issues. Again, photographs illustrating the construction process are presented in **Appendix C**.

3 ENGINEERING CERTIFICATION STATEMENT

The following statement is provided pursuant to 35 IAC 811.505(d); [Subpart E] construction quality assurance programs; documentation; acceptance reports. These regulations specify the following requirements:

1. A certification by the CQA Officer that the construction has been prepared and constructed in accordance with the engineering design;
2. As built drawings; and
3. All daily summary reports.

The attached certification documentation is intended to fulfill these specifications.

I hereby affirm that all information contained in this Application is true and accurate to the best of my knowledge and belief.

Facility: Zion Site 1A Landfill

IEPA Site No. 0978020001

ILD 980700728

Component(s) or Phase(s): Forcemain Abandonment and Replacement

Piping Appurtenances

Certified by: _____ 2/2/16

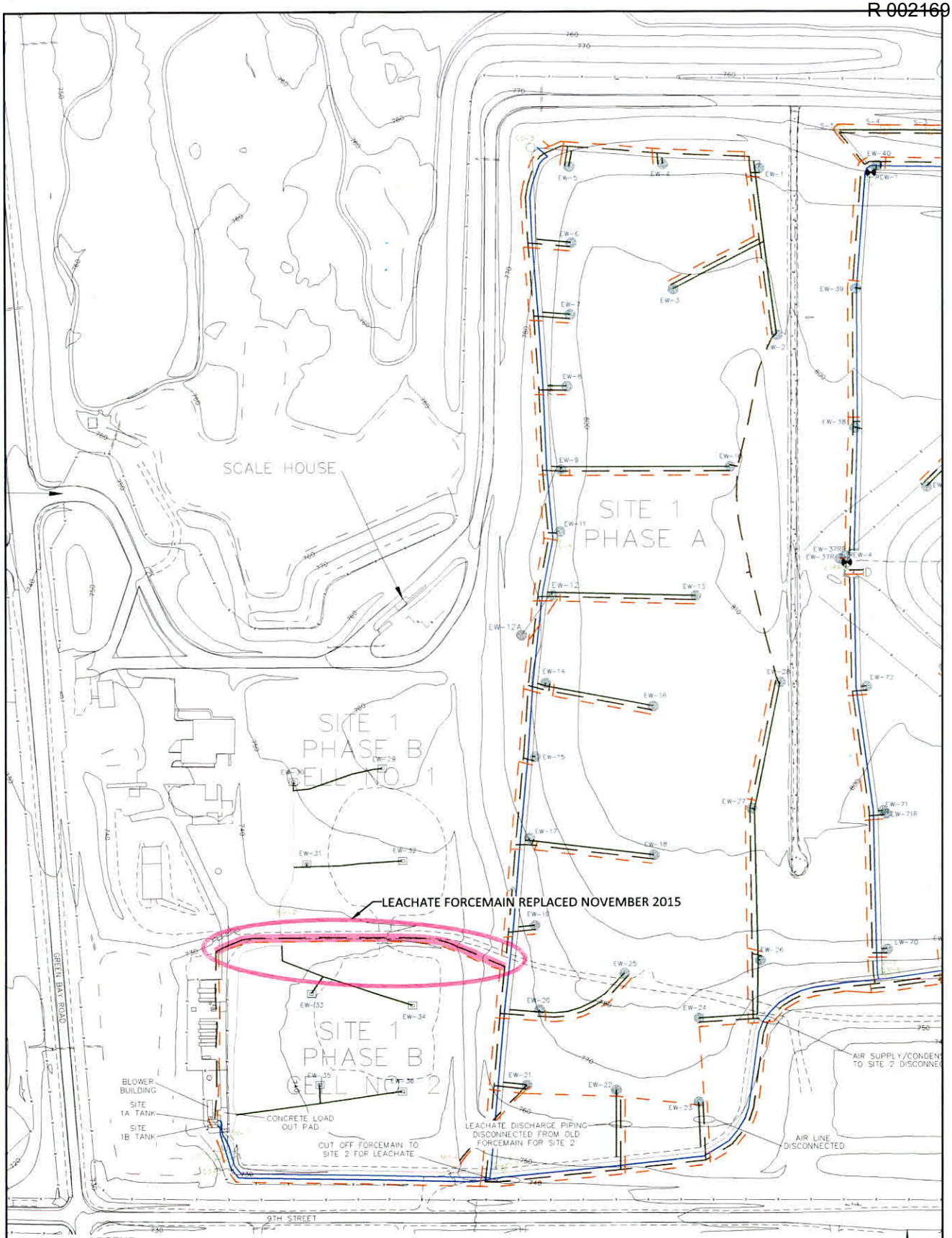
Weaver Consultants Group Date

John Bossert, P.E.

Illinois P.E. No. 062-050455

JOHN W. BOSSERT 062-050455 REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

FIGURES



LEGEND

- LEACHATE DISCHARGE PIPING
- AIR SUPPLY PIPING
- GAS HEADER PIPING
- CONDENSATE DISCHARGE PIPING
- EW-43 EXTRACTION WELL
- REW-2 REMOTE EXTRACTION WELLHEADS
- NORTH TRENCH SUMP
- CS-5 CONDENSATE SUMP
- VALVE BOX

APPROXIMATE GRAPHIC SCALE
200 0 100 200 400
1 inch = 200 ft.

N

PREPARED FOR:
ZION LANDFILL

PHASE A LEACHATE & GAS COLLECTION SYSTEM

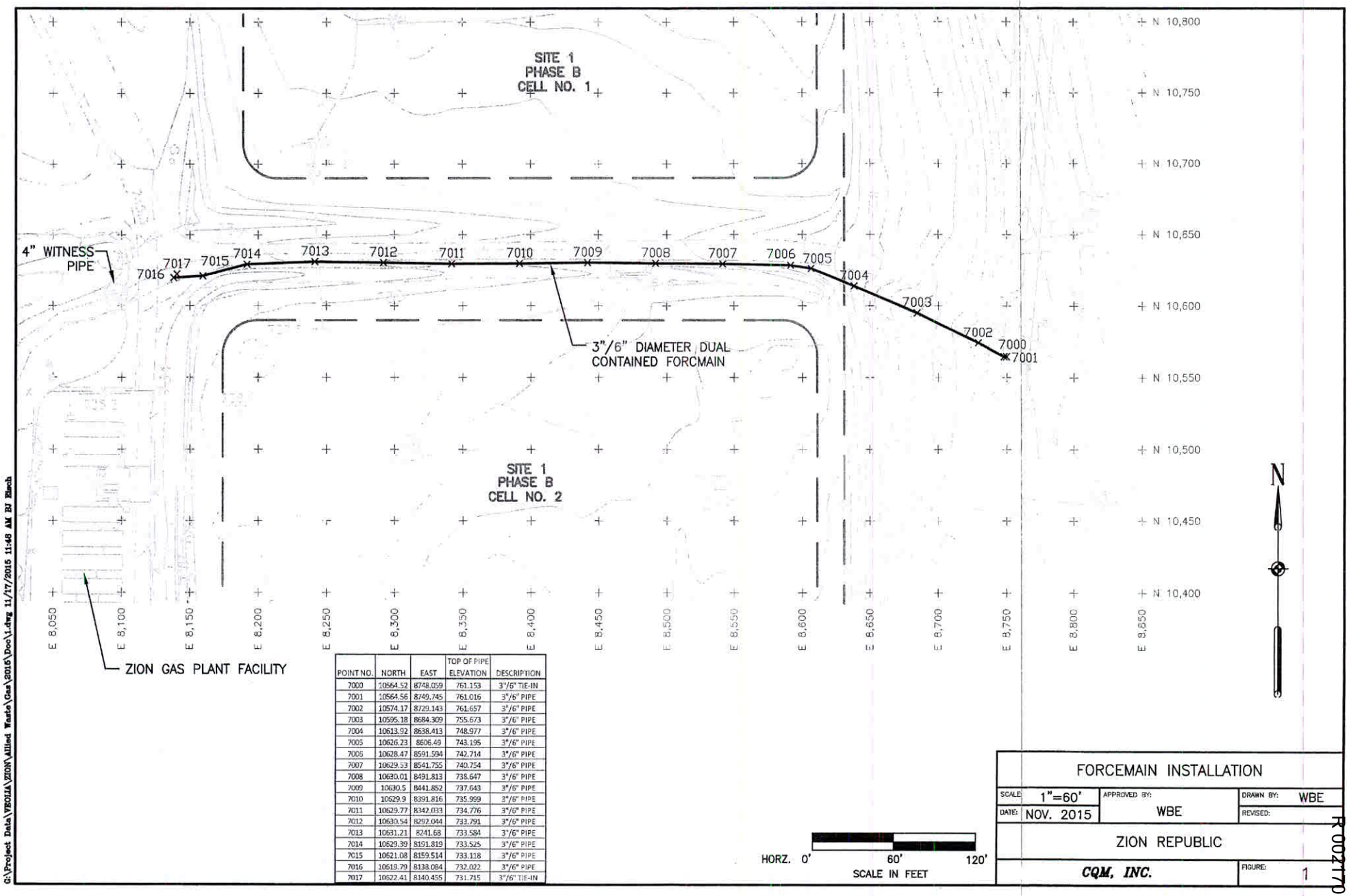
SITE 1 - ZION LANDFILL
POST-CLOSURE PERMIT APPLICATION
LAKE COUNTY, ZION, IL

Weaver Consultants Group
CHICAGO, ILLINOIS
(312) 922-1030 www.wcgrp.com

DRAWN BY: RMD
REVIEWED BY: MM
DATE: 1/28/2016
FILE: 0120-037-10-15
CAD: SITE 1.dwg

FIGURE A-1

SOURCE: LAND CONTOURS BASED UPON AERIAL SURVEY PERFORMED MARCH 2009.



POINT NO.	NORTH	EAST	TOP OF PIPE ELEVATION	DESCRIPTION
7000	10564.52	8748.059	761.153	3"/6" TIE-IN
7001	10564.56	8749.745	761.016	3"/6" PIPE
7002	10574.17	8729.143	761.657	3"/6" PIPE
7003	10595.18	8684.309	755.673	3"/6" PIPE
7004	10613.92	8638.413	748.977	3"/6" PIPE
7005	10626.23	8606.49	743.195	3"/6" PIPE
7006	10628.47	8591.594	742.714	3"/6" PIPE
7007	10629.53	8541.755	740.754	3"/6" PIPE
7008	10630.01	8491.813	738.647	3"/6" PIPE
7009	10630.5	8441.852	737.643	3"/6" PIPE
7010	10629.9	8391.816	735.999	3"/6" PIPE
7011	10629.77	8342.033	734.776	3"/6" PIPE
7012	10630.54	8292.044	733.791	3"/6" PIPE
7013	10631.21	8241.68	733.584	3"/6" PIPE
7014	10629.39	8191.819	733.525	3"/6" PIPE
7015	10621.08	8159.514	733.118	3"/6" PIPE
7016	10619.79	8138.084	732.022	3"/6" PIPE
7017	10622.41	8140.455	731.715	3"/6" TIE-IN

FORCEMAIN INSTALLATION

SCALE:	1"=60'	APPROVED BY:	DRAWN BY:	WBE
DATE:	NOV. 2015	WBE	REVISED:	

ZION REPUBLIC

CQM, INC. FIGURE: 1

R 002170

G:\Project Data\VEOLIA\ZION\Allied Waste\Gas\2015\Doc\1.dwg 11/17/2015 11:48 AM BJ Hoch

Appendix A

Correspondence With Illinois EPA

Weaver Consultants Group

October 30, 2015

Illinois Environmental Protection Agency
Bureau of Land #33
1021 N. Grand Ave. East
Springfield, IL 62794-9276
Attn: Mr. Kevin Lesko

Re: Notification of Post-Closure Maintenance
Leachate Forcemain Replacement
Zion Site 1 Landfill
ILD 980700728
Project No.: 0120-037-01

Dear Mr. Lesko:

On behalf of operator, BFI Waste Systems of North America, LLC, (BFI) Weaver Consultants Group North Central, LLC (WCG) is herein providing notice concerning pending post-closure maintenance activities planned for the leachate collection system at the above referenced facility.

The operator has previously identified blockage(s) within a portion of the leachate collection forcemain pipe located between Site 1B Cell No. 1 and Cell No. 2. These blockages have inhibited the ability of the leachate collection system to efficiently collect and transmit leachate from the closed landfill. In response, the operator had the forcemain pipe jetted multiple times in an attempt to remove the blockage(s). The specific number and location of the blockage(s) was unknown. While the jetting successfully removed the blockages, the increased leachate flow within this section of forcemain was only temporary, as additional blockage(s) were identified that again inhibited the efficiency of the leachate collection system.

Rather than continue to utilize jetting as a temporary means of keeping the leachate forcemain pipe open, the operator would like to replace the piping that is believed to be the source of the prior blockages. In summary, the following scope of work is expected:

- Excavate at east clean out riser to identify existing buried pipe;

- Find dual contained 3"x 6" leachate forcemain pipe going west and cut and cap the old forcemain to decommission existing pipe in place;
- The new tie in will be connected to the east clean out riser;
- Approximately 700 feet of new 3"x 6" dual contained forcemain pipe will be installed moving west;
- East of the western clean out risers, the existing forcemain will be cut and capped to decommission existing pipe in place; and
- The new forcemain pipe will be tied in to the west clean out riser.

Section I-2a of the approved "Post-Closure Permit Application, Zion Landfill Site 1, Phase A" dated December 2009 presents three different categories of modifications to the leachate/gas collection system intended to allow for implementation of certain enhancements, replacements or repairs without the need for prior formal Illinois EPA review and approval through the standard permit modification process. The above categories are as follows:

1. Category 1 – Automatic Implementation With Subsequent Notice to Illinois EPA;
2. Category 2 – Automatic Implementation After Providing Notice to Illinois EPA; and
3. Category 3 – Illinois EPA Approval Needed Through Standard Permit Modification Before Proceeding

The proposed maintenance activity described above is believed to fit into Category 2: "Automatic Implementation After Providing Notice to Illinois EPA". This category includes activities intended to maintain or enhance the leachate and/or gas piping to increase removal efficiency. The language in the approved permit application specifically includes the installation of new forcemain or other piping. Installation of this new forcemain is believed to be necessary to comply with various permit conditions requiring the operator to actively removal leachate from the closed landfill.

While a 7 day notice to Illinois EPA before proceeding with the work is specified in the approved permit application, the operator would prefer to proceed with the above described maintenance activities as early as November 3, 2015. This schedule is warranted because the existing blockages are impacting the efficiency of the leachate extraction and removal system, which if left unaddressed, will begin to impact the efficiency of the gas extraction system because leachate has the potential to backup within the landfill footprint. For these reasons, the operator intends to proceed with these repairs as early as November 3, 2015. A

construction quality assurance (CQA) Report will be prepared and provided to Illinois EPA within 90 days after completion of the construction in the field.

We trust that the enclosed information is sufficient for your current needs. If you should have any questions, please feel free to contact me or Mr. Jim Hitzeroth of BFI at (630) 894-5001.

Sincerely,

Weaver Consultants Group North Central, LLC

Michael B. Maxwell, LPG
Senior Project Manager

Cc: Mr. Jim Hitzeroth, BFI

Weaver Consultants Group

November 3, 2015

Illinois Environmental Protection Agency
Bureau of Land #33
1021 N. Grand Ave. East
PO Box 19276
Springfield, IL 62794-9276
Attn: Ms. Kelly Huser

Re: Notification of Post-Closure Maintenance
Leachate Forcemain Replacement
Zion Site 1 Landfill
0978020001 – Lake County
ILD 980700728
Project No.: 0120-037-01

Dear Ms. Huser:

On behalf of operator, BFI Waste Systems of North America, LLC, (BFI) Weaver Consultants Group North Central, LLC (WCG) is herein providing follow up information pertaining to our October 30, 2015 letter regarding the above referenced facility.

Three facility figures are attached to support our prior request to proceed with replacement of a leachate forcemain. As mentioned in the October 30, 2015 letter, the forcemain transmits leachate from Site 1A to the leachate storage tank located in the southwest portion of the facility. The specific stretch of piping is shown on the enclosed figures and runs south of Site 1, Phase B, Cell 1 and north of Site 1, Phase B Cell 2.

This stretch of piping is particularly important to the overall leachate extraction system because it transmits leachate from the majority of the Site 1A footprint to the storage tank. Therefore, a blockage has the potential to have a significant impact on leachate levels throughout the facility.

We trust that the enclosed information is sufficient for your current needs. If you should have any questions, please feel free to contact me or Mr. Jim Hitzeroth of BFI at (630) 894-5001.

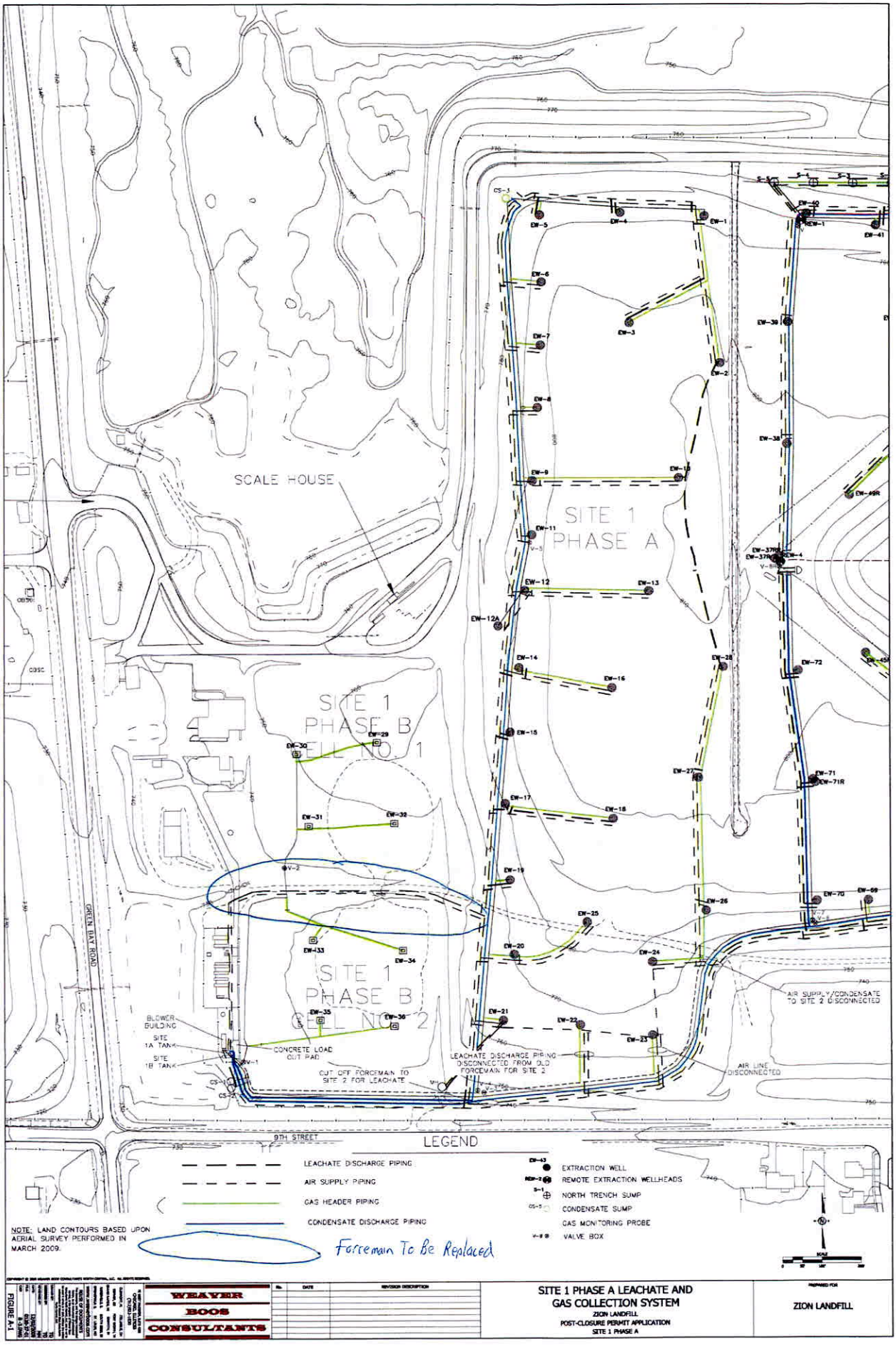
Sincerely,

Weaver Consultants Group North Central, LLC

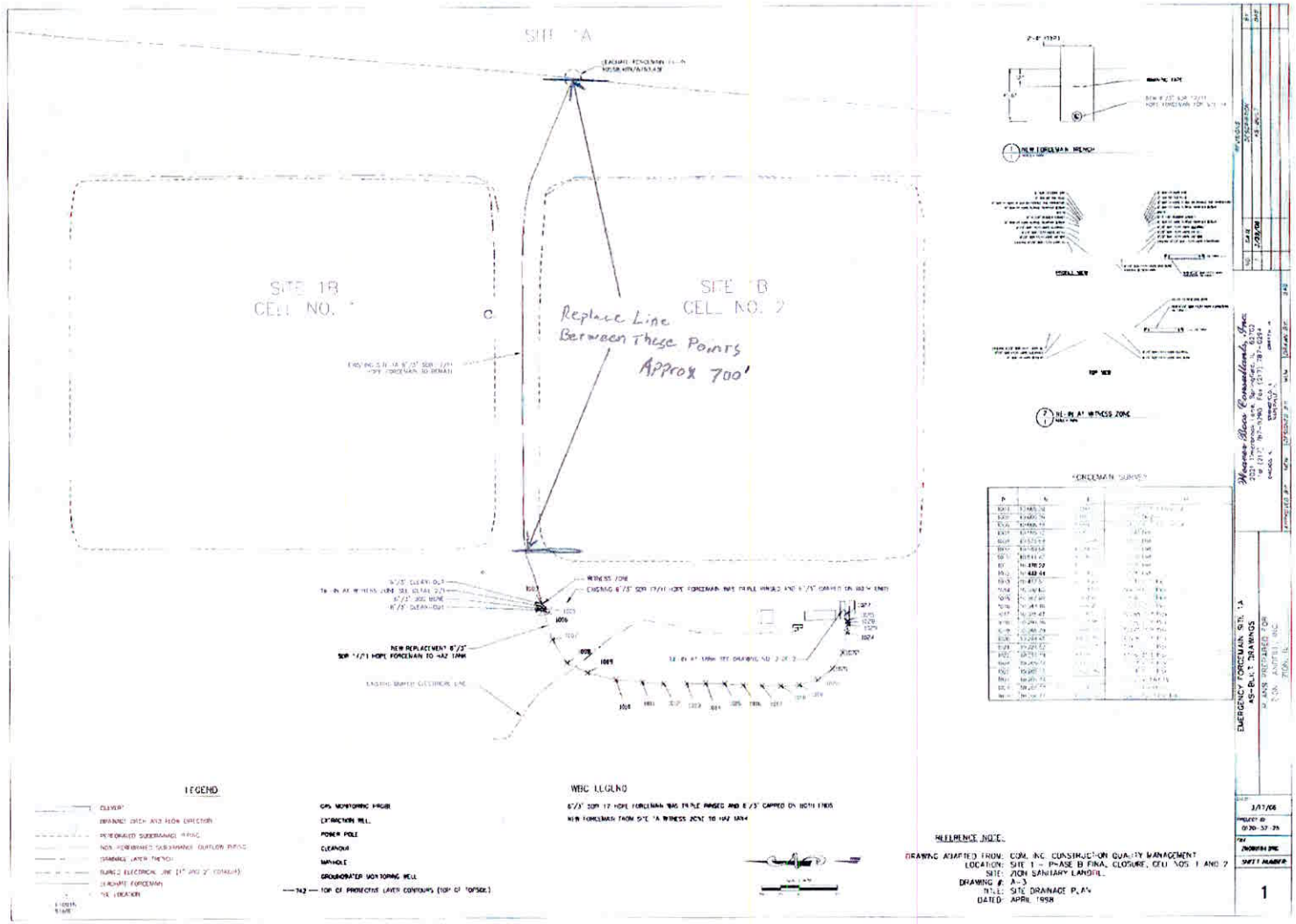
Michael B. Maxwell, LPG
Senior Project Manager

Enclosures: Figure A-1: Site 1 Phase A Leachate and Gas Collection System
Sheet 1: Emergency Forcemain Site 1A As-Built Drawings
Close Up View of Leachate Forcemain Line

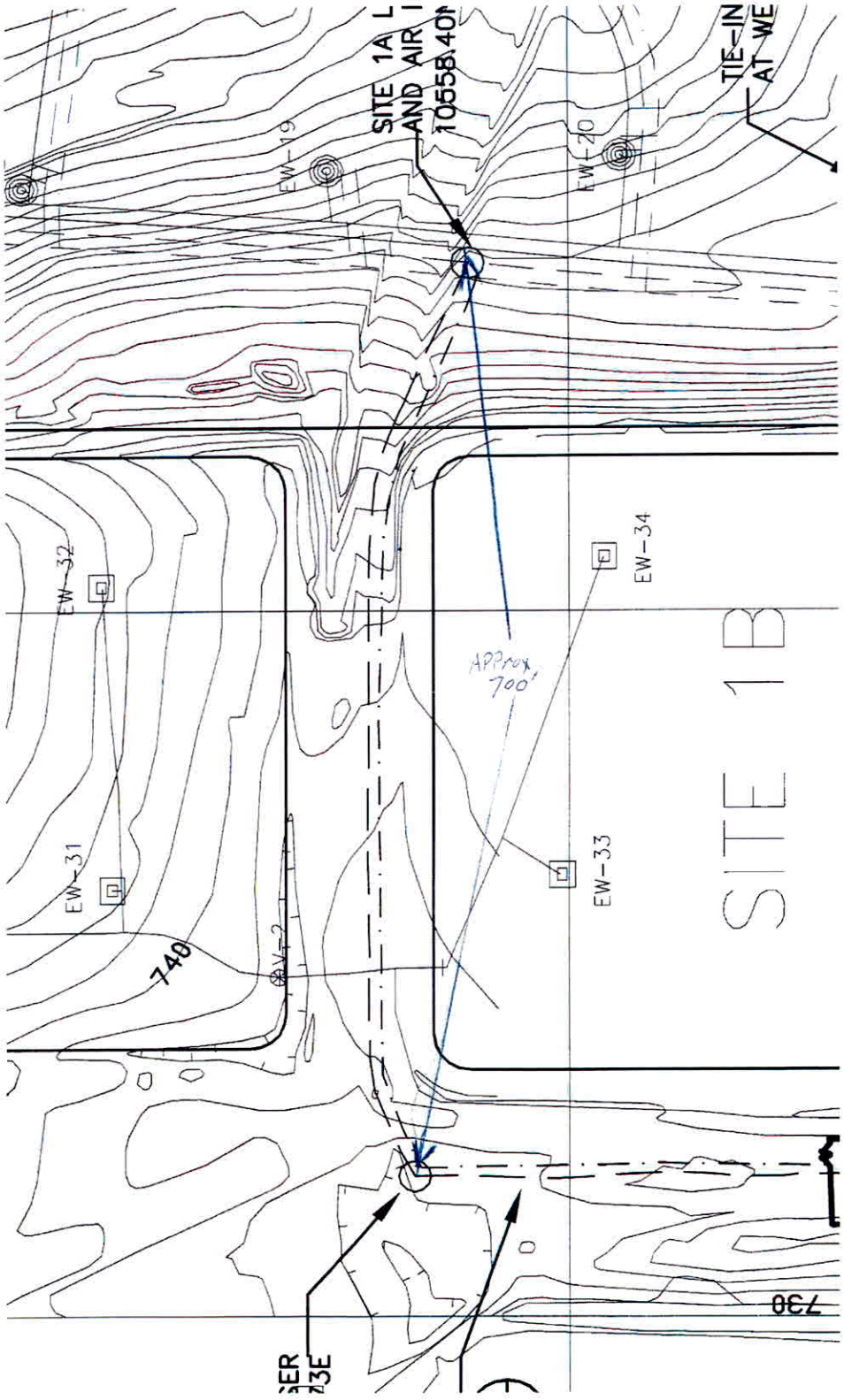
Cc: Mr. Jim Hitzeroth, BFI (w/ encl.)


SCALE HOUSE
SITE 1 PHASE A
SITE 1 PHASE B CELL NO. 1
SITE 1 PHASE B CELL NO. 2
GREEN BAY ROAD
9TH STREET
BLOWER BUILDING
SITE 1A TANK
SITE 1B TANK
CONCRETE LOAD OUT PAD
CUT OFF FORCEMAIN TO SITE 2 FOR LEACHATE
LEACHATE DISCHARGE PIPING DISCONNECTED FROM OLD FORCEMAIN FOR SITE 2
AIR SUPPLY/CONDENSATE TO SITE 2 DISCONNECTED
AIR LINE DISCONNECTED
LEGEND
LEACHATE DISCHARGE PIPING
AIR SUPPLY PIPING
GAS HEADER PIPING
CONDENSATE DISCHARGE PIPING
EXTRACTION WELL
REMOTE EXTRACTION WELLHEADS
NORTH TRENCH SUMP
CONDENSATE SUMP
GAS MONITORING PROBE
VALVE BOX
NOTE: LAND CONTOURS BASED UPON AERIAL SURVEY PERFORMED IN MARCH 2009.
Forcemain To Be Replaced
WEAVER BOOS CONSULTANTS
SITE 1 PHASE A LEACHATE AND GAS COLLECTION SYSTEM
ZION LANDFILL
POST-CLOSURE PERMIT APPLICATION
SITE 1 PHASE A
ZION LANDFILL
FIGURE A-1

R 002177


SITE 1A
SITE 1B
CELL NO. 1
SITE 1B
CELL NO. 2
Replace Line
Between These Points
Approx 700'
EMERGENCY FOREMAN SITE 1A
AS-BUILT DRAWINGS
LEGEND
WBC LEGEND
REFERENCE NOTE:
DRAWING ADAPTED FROM: CDM, INC. CONSTRUCTION QUALITY MANAGEMENT
LOCATION: SITE 1 - PHASE B FINAL CLOSURE, CELL NOS. 1 AND 2
SITE: ZION SANITARY LANDFILL
DRAWING #: A-3
TITLE: SITE DRAINAGE PLAN
DATED: APRIL 1998
SHEET NUMBER
1

R 002178


SITE 1A L
AND AIR
TIE-IN
AT WE
EW-19
EW-20
EW-32
EW-34
EW-31
EW-33
740
730
SITE 1B
Approx
700'

Appendix B

Daily Summary Reports and Supporting Information

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic/Zion
Project: Forcemain Replacement Site 1A
Engineer's Rep: Tyler Hoops
Contractor's Rep: Jason Vesper
Signed: [signature]

Date: 11/3/15
Day: Tuesday
Page: 1 of 2
Report No.:

RESIDENT INSPECTION REPORT

Field Book No.: Page #s:

Contractor(s) on Site:
CEC Inc

Weather Conditions:

Temperature		Sky
Low	High	
50	70	Clear
Rain	Snow	Site Conditions
NONE	NONE	(Dry) / Muddy

Report of Observation of Work and Comments:

- 815AM: Vacuumed out east end of existing forcemain
- 835AM: Started to excavate at east side tie-in location
- 930AM: vacuumed out west side of existing forcemain
- 9AM-4PM: Excavated trench where new forcemain will be placed
- 1150AM - 5PM: Fused dual contained Forcemain

Sketch:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic / Tion
Project: Forcemain Replacement Site 14
Engineer's Rep: Tyler Hoops
Contractor's Rep: Jason Vesper
Signed: [signature]

Date: 11/4/15
Day: Wednesday
Page: 1 of 2
Report No.:

RESIDENT INSPECTION REPORT

Field Book No.: Page #s:

Contractor(s) on Site:
CEC Inc

Weather Conditions:

Temperature		Sky
Low	High	
52	70	Clear
Rain	Snow	Site Conditions
NONE	NONE	(Dry) / Muddy

Report of Observation of Work and Comments:

-700AM: Fused remaining dual Contained forcemain
-745AM: Continued to excavate trench
-125PM: Pressurized 6" HDPE pipe
-250PM: Start of pressure test on 6" @ 50PSI
-410PM: Pressurized 3" HDPE pipe
-440PM: Start of pressure test on 3" @ 50PSI
-630PM: Camera existing forcemain on west end at tie-in location
-700PM: Tie in to west end of forcemain
-845PM: Tie in to east end of forcemain

Sketch:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic/Zion
Project: Forcemain Replacement Site 1A
Engineer's Rep: Tyler Hoops
Contractor's Rep: Jason Uesper
Signed:

Date: 11/5/15
Day: Thursday
Page: 1 of 2
Report No.:

RESIDENT INSPECTION REPORT

Field Book No.: Page #s:

Contractor(s) on Site:
CEC Inc

Weather Conditions:

Temperature		Sky
Low	High	
60	71	Clear
Rain	Snow	Site Conditions
NONE	NONE	(Dry) / Muddy

Report of Observation of Work and Comments:
- CEC stationed 624' of forcemain
- CQM surveyed top of pipe
- CEC buried forcemain

Sketch:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic/Zion
Project: Forcemain Replacement Site 1A
Engineer's Rep: Tyler Hoops
Contractor's Rep: Jacon Vesper
Signed: THops

Date: 11/6/15
Day: Friday
Page: 1 of 2
Report No.:

RESIDENT INSPECTION REPORT

Field Book No.: Page #s:

Contractor(s) on Site:
CEC

Weather Conditions:

Temperature		Sky
Low	High	
47	69	Clear
Rain	Snow	Site Conditions
NONE	NONE	Dry / (Muddy)

Report of Observation of Work and Comments:
CEC threw grass seed & covered seed with straw

Sketch:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax (920) 465-3913

Client: ADS Zion Date: 11/4/15
Project: Forcemain Replacement Site 1A Day: Wednesday
Engineer's Rep: Tyler Hoops Page:
Contractor's Rep: Jason Vesper Job No.:

PIPELINE TEST FORM

Location: (Bldg. to Bldg., Struct. to Struct., M.H. to M.H., Sta. to Sta., etc.)

0+00 tie-in west end
6+24 tie-in east end

Description: (Material and Line Usage, Example: PVC-Sanitary, Di-Water, etc.)

6" Forcemain Replacement for site 1A
3" Forcemain Replacement for site 1A

Type of Test: (Air, Hydrostatic, Infiltration, Exfiltration, Other)

Air Test

Test Pressure Per Spec. 50 PSI (PSI, Gal/Day, etc.)

Test Results: (Fill in Applicable Section)

	AIR	Hydrostatic		
Start Pressure:	50 PSI		GAL/DAY	GAL/HR.
End Pressure:	50 PSI			
Time:	1 hr			

Comments: (Pass)/Fail (Circle One)

Signatures:

Contractor Rep: Jason Vesper
Engineer/Owner Rep:
Date Test Performed: 11/4/15

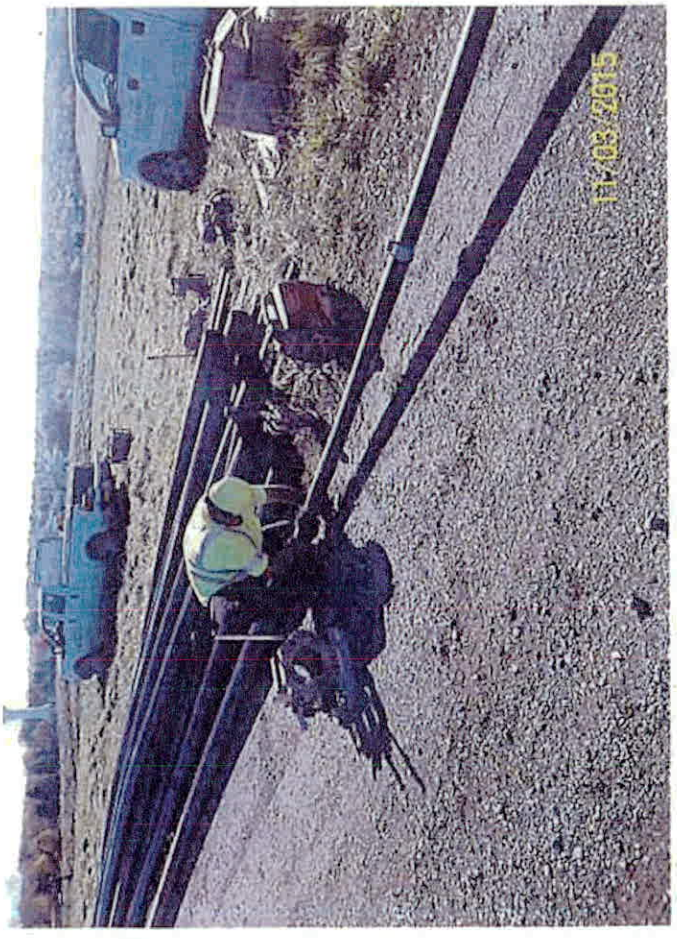
Appendix C

Construction Photographs


11/03/2015


11/03/2015


11/03/2015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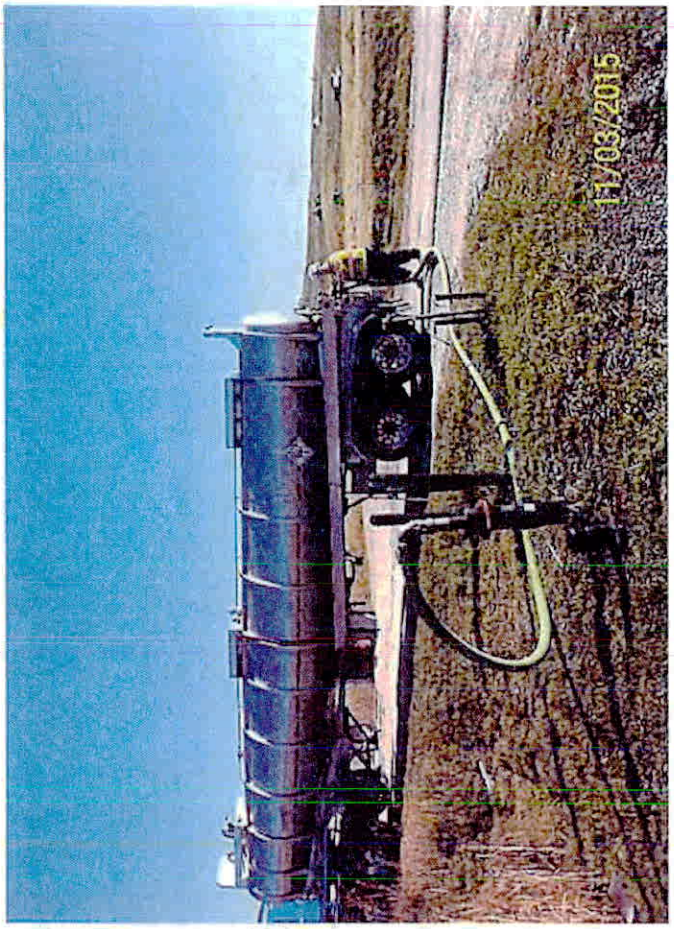
11/03/2015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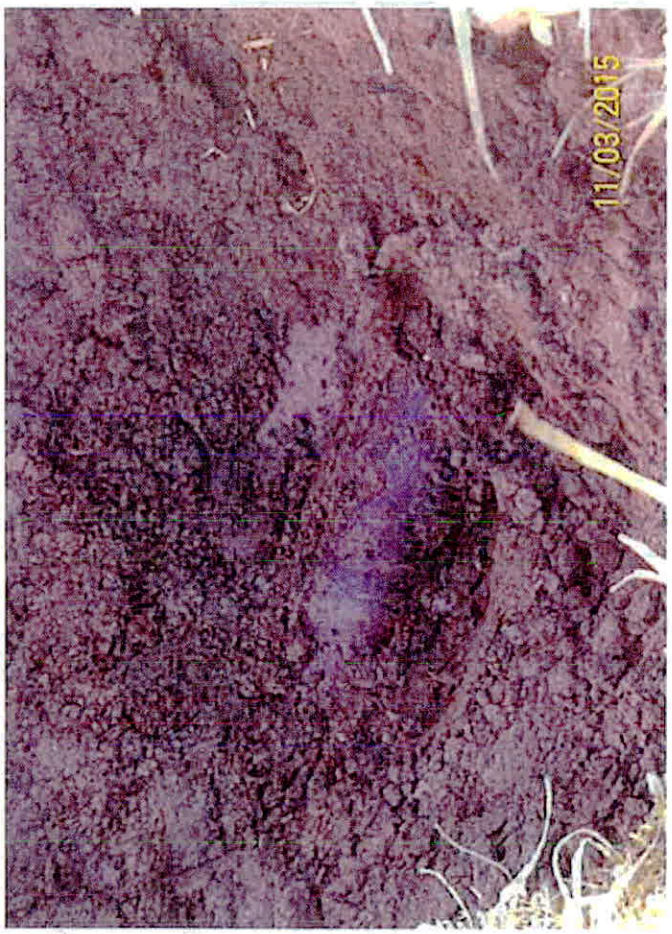
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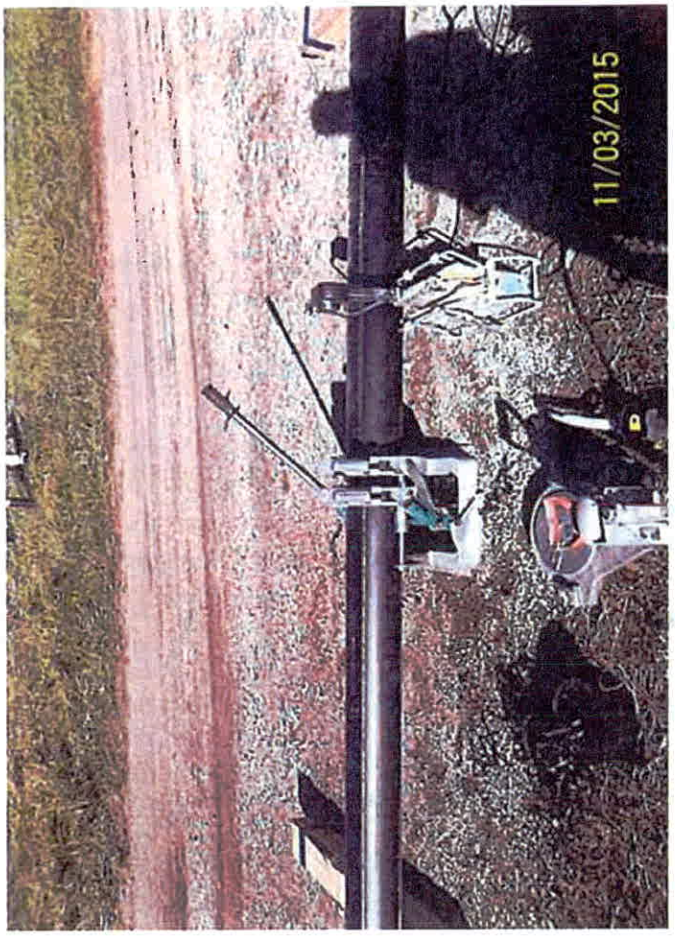
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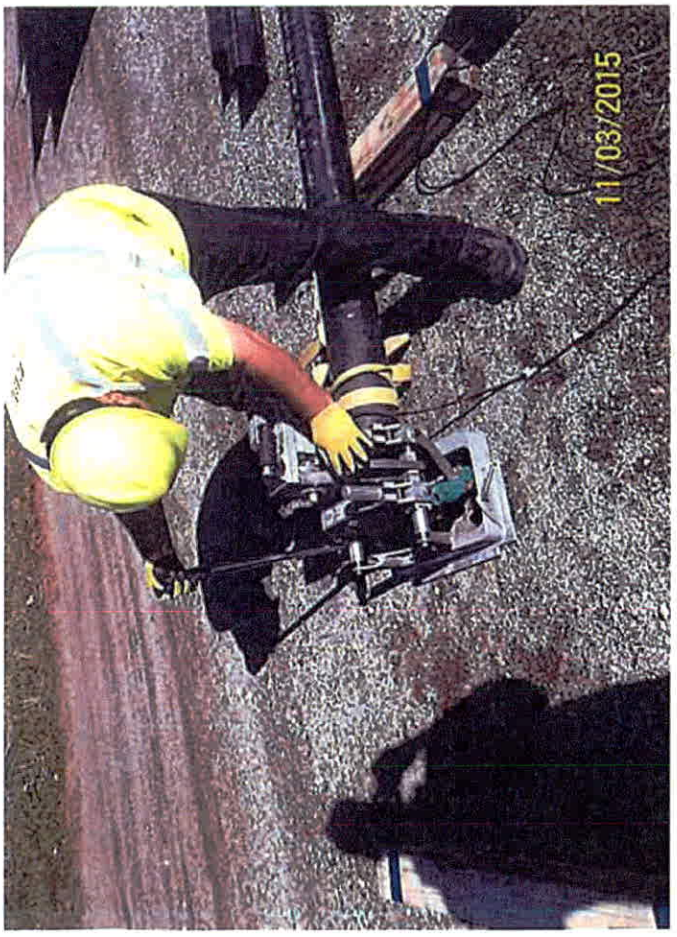
11/03/2015


11/04/2015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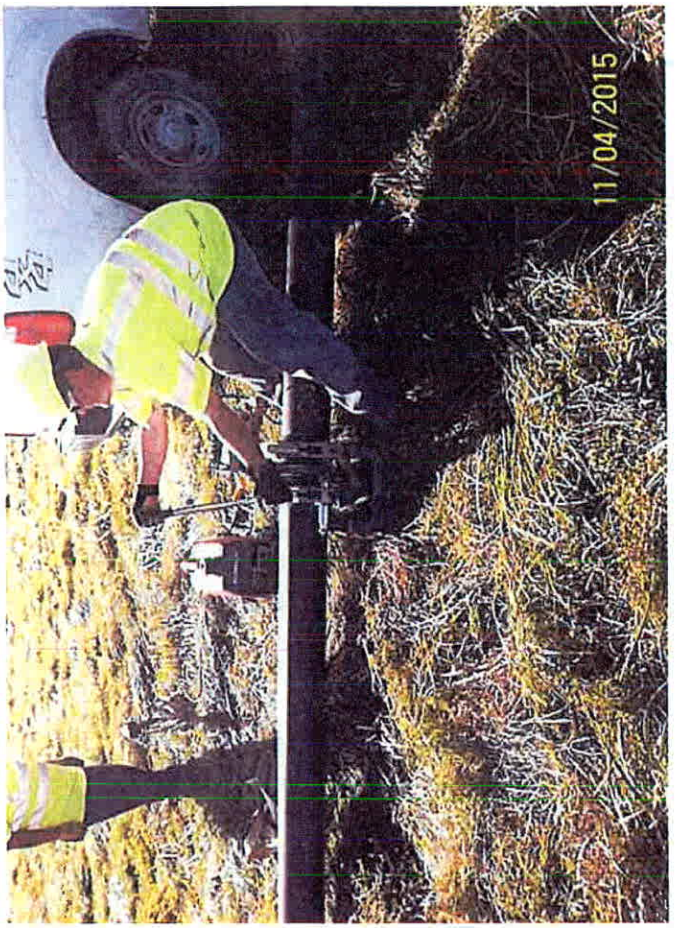
11/04/2015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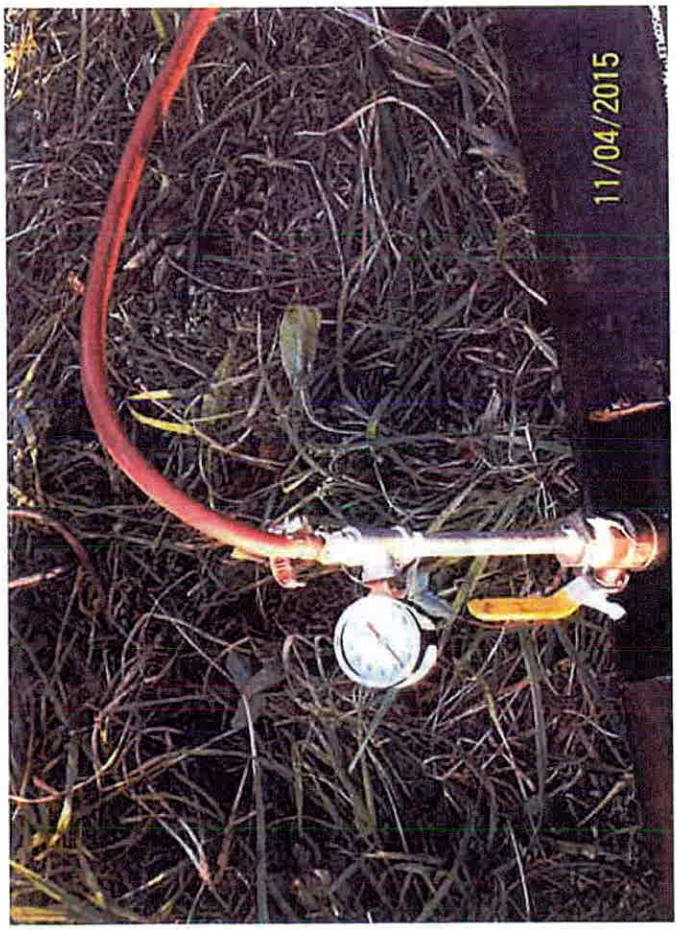
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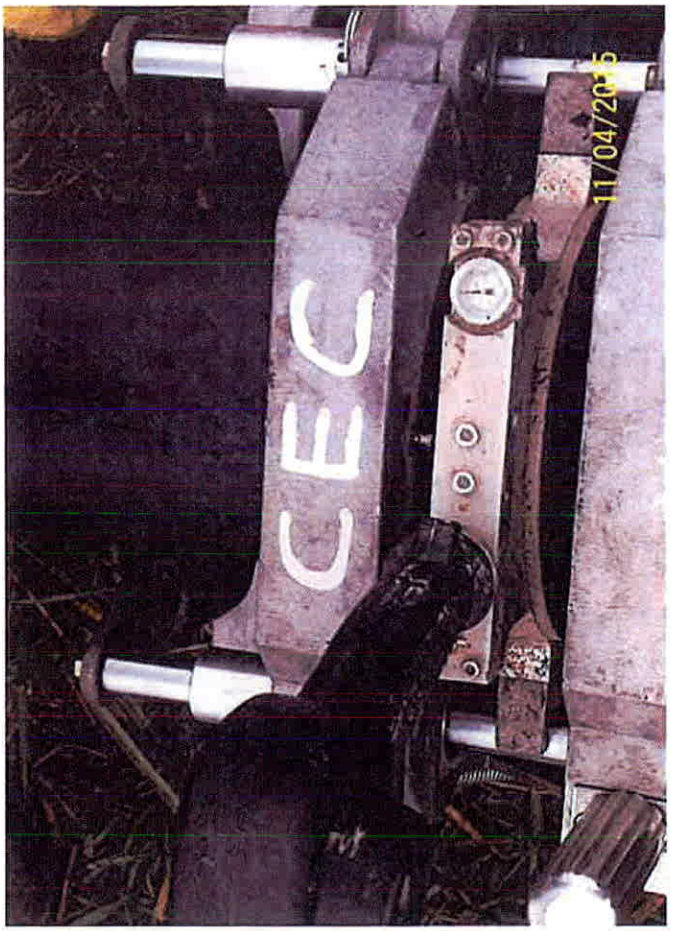
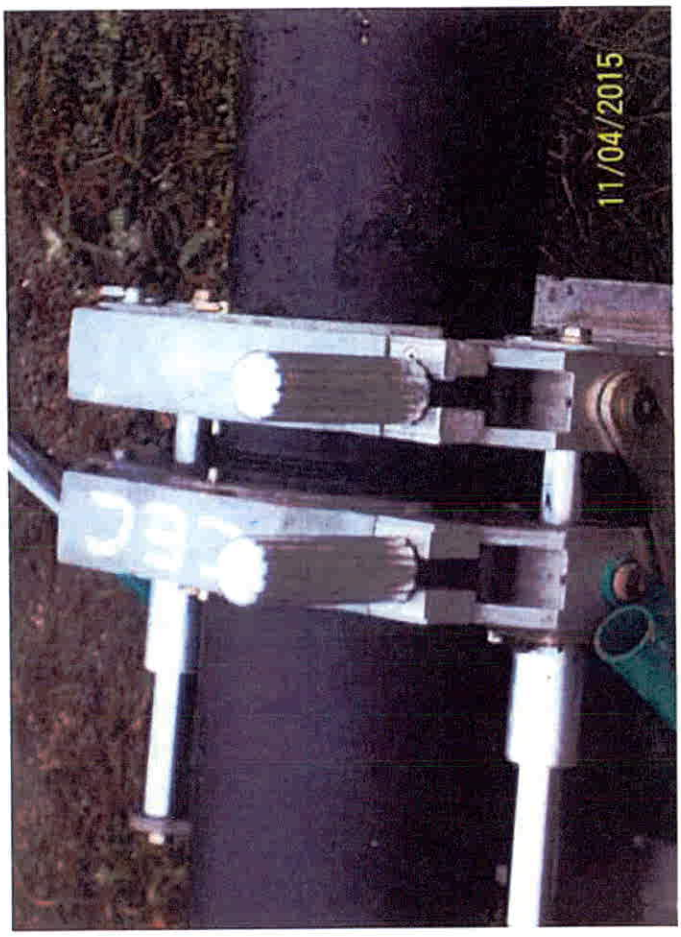

CEC
11/04/2015


11/04/2015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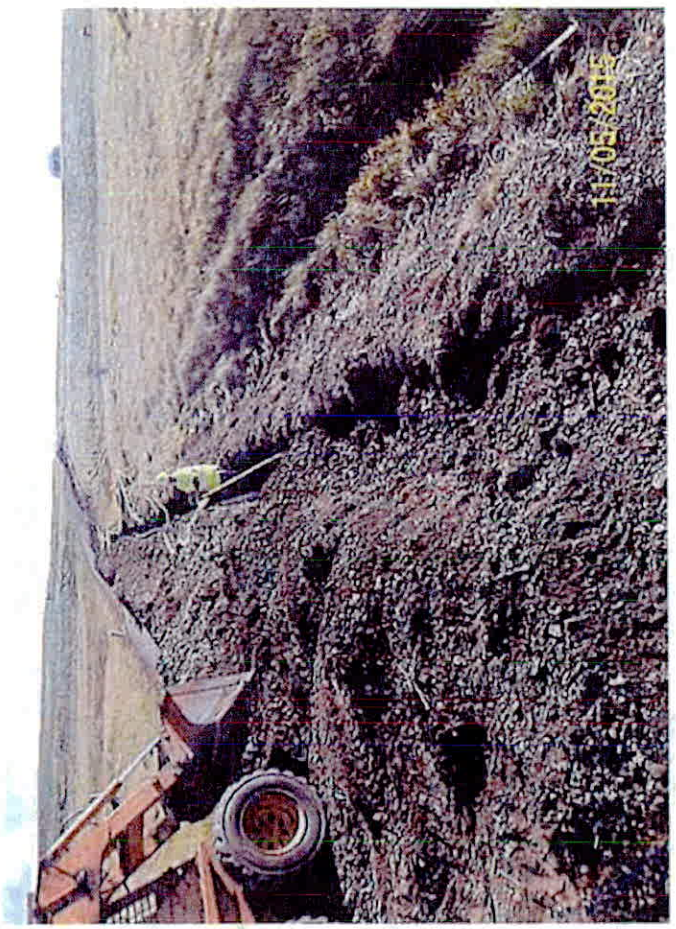
11/04/2015


11/04/2015


11/05/2015


11/05/2015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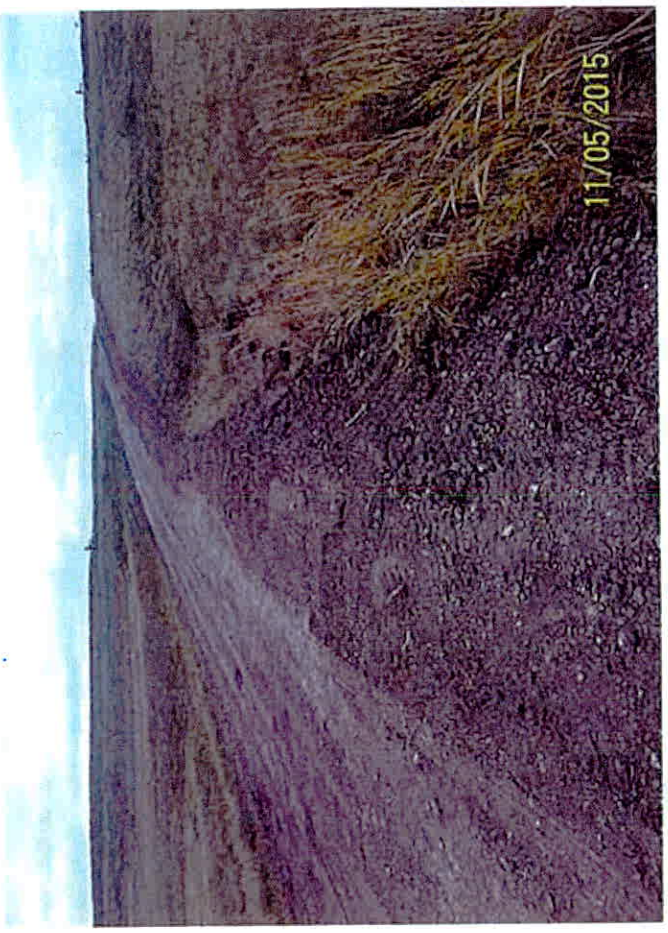
11/05/2015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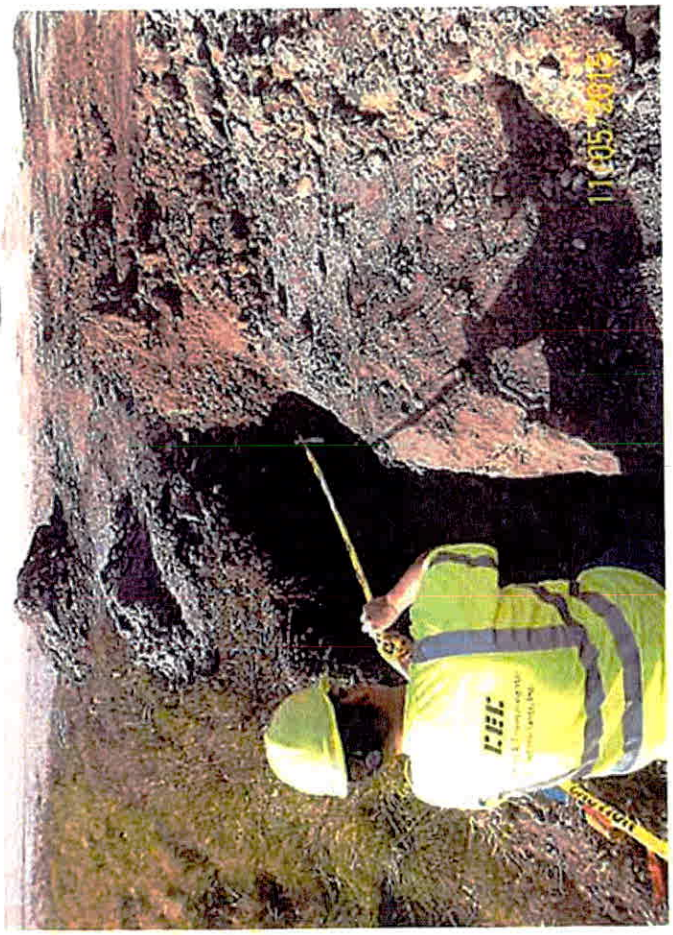
11/06/2015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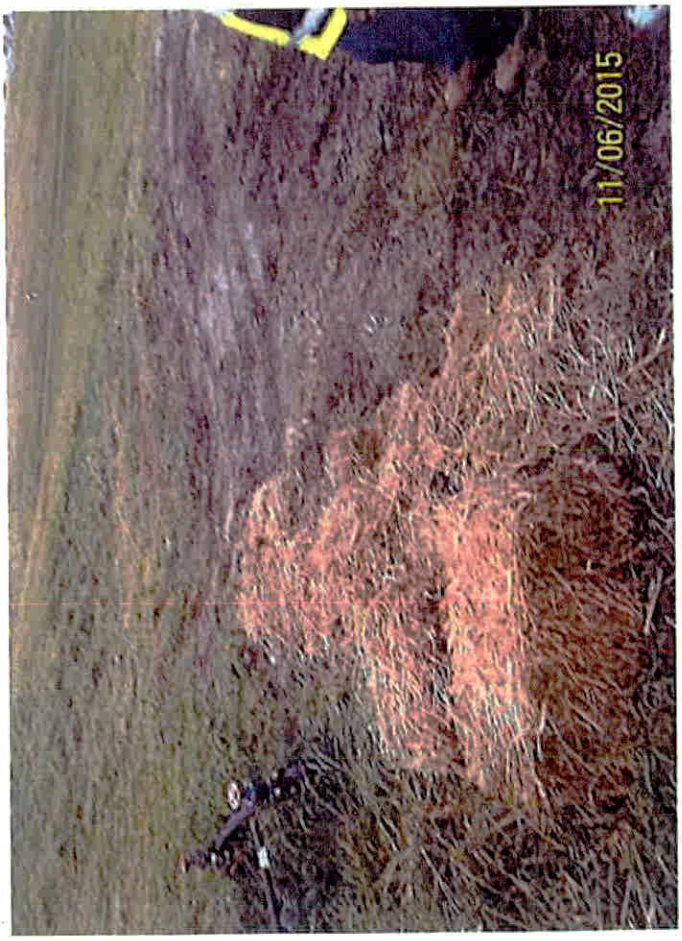
11/06/2015

January 29, 2016

Project No.: 0120-037-10-15

CONSTRUCTION ACCEPTANCE REPORT

ZION SITE 1, PHASE A LANDFILL

ZION, ILLINOIS

Zion, Illinois

LPC# NO. 0978020001

ILD 980700728

PREPARED BY

Weaver Consultants Group

Appendix E-12

Construction Acceptance Report, February 2018

Civil & Environmental Consultants, Inc.

February 21, 2018

Mr. Kevin Lesko
Illinois Environmental Protection Agency
Bureau of Land #33
1021 North Grand Avenue East
Springfield, Illinois 62794-9276

Re: Construction Acceptance Report
Zion Site 1 Landfill
IEPA Site No. 0978020001 - Lake County
ID 980700728
CEC Project 170-256

Dear Mr. Lesko:

On behalf of BFI Waste Systems of North America, LLC, Civil & Environmental Consultants, Inc. respectfully submits the enclosed Construction Acceptance Report for the leachate extraction system at Zion Site 1 Landfill located in Zion, Illinois. Attached is the following information:

- Illinois Environmental Protection Agency (IEPA) form LPC-PA23
- Construction Acceptance Report

An original and three copies are enclosed for your review. If you have questions regarding this submittal, please contact us at (630) 963-6026.

Sincerely,

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.

Chastity Montalvo, E.I.T.
Project Manager

Kenneth Kruszynski, P.E.
Principal

Enclosures: Attachment 1 - IEPA Form
Attachment 2 - Construction Acceptance Report

cc: Jim Hitzeroth, BFI Waste Systems of North America, LLC - Zion Site 1 Landfill

ATTACHMENT 1

IEPA FORM

Illinois Environmental Protection Agency

Bureau of Land • 1021 North Grand Avenue East • P.O. Box 19276 • Springfield • Illinois • 62794-9276

RCRA Permit Application Form LPC-PA23

This form must be used for any permit application for a hazardous waste management facility regulated in accordance with RCRA, Subtitle C, including all requests to modify an existing permit. One original and three (3) copies, of all permit applications must be submitted. Attach the original and appropriate number of copies of a cover letter, any necessary plans, specifications, reports, forms, (e.g., corrective action certification form), and any other certifications etc. to fully support and describe the activities or modifications being proposed. Attach sufficient information to demonstrate compliance with all applicable regulatory requirements. Applications without this form will be deemed incomplete. Please refer to the RCRA checklist and decision guide documents for further guidance. For RCRA corrective action, this form should only be used if requesting an actual modification to a RCRA permit. A RCRA Corrective Action Certification form should be used in all other instances.

Note: Permit applications which are hand-delivered to the Bureau of Land, Permit Section must be delivered to 1021 North Grand Avenue East between the hours of 8:30 a.m. to 5:00 p.m., Monday through Friday (excluding State holidays).

Please type or print all information legibly.

I. Site Identification

Site # (Illinois EPA): 0978020001 USEPA ID Number: ILD980700728

Site Name: Zion Site 1 Landfill

Physical Site Location (street, road, etc.): 701 Green Bay Road

City: Zion Zip Code: 60099 County: Lake

Existing RCRA Permit (if applicable): 1976-53-OP

II. Owner/Operator Identification

Owner Information

Name: Advanced Disposal Services

Mailing Address:
701 Green Bay Road
Zion, Illinois 60099

Contact Name: James Lewis

Phone #: 847-599-5910

Operator Information

Name: BFI Waste Systems of North America, LLC

Mailing Address:
26 W. 580 Schick Road
Hanover Park, Illinois 60103

Contact Name: James Hitzeroth

Phone #: 630-894-5001

III. Permit Application Identification

Application Type

- ☐ New Part B Permit
- ☐ Part B Permit Renewal
- ☐ Class 2 Modification
- ☑ Class 1 Modification
- ☐ Class 1* (prior approval required) Modification
- ☐ Class 3 Modification
- ☐ Additional information to supplement UIC Class I application Log Number

This Agency is authorized to require this information under Illinois Revised Statutes, 1979, Chapter 111 1/2, Section 1039. Disclosure of this information is required under that Section. Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

Application Type contd.

- ☐ Remedial Action Plan Permit (RAPP)
- ☐ Sig RAPP Modification
- ☐ Non Sig RAPP Modification
- ☐ Major UIC Modification
- ☐ Minor UIC Modification

This Application Involves

- ☐ Storage ☐ Treatment ☑ Disposal ☐ Incineration
- ☐ Groundwater ☐ Corrective Action ☐ UIC Class I ☐ UIC Class V

Description of This Permit Request: (Include a brief narrative description here.)

Emergency leachate collection system repairs construction documentation and report.

IV. **SIGNATURES** Original signatures required. Signature stamps or applications transmitted electronically or by facsimile are not acceptable. All applications shall be signed by the person in accordance with 35 IAC 702. 126(a).

Please check the box of the appropriate certification.

Owner

☐ I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Alternative owner certification. For remedial action plans (RAPs) permit under Subpart H of 35 IAC 703, the owner may choose to make the following certification instead of the certification above.

☑ Based on my knowledge of the conditions of the property described in the RAP and my inquiry of the person or persons that manage the system referenced in the operator's certification, or those persons directly responsible for gathering the information, the information submitted is, upon information and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owner Name (Printed or Typed): DANIEL T REWARDS

Owner Signature: [signature] Date: 1/22/18

Title: REGION VICE PRESIDENT

Operator

I certify under penalty of law that this document and all attachment were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information.

Operator Name (Printed or Typed): Kevin Bremer

Operator Signature: Kevin Bremer Date: 1/16/2018

Title: Area President

NOTARY: (Required for both owner and operator signatures)

Subscribe and sworn before me this 16 day of January, 2018

Notary Signature: Yadira Potts

My commission expires on: April 27, 2021

Notary Seal:

OFFICIAL SEAL
YADIRA POTTS
NOTARY PUBLIC, STATE OF ILLINOIS
My Commission Expires April 27, 2021

Engineer

I certify under penalty of law that this document and all attachment were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information.

Engineer Name (Printed or Typed): KENNETH R. KRUSZYNSKI

Engineer Signature: Kenneth R Kruszynski

Illinois License No.: 062-046886

Expiration Date of License: 11-30-2019

Engineer Phone No. (630) 963-6026

Engineer Seal:

KENNETH R. KRUSZYNSKI
062-046886
LICENSED
PROFESSIONAL
ENGINEER
STATE OF ILLINOIS

Engineer Address:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC
555 BUTTERFIELD ROAD, SUITE 300
LOMBARD, IL 60148

All information submitted as part of the Application is available to the public except when specifically designated by the Applicant to be treated confidentially as a trade secret or secret process in accordance with Section 7(a) of the Environmental Protection Act, applicable Rules and Regulations of the Illinois Pollution Control Board and applicable Illinois EPA rules and guidelines.

Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44(h))

Instructions for

RCRA Permit Application Form LPC-PA23

The following instructions are designed to aid in the completion of the RCRA Permit Application Form LPCPA23. If you have additional questions regarding the form, or the informational requirements, please contact the Illinois EPA Bureau of Land (BOL) Permit Section at 217-524-3300.

This form must be used for any permit application for a hazardous waste management facility regulated in accordance with RCRA, Subtitle C, including all requests to modify an existing permit. If an application has already been submitted to the Agency, a completed RCRA Permit Application Form must accompany all additional information that is submitted to the agency for that application. An example of "additional information" would be a response to verbal or written comments from the Agency. For RCRA corrective action, this form should only be used if requesting an actual modification to a RCRA permit. A RCRA Corrective Action Certification form should be used in all other instances.

I. Site Identification

Enter all of the required information in the space provided. If you do not have an Illinois or USEPA identification number, call the Illinois EPA BOL Waste Reduction and Compliance Section at 217/785-8604 to obtain these numbers prior to completing the form.

II. Owner/Operator Identification

The terms "owner" and "operator" are defined at 35 IAC 720.110 and 702.110. If the facility has the same owner and operator, you may type in "same" under operator information. Also, if the contact person for an application is different from the owner or operator (i.e. the consultant), please indicate this in the cover letter for the application.

III. Permit Application Identification

Indicate both the type of application and the kind of waste management involved. For instance, if the application involves more than one type of waste management, check all applicable options.

IV. Signatures

The signatory requirements for permit applicants are identified at 35 IAC 702.126 and 702.151. If the facility has the same owner and operator, you may type in "same" under operator information.

Notary Public: A notary public's signature and stamp are required for both the owner and operator signatures on the form.

Engineer Certification: A professional engineer that is licensed in the State of Illinois must certify all technical information provided in a permit application. 35 IAC 703.182 describes the types of information that must be certified by a professional engineer.

ATTACHMENT 2

CONSTRUCTION ACCEPTANCE REPORT

CONSTRUCTION ACCEPTANCE REPORT

2017 LANDFILL LEACHATE COLLECTION SYSTEM CONSTRUCTION

Prepared for:

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC.
ZION SITE 1 PHASE A LANDFILL
LPC NO. 0978020001
ILD 980700728

Prepared by:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
LOMBARD, ILLINOIS

CEC PROJECT 170-256

FEBRUARY 2018

Civil & Environmental Consultants, Inc.

Chicago 555 Butterfield Road, Suite 300 | Lombard, IL 60148 | p: 630-963-6026 f: 630-963-6027 | www.cecinc.com

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FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 PROJECT SUMMARY

This Construction Acceptance Report presents construction documentation of the emergency repairs to the landfill leachate collection system in 2017 at the Zion Site 1 Phase A Landfill (Site). The landfill is located in Zion, Illinois and is owned by Advanced Disposal Services, Inc., but operated by BFI Waste Services of North America, LLC. The Site experienced low leachate volumes and attributed the decrease to a blockage in the leachate force main. Leachate generated from the Site could not be removed until the force main blockage was repaired and the system returned to full operation. The following report summarizes the installation of leachate components constructed and repaired at the Site.

Installation of the leachate forecemain was performed by Tri-County Trenching and Civil & Environmental Consultants, Inc. (CEC). Construction activities took place between May 19, 2017 and July 28, 2017. Construction monitoring oversight was performed by CQM, Inc. (CQM).

Construction involved installation of new force main piping, the abandonment of the old force main piping, and repairs to a leachate force main junction. Construction documentation of the installed components is provided in the attached figures and appendices.

2.0 LEACHATE COLLECTION SYSTEM CONSTRUCTION

2.1 SUMMARY

The installed components of the 2017 leachate collection system construction consisted of 2-inch by 4-inch and 3-inch by 6-inch dual-contained leachate force mains and the abandonment of the old leachate force main. The individual components of construction are detailed in the following sections.

2.2 CONSTRUCTION PROCEDURES

2.2.1 Leachate Force Main

Reduced leachate collection volumes from the Site prompted an investigation of the leachate force main located along the west side. On May 9, 2017 CEC, CQM, and Tri-County Trenching arrived to the Site to begin an emergency repair on the leachate force main. Construction consisted of replacing a portion of the leachate force main thought to be the location causing the leachate blockage. A horizontal trench was constructed along the south perimeter of the Site. The trench began near Well EW-21 and extended toward the manhole (9th Street Manhole) located near the southwest corner of the Site. A dual-contained force main consisting of approximately 300 feet of 2-inch high-density polyethylene (HDPE) SDR 11 and 4-inch HPDE SDR 17 was installed in the trench. The pipe was fused to the existing line near the 9th Street Manhole. In addition, CEC installed a 45 degree wye to the 2-inch by 4-inch dual contained pipe to create a cleanout riser near Well EW-21, pipe detail available in Figure 2. A bentonite seal and leak seal was placed around the inlet to the 9th Street Manhole to seal the force main tie-in. The trench was then backfilled to the surface with soil. The old force main was capped at both ends with a dual containment end cap.

The force main was pressure tested by CEC and observed by CQM. Copies of the pipe pressure test reports by CQM are included in Appendix A. Daily resident inspection reports are provided in Appendix B with relevant leachate collection system construction notes highlighted in yellow. The location of the installed force main pipeline is illustrated in Figure 1.

On May 16, 2017, CEC returned to the site to replace another portion of the failed dual-contained force main located at the 9th Street Manhole inlet. CEC replaced approximately 20 feet of existing force main beginning from the 9th Street Manhole inlet up to the dual-contained pipe installed on May 9 through 10, 2017. Once the system was determined to be performing properly, the trench was backfilled and leachate system turned on.

2.2.2 Leachate Force Main Repair

The Site continued to experience reduced leachate volumes and prompted another leachate force main investigation along the west side. On July 25, 2017, CEC, CQM, and Tri-County Trenching arrived to the Site to investigate potential blockage near a leachate force main junction. The force main junction is located northwest of well EW-20 and consisted of a leachate clean-out line, valve stem, and leachate force main T-junction. A pinched 2-inch leachate line under final cover was discovered at the force main junction and prompted an emergency repair. The pinched line was removed and the leachate collection line was reconfigured. Two clean-out lines were removed and the damaged 2-inch line was cut, capped, and abandoned. A new 2-inch to 3-inch reducer with end-seal was installed to the 2-inch force main from the north. A new 3-inch by 6-inch dual contained line with 45 degree bend was installed and fused to the existing horizontal 3-inch by 6-inch dual contained line that tied the valve riser, and leachate force mains to the west (feeds Site 1 Phase A leachate storage tanks) and south. To the south, a new 3-inch by 6-inch to 2-inch by 4-inch reducer was installed to tie into the existing 2-inch by 4-inch dual contained leachate force main. Pipe detail for the reconfigured T-junction is available in Figure 2.

Once the repair was complete, 1-inch washed stone was placed 1 foot around and under the force main line. Excavated soil refuse was used to backfill the trench up to the bottom of final cover. Clay was then placed and compacted in four 6-inch lifts, followed by a geocomposite layer. CQM observed the clay installation and performed density test for each lift. Density test results are located in the July 28, 2017 resident inspection report provided by CQM. The airlines and control valves were reconnected and the leachate collection system started. The exposed force main lines located above the final cover were embedded 6 inches all around with 1-inch washed stone. Insulation was placed above the 2-inch by 6-inch dual contained line and backfilled with soil.

CQM observed the leachate force main repair and abandonment of the old 2-inch line and related clean-out risers. Copies of the resident inspection reports provided by CQM are included in Appendix B with relevant leachate collection system construction notes highlighted in yellow. The location of the repaired leachate forecemain is illustrated in Figure 1.

3.0 SUMMARY AND CONCLUSIONS

CEC has completed the documentation of the 2017 leachate collection system construction for Zion Site 1 Phase A Landfill. CQM observed and documented all contractor and construction activities. Copies of the resident inspection reports provided by CQM are included in Appendix B. This Construction Acceptance Report provides documentation describing the extent and details of the leachate collection system construction.

The system components observed were found to be installed in general accordance with the current permit. Record drawing of the layout are included in Figures 1 and 2 and Appendix C.

4.0 ENGINEERING CERTIFICATION STATEMENT

In accordance with 35 Illinois Administrative Code Part 811.505(d), CEC has prepared this construction completion report to document the leachate system repairs at Zion Site 1 Phase A Landfill. The report includes construction record drawings, daily summary reports and photographs, and certification by the CQA officer. The construction quality assurance for this work was conducted under the supervision of a registered professional engineer knowledgeable in solid waste facility design, construction, and operations.

"I hereby affirm that all information contained in this application is true and accurate to the best of my knowledge and belief."

Engineer Name	Kenneth Kruszynski, P.E.
PE Registration Number	062-046886
PE License Expiration	11-30-2019
State of Registration	Illinois
Date of Report Certification	02-20-2018

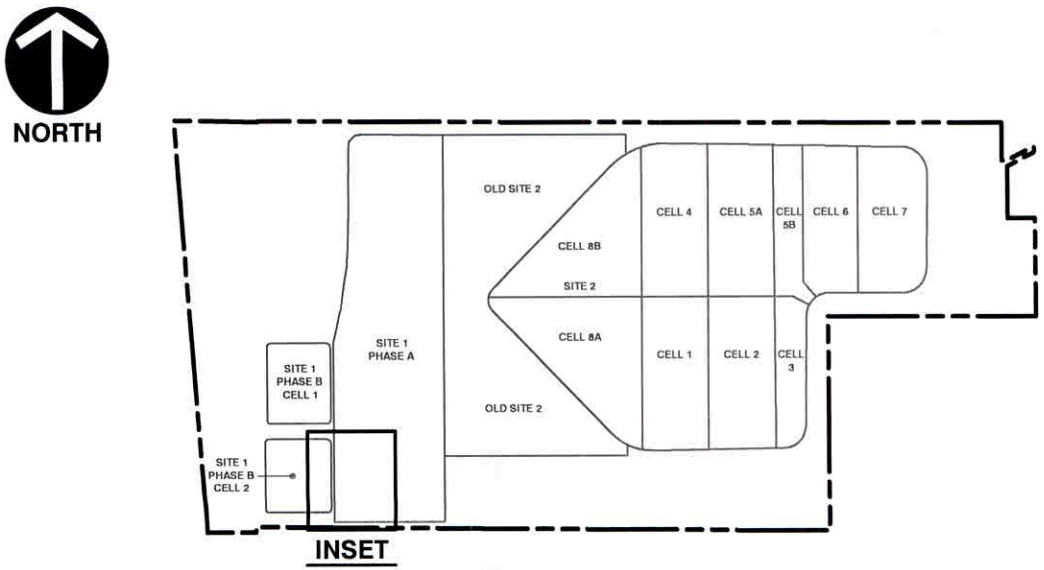
Kenneth K Kruszynski
Engineer Signature

02-20-2018
Date

Engineer's Seal:

FIGURES

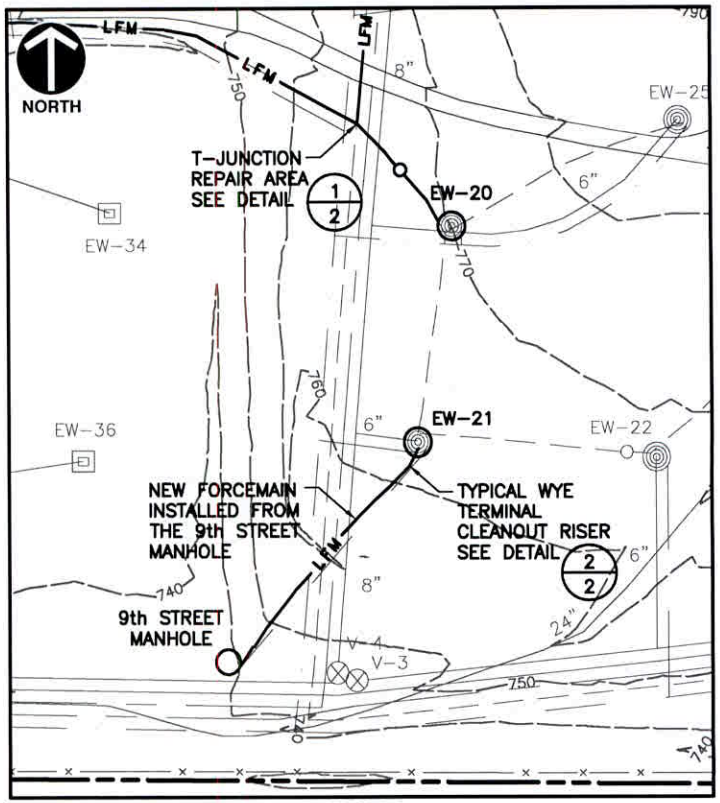
LEACHATE COLLECTION SYSTEM CONSTRUCTION RECORD AND DETAILS



ZION LANDFILL

SCALE IN FEET

0 800 1600



INSET

SCALE IN FEET

0 100 200

REFERENCE

1. EXISTING BASE TOPOGRAPHY AND LANDFILL INFORMATION PROVIDED BY CQM, INC. LANDFILL GAS AND LEACHATE SYSTEM PLAN, DRAWING NUMBER 1 DATED JANUARY 2014.

Civil & Environmental Consultants, Inc.
555 Butterfield Road, Suite 300 - Lombard, IL 60148
630-963-6026 · 877-963-6026
www.cecinc.com

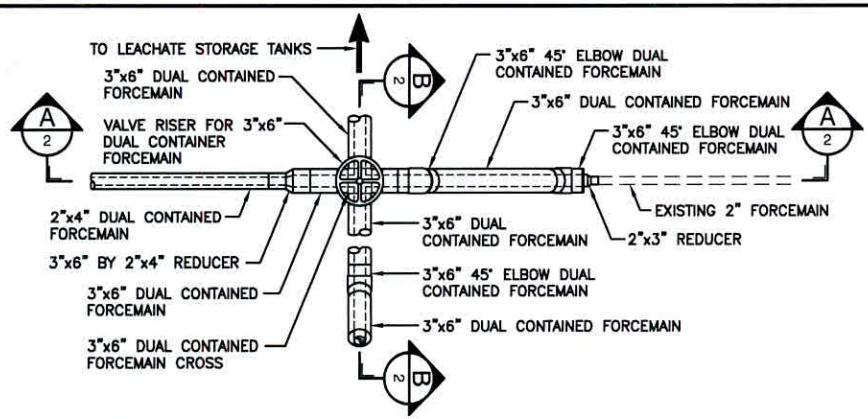
DRAWN BY:	MSK	CHECKED BY:	CBML	APPROVED BY:	BRH
DATE:	01/25/2018	DWG SCALE:	AS SHOWN	PROJECT NO:	170-256.0004

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC
ZION SITE 1 PHASE A LANDFILL
ZION, ILLINOIS

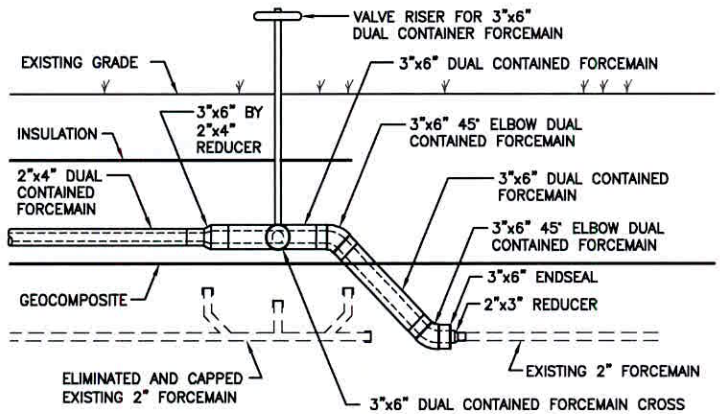
LEACHATE COLLECTION SYSTEM
CONSTRUCTION RECORD

FIGURE NO.: 1

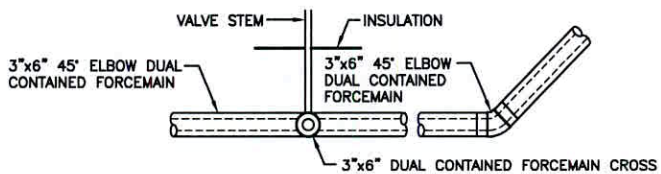
R 00221



1 / 1 DUAL CONTAINED FORCEMAIN AND VALVE RISER
NOT TO SCALE



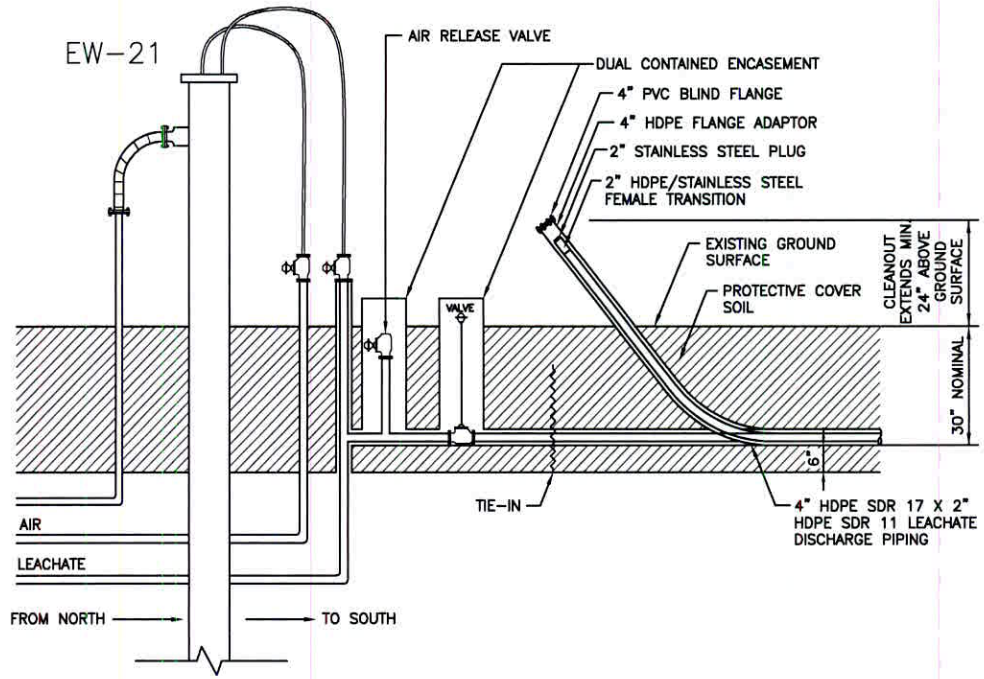
A / 2 SECTION A–A
NOT TO SCALE



B / 2 SECTION A–A
NOT TO SCALE

REFERENCE

1. DUAL CONTAINED FORCEMAIN AND VALVE RISER DETAIL PROVIDED BY CQM, INC. AS A FIELD SKETCH AND NOTES DATED JULY 28, 2017.



2 / 1 TYPICAL TERMINAL CLEANOUT RISER
NOT TO SCALE

Civil & Environmental Consultants, Inc.
555 Butterfield Road, Suite 300 · Lombard, IL 60148
630-963-6026 · 877-963-6026
www.cecinc.com

BFI WASTE SYSTEMS OF NORTH AMERICA, LLC
ZION SITE 1 PHASE A LANDFILL
ZION, ILLINOIS

DETAILS

DRAWN BY:	MSK	CHECKED BY:	CBML	APPROVED BY:	BRH	FIGURE NO.:
DATE:	01/25/2018	DWG SCALE:	NOT TO SCALE	PROJECT NO:	170-256.0004	2

R 002212

APPENDIX A

PRESSURE TEST REPORTS

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax (920) 465-3913

Client: Republic Zinc
Project: Site 1A
Engineer's Rep: Tyler Hoops
Contractor's Rep: Greg
Date: 5-9-17
Day: Tuesday
Page:
Job No.: 1

PIPELINE TEST FORM

Location: (Bldg. to Bldg., Struct. to Struct., M.H. to M.H., Sta. to Sta., etc.)

Man hole to EW-21

Description: (Material and Line Usage, Example: PVC-Sanitary, Di-Water, etc.)

4" SDR 17

Type of Test: (Air, Hydrostatic, Infiltration, Exfiltration, Other)

Air

Test Pressure Per Spec. 50 PSI / 1 hr (PSI, Gal/Day, etc.)

Test Results: (Fill in Applicable Section)

	AIR	Hydrostatic		
Start Pressure:	60		GAL/DAY	GAL/HR.
End Pressure:	60			
Time:	1 hr			

Comments: (Pass)/Fail (Circle One)

Signatures:

Contractor Rep:
Engineer/Owner Rep:
Date Test Performed: 5-9-17 - 5-10-17

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax (920) 465-3913

Client: Republic Zinc
Project: Site 1A
Engineer's Rep: Tyler Hoops
Contractor's Rep:
Date: 5-10-17
Day: Wednesday
Page: 2
Job No.:

PIPELINE TEST FORM

Location: (Bldg. to Bldg., Struct. to Struct., M.H. to M.H., Sta. to Sta., etc.)

Manhole to EW-21

Description: (Material and Line Usage, Example: PVC-Sanitary, Di-Water, etc.)

2" SDR 11

Type of Test: (Air, Hydrostatic, Infiltration, Exfiltration, Other)

Air

Test Pressure Per Spec. 50PSI/1 hr (PSI, Gal/Day, etc.)

Test Results: (Fill in Applicable Section)

	AIR	Hydrostatic		
Start Pressure:	50PSI		GAL/DAY	GAL/HR.
End Pressure:	50PSI			
Time:	1 hr			

Comments: Pass/Fail (Circle One)

Signatures:

Contractor Rep:
Engineer/Owner Rep:
Date Test Performed: 5-10-17

APPENDIX B

RESIDENT INSPECTION REPORTS

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: REPUBLIC ZION
Project: ~~EW-11 EW-12 REPAIR~~ Site 1A
Engineer's Rep: Tyler Hoops
Contractor's Rep: Greg
Signed:

Date: 5-9-17
Day: Tuesday
Page: 1 of 2
Report No.: 1

RESIDENT INSPECTION REPORT

Field Book No.: Page #s:

Contractor(s) on Site:
CEC

Weather Conditions:

Temperature		Sky
Low	High	Cloudy
46	49	
Rain	Snow	Site Conditions
A.M.		(Dry) Muddy

Report of Observation of Work and Comments:

8:00AM - CQM & CEC on site
Jim H on site
8:30AM - CEC began fusing pipe. Fused 2" & 4" in 60' sections then fused 4x4 60' sections together
8:40AM - Tri County excavating began to excavate around EW-21 to expose force main.
10:07AM - Began excavating at manhole location to expose forcemain.
11:30AM - Finished excavating new forcemain trench going from EW-21 to manhole.

Sketch:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic Zinc. Date: 5-9-17
Project: Day: Tuesday
Engineer's Rep: Tyler Hoops Page: 2 of 2
Contractor's Rep: Greg Report No.: 1

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

Number of Men: 3
Foreman 1
Operators 1
Laborers 1

Equipment: Mini excavator 329E SKidSteer

12:30 PM - Tri County began excavating at North in ground vault, containing 4 valves that are going to be abondened. to expose geo composite.

2:30 PM - Finished exposing geo composite at North in ground vault.

3:00PM - Tri County began excavating at South in ground vault locations to remove vaults.

4:10PM - Finished excavating. Removed small vault containing 1 valve, will continue on 5-10-17.

4:20PM - Tri County off Site

5:30PM - CEC began pressure testing 300' of 4" outter forcemain. Will test over night.

6:00PM - CQM & CEC off Site

M, INC.
9 Continental Drive
reen Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic Zion
Project:
Engineer's Rep: Tyler Hoops
Contractor's Rep: Greg
Signed:

Date: 5-10-17
Day: Wednesday
Page: 1 of 2
Report No.: 2

RESIDENT INSPECTION REPORT

Field Book No.: Page #s:

Contractor(s) on Site:
CEC

Weather Conditions:

Temperature		Sky
Low	High	Cloudy
49	64	
Rain	Snow	Site Conditions
		(Dry) / Muddy

Report of Observation of Work and Comments:

7:00AM - CEC & CQM on site. CQM checked pressure test from 5-9-17, test passed.
8:00AM. Operator began cleaning up area around South vaults
8:30AM. CEC began pressure testing 2" forcemain @ 80psi/1hr. Test passed
9:15AM - Jim H on site
9:30AM - Operator began removing gravel from around 5 southwest valves.
9:50AM - Discovered betonite plug under the 5 South valves, CEC began placing betonite to the East of all 5 valves & to the North to seal valves in betonite. Operator then back filled with clay.

Sketch:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic Zinc
Project:
Engineer's Rep: Tyler Hoops
Contractor's Rep: Greg

Date: 5/10/17
Day: Wednesday
Page: 2 of 2
Report No.: 2

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

11:15AM - Operator placed in ground vaults around the 5 South west valves.

11:30AM - Operator began placing ~~top~~ 5 black dirt over clay.

12:55PM - CEC began cutting bolts on valver in the North side vault. Because of the time this is taking ~~decid~~ Jim H decided it would be better to order 6" electrofuse caps to abondun valves.

2:18PM - CEC began installing 2x4 ~~forcemain~~ in site 1A

4:30PM - Heavy rain started, CEC could no longer fuse.

~~4:45PM~~ - CQM, & CEC off site.

Number of Men: 4
Foreman 1
Operators 1
Laborers 2

Equipment: Same

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic Zinc
Project:
Engineer's Rep: Tyler Hoops
Contractor's Rep: Greg
Signed:

Date: 5/11/17
Day: Thursday
Page: 1 of 2
Report No.: 3

RESIDENT INSPECTION REPORT

Field Book No.: Page #s:

Contractor(s) on Site:
CEC

Weather Conditions:

Temperature		Sky
Low	High	
49	59	P.C.
Rain	Snow	Site Conditions
		Dry / Muddy

Report of Observation of Work and Comments:

7:00AM - CEC & CQM on site
7:30AM - CQM began surveying forcemain already in trench from 5/10/17
8:00AM - CEC began fusing vertical wye/45°/riser together for forcemain cleanout
9:00AM - CEC finished installing new forcemain, abondened old forcemain using 2x4 caps.
9:07AM - CEC placed bentonite on inlet into manhole.
9:10AM - Operator began backfilling trench with excavated material
10:05AM - CEC began hand shoveling South east valve to be abondoned

Sketch:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic Iron
Project:
Engineer's Rep: Tyler Hoops
Contractor's Rep: Greg

Date: 5/11/17
Day: Thursday
Page: 2 of 2
Report No.: 3

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

11:20AM - CEC Cut liner on North Vaults so vaults can be removed.
12:30PM - Removed North vaults
1:45 PM - CEC began cutting out valves to abondon each side with 6" electrofuse Coupler & 6" Caps.
4:00PM - CEC began to abonden each line using electrofuse Couplers & caps CEC electrofused 4 couplers/caps before electrofure machine broke.

8:00PM - All off Site

Number of Men: 4
Foreman 1
Operators 1
Laborers 2

Equipment:
SAME

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic Iron
Project: Site 1A/Site 2
Engineer's Rep: Tyler Hoops
Contractor's Rep: Greg
Signed:

Date: 5/12/17
Day: Friday
Page: 1 of 2
Report No.: 4

RESIDENT INSPECTION REPORT

Field Book No.: Page #s:

Contractor(s) on Site:
CEC

Weather Conditions:

Temperature		Sky
Low	High	
51	66	P.C.
Rain	Snow	Site Conditions
		Dry / Muddy

Report of Observation of Work and Comments:

7:00 - CQM & CEC on site

8:10 - CEC continued to electrofuse caps to abondon north side lines while laborers shovel out valve to be abondened on South side.

8:43 - CEC began shoveling out North west valve to be abondened. Located in vault west of previously mentioned North vault.

10:10 - CEC finished electrofusing all North lines. Used a total of 12 electrofuse couplers/caps

11:00 - CEC began to electrofuse South lines to abondon Used 2 electrofuse couplers/caps.

Sketch:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic Zion
Project: Site 1A / Site 2
Engineer's Rep: Tyler Hoops
Contractor's Rep: Greg

Date: 5/12/17
Day: Friday
Page: 2 of 2
Report No.: 4

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

12:00pm- All of Site.

Number of Men: 3
Foreman 1
Operators
Laborers 2

Equipment:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: REPUBLIC ZION
Project: ~~EW-41 EW-42 REPAIR~~ Site 14/Site 2
Engineer's Rep: Tyler Hoops
Contractor's Rep: Greg
Signed:

Date: 5/16/17
Day: Tuesday
Page: 1 of 2
Report No.:

RESIDENT INSPECTION REPORT

Field Book No.: Page #s:

Contractor(s) on Site:
CEC

Weather Conditions:

Temperature		Sky
Low	High	Sunny / P.C.
65	82	
Rain	Snow	Site Conditions
		Dry / ~~Muddy~~

Report of Observation of Work and Comments:

730AM - CEC & CQM on site
800AM - AEG On site to do liner repair
830AM - CEC & AEG began pumping water out of liner repair area from rain on 5/15/17.
905AM - Operator began back filling around 5 abandoned valves
940AM - AEG began preparing liner repair
1050AM - operator began to expose failed forcemain that was installed 5/10 - 5/11. CEC removed inlet from manhole & removed 20' section of old forcemain & replaced it with new forcemain.

Sketch:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: Republic Zion
Project: Site 14/Site 2
Engineer's Rep: Tyler Hoops
Contractor's Rep: Greg

Date: 5/16/17
Day: Tuesday
Page: 2 of 2
Report No.:

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

1130AM - AEG finished preparing repair area.
130PM - CEC finished installing forcemain & turned pumps on to make sure it's working properly. Forcemain is working properly.
300PM - Operator began back filling forcemain trench
330PM - All of site.

	CEC	AEG
Number of Men:	4	1
Foreman	1	1
Operators	1	
Laborers	2	

Equipment:
SAME

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: REPUBLIC - ZION
Project: FORCEMAIN REPAIRS SITE 1
Engineer's Rep: JUSTIN NAUMANN
Contractor's Rep: GREG KOMPERDA
Signed:

Date: 7-25-17
Day: TUESDAY
Page: 1 of 2
Report No.: 1

RESIDENT INSPECTION REPORT

Field Book No.: Page #s:

Contractor(s) on Site:
CEC

Weather Conditions:

Temperature		Sky
Low	High	CLEAR
57	78	
Rain	Snow	Site Conditions
—	—	(Dry) / Muddy

Report of Observation of Work and Comments:

7:30 - CQM ONSITE

CEC SHOWED UP ONSITE AND BEGAN EXCAVATING AROUND CLEANOUT JUST NORTH OF FW 20. CEC OPENED UP AND EXPOSED AROUND THE WHOLE AREA OF THE CLEANOUT. CEC DISCOVERED AFTER EXPOSING THE CLEANOUT TIE IN THAT THE 2" FORCEMAIN BELOW THE CROSS FOR RISER TO ABOVE GRADE HAS COLLASPED AND KINKED CAUSING THE BLOCKAGE IN THE FORCEMAIN. AFTER EXAMINING THE AREA JIM HITZEROTH FROM REPUBLIC, CEC, AND CQM CAME UP WITH PLAN TO FIX THE FORCEMAIN FROM DOING THE SAME THING IN THE FUTURE.

4:30 - CQM & CEC OFFSITE.

Sketch:

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: _____ **Date:** _____
Project: _____ **Day:** _____
Engineer's Rep: _____ **Page:** 2 of 2
Contractor's Rep: _____ **Report No.:** _____

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

Number of Men: 4
Foreman 1
Operators 1
Laborers 2

Equipment:
KX 121-3 EXCAVATOR

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: _____ **Date:** _____
Project: _____ **Day:** _____
Engineer's Rep: _____ **Page:** 2 of 2
Contractor's Rep: _____ **Report No.:** _____

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

Number of Men: 3
Foreman 1
Operators 1
Laborers 1

Equipment:
KX 121-3 EXCAVATOR

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: REPUBLIC ZION
Project: SITE 1 FORCEMAIN
Engineer's Rep: JUSTIN NAUMANN
Contractor's Rep: GREG KOMPERDA
Signed:

Date: 7-28-17
Day: FRIDAY
Page: 1 of 2
Report No.: 3

RESIDENT INSPECTION REPORT

Field Book No.: Page #s:

Contractor(s) on Site:
CEC

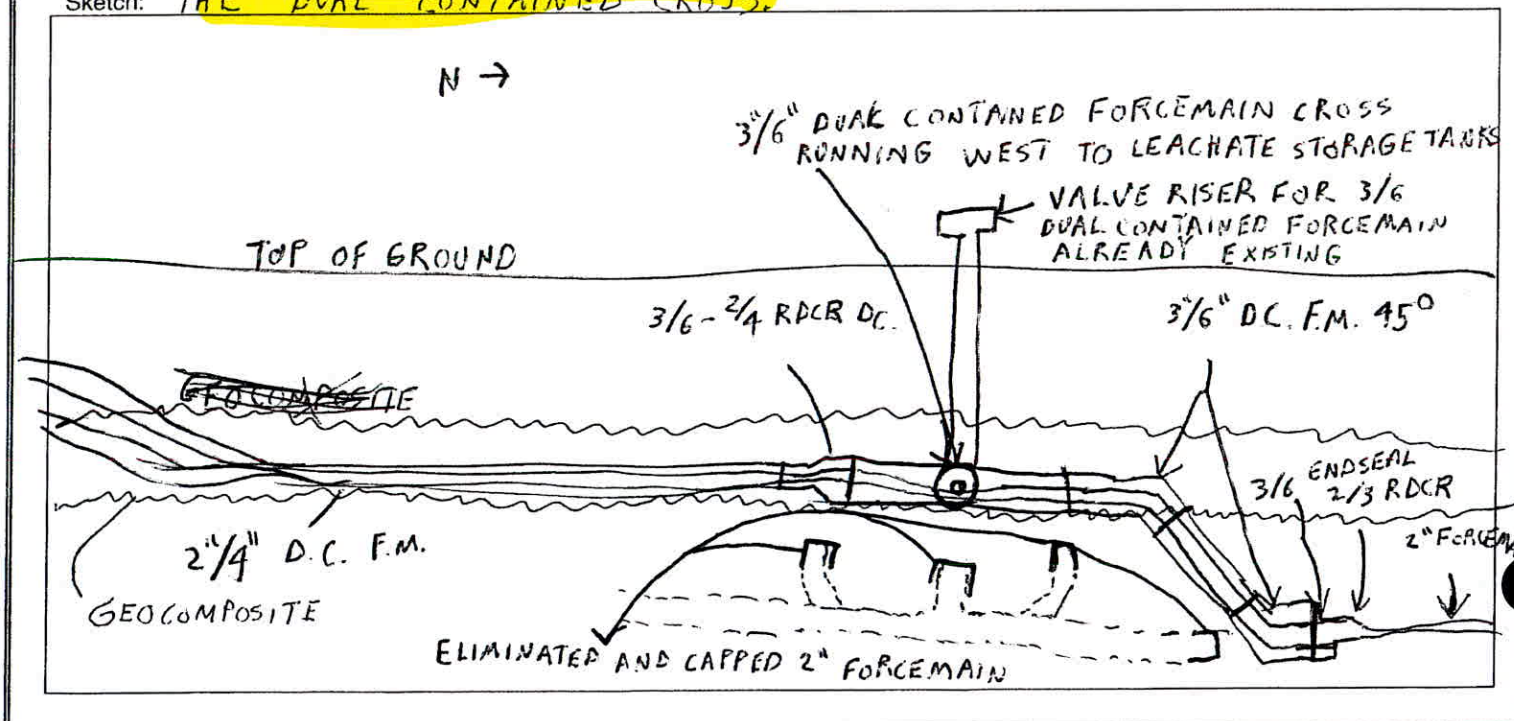
Weather Conditions:

Temperature		Sky
Low	High	P/C
67	76	
Rain	Snow	Site Conditions
—	—	(Dry) Muddy

Report of Observation of Work and Comments:
730 - CQM, CEC ONSITE

CEC BEGAN BY BEGINNING TO ATTACH THE 2" FORCE MAIN RUNNING NORTH INTO THE 6" DUAL CONTAINED CROSS THEY TURNED HORIZONTALLY ON 7-27-17 CEC ATTACHED THE CROSS TO THE 2" FORCEMAIN WITH A 45° BEND OFF THE CROSS POINTING DOWN TO THE 2" F.M. THEN A SECTION OF 6" DUAL CONTRINED FORCEMAIN PIPE WITH A 45° BEND OF 6" DUAL CONTAINED AT THE LEVEL OF THE 2" FORCEMAIN, CEC INSTALLED AN END SEAL AT THE BACK OF THE 45° BEND AND A REDUCER FROM 3" TO 2" TO TIE THE 2" FORCEMAIN INTO THE CROSS. CEC THEN FUSED A 2" CAP ONTO THE 2" FORCEMAIN TO THE SOUTH. CEC THEN FUSED THE 2"/4" DUAL CONTAINED FORCEMAIN OVER LINER RUNNING SOUTH INTO THE DUAL CONTAINED CROSS.

Sketch:



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax: (920) 465-3913

Client: _____ Date: _____
Project: _____ Day: _____
Engineer's Rep: _____ Page: 2 of 2
Contractor's Rep: _____ Report No.: _____

RESIDENT INSPECTION REPORT

Report of Observation of Work and Comments:

Number of Men: 3
Foreman 1
Operators 1
Laborers 1

Equipment:
1845 CASE SKID LOADER
15X 121-5 EXCAVATOR

AFTER THE FORCEMAIN WAS COMPLETED WITH FUSING CEC BEDDED THE FORCEMAIN CONNECTION AT THE 2" AND DUAL CONTAINED LINE MEETS AT THE NORTH WITH 1" WASHED STONE 1' BELOW PIPE AND 1' OVER TOP OF PIPE. CEC THEN RETURNED ANY WASTE PULLED FROM EXCAVATION BACK IN HOLE AND BEGAN BACKFILLING THE TRENCH AND HOLE WITH MATERIAL UP UNTIL THE GEOCOMPOSITE PUTTING THE MATERIAL IN AT 6" LIFTS COMPACTING WITH EXCAVATOR CQM TOOK DENSITY TESTS ON THE LIFTS.

ONCE THE CLAY WAS UP TO THE GEOCOMPOSITE CEC INSTALLED GEOCOMPOSITE INTO THE HOLE UP UNTIL THE OLD GEOCOMPOSITE. CEC RECONNECTED THE AIR LINES AND CONTROL VALVES AND STARTED THE FORCEMAIN SYSTEM BACK UP PUMPING. CEC BEDDED THE 6" CROSS WITH 1" WASHED STONE 6" BELOW THE CROSS AND 6" ABOVE THE CROSS. CEC REINSTALLED INSULATION IN THE 2/4 DUAL CONTAINED FORCEMAIN RUNNING SOUTH THAT WAS RIPPED OUT DURING EXCAVATION.

CEC THEN FINISHED UP BACKFILLING THE AREA WITH THE ROOTING ZONE LAYER REBUILT THE ROAD GRADED THE AREA WITH THE SKID LOADER.

500 - CQM OFFSITE

DENSITY'S

% PR	WD	DD	% M
90.0	130.0	117.4	10.7
90.3	130.5	117.8	10.8
90.2	130.0	117.8	10.4
98.3	140.8	128.3	9.8

623 2119

APPENDIX C

CONSTRUCTION SURVEY DATA

Leachate System Survey Data
May 2017

Point No.	North	East	Pipe Elevation	Description
1	10112.03	8646.29	737.16	2X4 MANHOLE INLET TOP
2	10127.18	8656.62	743.21	2X4 FM TIE-IN TOP
3	10127.1	8657.48	743.04	2X4 CAP TOP
4	10142.58	8668.15	746.86	2X4 FM TOP
5	10157.83	8680.66	749.44	2X4 FM TOP
6	10173.16	8692.63	751.86	2X4 FM TOP
7	10187.66	8705.98	754.03	2X4 FM TOP
8	10202.63	8718.76	756.43	2X4 FM TOP
9	10217.79	8731.41	756.36	2X4 FM TOP
10	10232.38	8744.89	757.4	2X4 FM TOP
11	10246.41	8759.11	758.27	2X4 FM TOP
12	10259.42	8773.47	758.8	2X4 FM TOP
13	10273.73	8787.44	758.83	2X4 FM TOP
14	10285.61	8793.96	759.13	VERT WYE/45/RISER TOP
15	10287.33	8795.25	759.05	2X4 CAP TOP

Data provided by CQM, INC.

Leachate System Survey Data
July 2017

Point No.	North	East	Pipe Elevation	Description
1	10558.79	8765.48	754.99	2" CAP
2	10557.99	8765.63	757.48	2" CAP
3	10558.34	8764.74	757.86	2" CAP
50	12488.28	10261.29	758.14	EDGE OF GEO
51	12493.55	10259.55	757.56	GEO
100	12557.71	10953.18	754.52	STKCM_6 PK Nail-Truck Wash Pad
101	10565.35	8766.49	756.63	2/3 RDCR
102	10564.95	8766.62	756.79	3/6 END SEAL
103	10564.3	8766.45	756.92	3/6 DC 45
104	10560.52	8765.7	761.77	3/6 DC 45
105	10558.41	8765.53	761.97	3/6 DC CROSS
106	10557.09	8765.05	762.33	3/6 - 2/4 RDCR
107	10559.91	8762.44	761.81	3/6 DC VALVE
108	10557.77	8768.23	761.95	3/6 DC 45
109	10556.05	8765.64	758.36	2" CAP
110	10556.83	8774.66	767.83	6" FLANGE
111	10536.16	8763.1	763.51	2/4 DC FM
112	10544.2	8761.27	761.95	2/4 DC FM
113	10550.41	8763.17	761.87	2/4 DC FM
114	10556.67	8765.68	762	2" AIR 90
115	10558.8	8765.21	762.43	2" AIR 90
116	10561.84	8762.67	761.42	2" AIR 90
117	10560.76	8761.6	761.27	2" AIR 90
118	10559.66	8761.76	761.61	2" AIR 90

Data provided by CQM, INC.

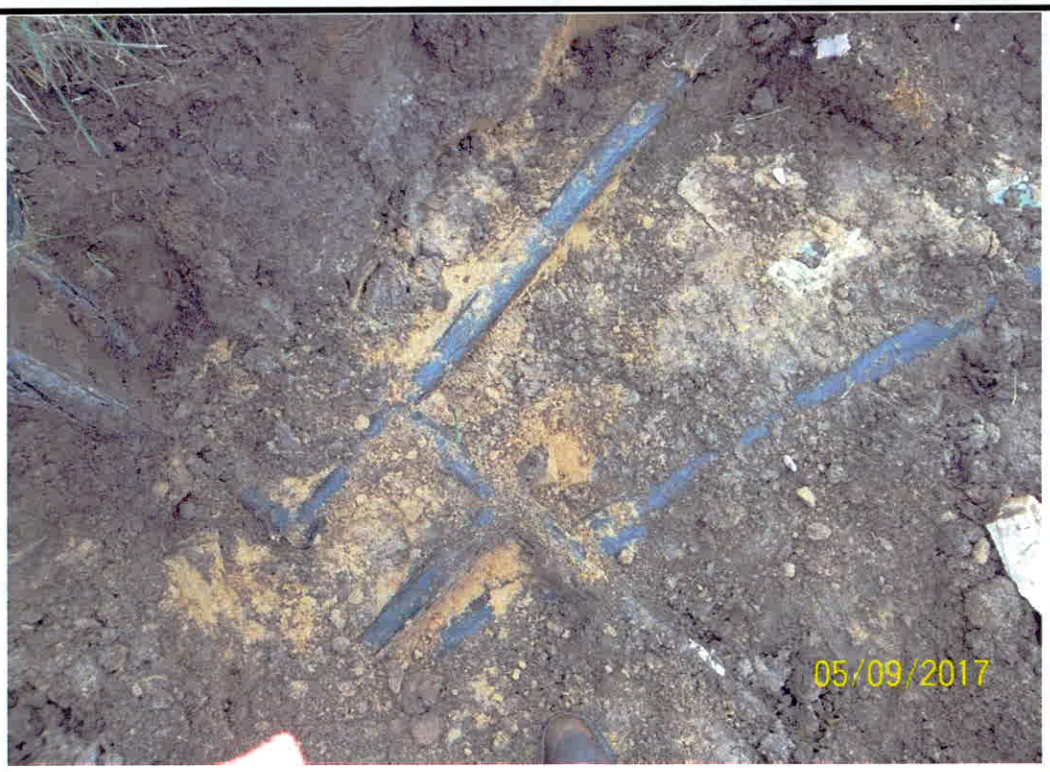
APPENDIX D

PHOTO LOG

Photograph Number: 1

Description:

Uncover existing forcemain by Well EW-21.



Photograph Number: 2

Description:

Leachate forcemain near Well EW-21.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 3

Description:

9th Street Manhole.

Photograph Number: 4

Description:

View from north looking south. Trench from EW-21 to 9th Street Manhole.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 5

Description:

2-inch x 4-inch dual containment pipe weld.

Photograph Number: 6

Description:

Pipe weld.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 7

Description:

4-inch x 2-inch dual contained leachate forcemain.

Photograph Number: 8

Description:

Pressure test for 2-inch contained pipe.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 9

Description:

Trench with leachate forcemain.

Photograph Number: 10

Description:

Tie-in to existing forcemain at 9th Street Manhole. Abandoned and capped leachate line.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 11

Description:

Cleanout riser near EW-21.

Photograph Number: 12

Description:

Bentonite seal at manhole inlet.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 13

Description:

Backfill trench.

Photograph Number: 14

Description:

Trench backfilled.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 15

Description:

Repair at 9th Street Manhole.

Photograph Number: 16

Description:

Trench to repair leachate forcemain.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 17

Description:

Trench to 9th Street Manhole.

Photograph Number: 18

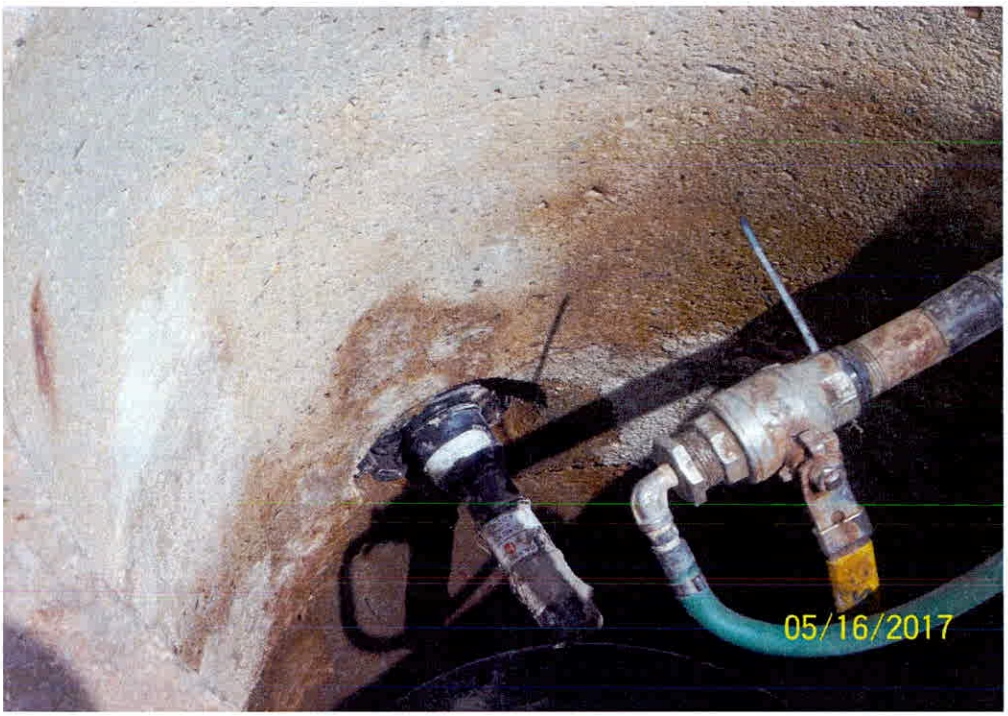
Description:

New leachate forcemain installed.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017



Photograph Number: 19

Description:

9th Street Manhole forcemain inlet and air line with valve.

Photograph Number: 20

Description:

Outside view of 9th Street Manhole forcemain.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 21

Description:

Leachate forcemain placed in trench. Trench backfilled.

Photograph Number: 22

Description:

Leachate line pinched. Uncover piping to investigate pinch in leachate forcemain.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 23

Description:

Cluster of leachate forcemain and clean-out riser.

Photograph Number: 24

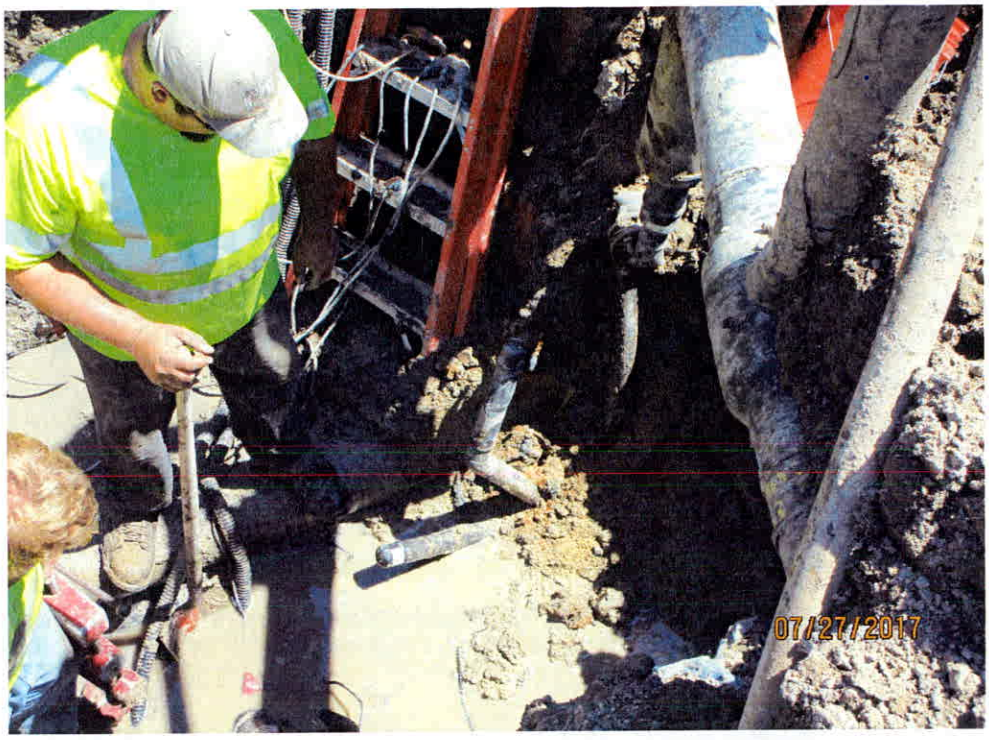
Description:

Bend in 2-inch leachate line that ties into 3-inch x 6-inch dual contained forcemain.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

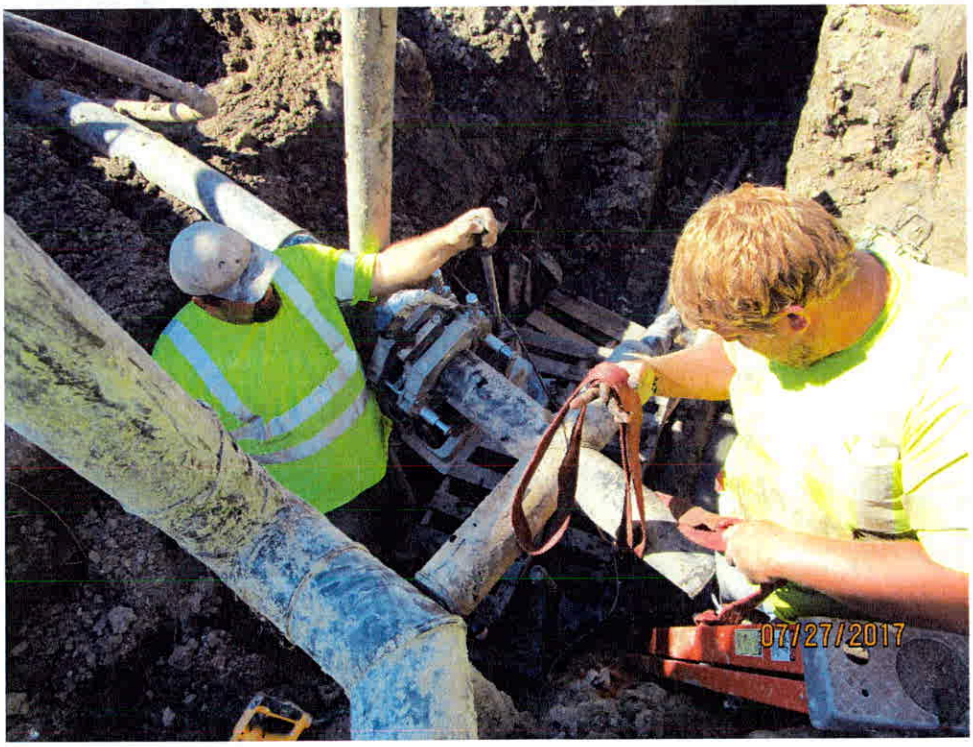
Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017



Photograph Number: 25

Description:

Abandoned 2-inch line.



Photograph Number: 26

Description:

Reconfigure piping to prevent same issue from reoccurring.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 27

Description:

3-inch x 6-inch to 2-inch x 4-inch reducer added to existing pipe. 3-inch x 6-inch 45-degree elbow added to opposite end of line.

Photograph Number: 28

Description:

New 45-degree elbow in line connects to 2-inch leachate line.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

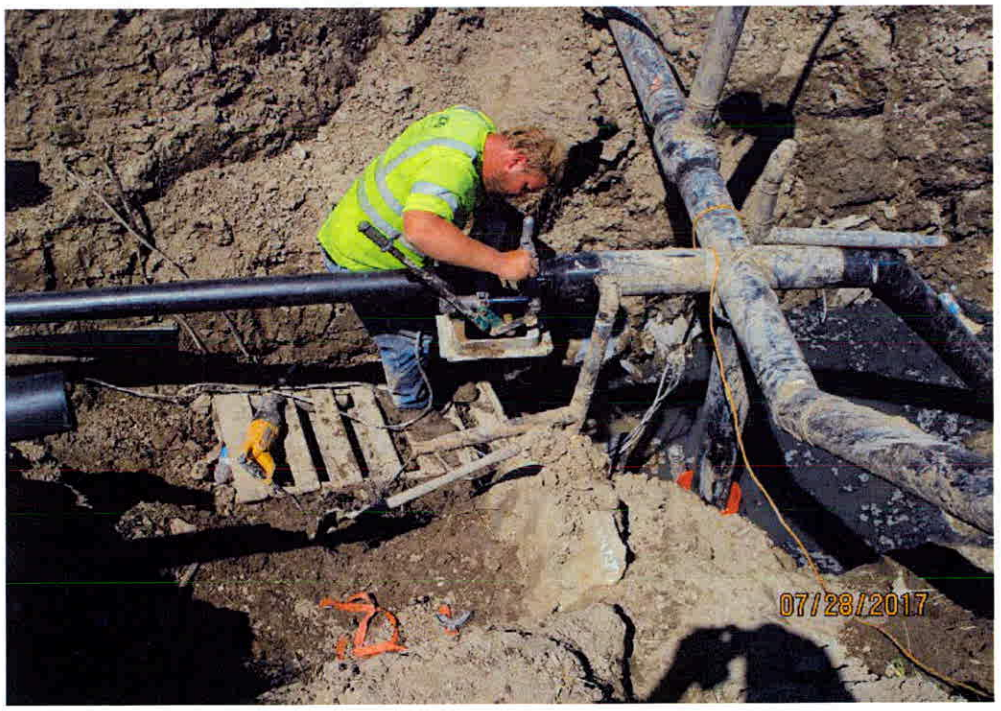
Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 29

Description:

3-inch x 6-inch end seal with 3-inch to 2-inch reducer connected to 2-inch leachate line.



Photograph Number: 30

Description:

New leachate forcemain line.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 31

Description:

Final configuration.

Photograph Number: 32

Description:

Pipe embedded in 1-inch washed stone and backfilled with soil.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 33

Description:

Density test for compacted clay performed by CQM, Inc.

Photograph Number: 34

Description:

Geocomposite.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 35

Description:

Insulation reinstalled over 2-inch x 4-inch leachate forcemain.

Photograph Number: 36

Description:

1-inch washed gravel placed around piping.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Photograph Number: 37

Description:

Clean-out riser.

Photograph Number: 38

Description:

Area backfilled and graded.

Civil & Environmental Consultants, Inc.
Chicago, Illinois
Ph: 630-963-6026 Toll Free: 877-963-6026

Leachate Collection System
Zion Landfill

Client Name:	BFI Waste Systems, NA
CEC Project:	170-256
Author:	Chastity Montalvo
Photographs Taken On:	May 9,11,16, 2017 & July 25, 27, 28, 2017

Appendix E-13

Leachate/Gas Collection System Layout and Flow Figures

R 002256

DETENTION BASIN 2

OLD SITE 2

CELL 4

CELL 8

CELL 1

N 12,000

N 11,000

8,000

9,000

10,000

11,000

DETENTION BASIN 7

FACILITY ENTRANCE

SCALE HOUSE

SITE 1 PHASE A

GREEN BAY ROAD

OFFICE

SITE 1 PHASE B

GAS TO ENERGY PLANT

DETENTION BASIN 1

SITE 1 PHASE B

BLOWER BUILDING AND FLARE

OLD SITE 2

DETENTION BASIN 3

MAINTENANCE BUILDING

LEACHATE STORAGE TANK(S)/ LOADOUT FACILITY

NINTH STREET

LEGEND

- PROPERTY BOUNDARY
- PERMITTED SOLID WASTE BOUNDARY
- CELL BOUNDARY
- FINAL COVER BOUNDARY
- 2' CONTOUR
- 10' CONTOUR
- LFG PIPING (SIZE VARIES)
- LFG PIPING ABOVE COVER GEOMEMBRANE
- LEACHATE FORCEMAIN
- CONDENSATE PIPING
- HORIZONTAL LFG WELL
- AIR SUPPLY PIPE
- ELECTRIC
- LEACHATE TRENCH
- MONITORING WELL
- PIEZOMETER
- GAS MONITORING PROBE
- LEACHATE MANHOLE
- LEACHATE CLEANOUT RISER
- LFG VALVE
- AIR VALVE
- CONDENSATE SUMP
- GAS EXTRACTION WELL
- CAISSON GAS EXTRACTION WELL
- GAS EXTRACTION WELL WITH PUMP
- CAISSON GAS EXTRACTION WELL WITH PUMP
- REMOTE EXTRACTION WELLHEAD
- NORTH TRENCH SUMP
- LEACHATE RECIRCULATION/LFG WELLHEAD
- DETECTION RISER
- ACCESS RISER
- EXISTING VACUUM CURTAIN WELLS
- SITE 1A GAS HEADER
- SITE 1A AIR LINE FLOW
- SITE 1A LEACHATE LINE FLOW

N

GRAPHIC SCALE

0 75' 150' 300

(IN FEET) 1 inch = 300 ft.

NOTES

1. TOPOGRAPHICAL MAP PREPARED FROM AERIAL SURVEY PERFORMED BY COOPER AERIAL SURVEYS ON APRIL 28, 2023 COMBINED WITH AN ADDITIONAL SURVEY ON JANUARY 3, 2024 BY TETRA TECH WITHIN THE WASTE BOUNDARY. CONTOUR INTERVAL IS 2 FEET AND ELEVATIONS ARE U.S.G.S MEAN SEA LEVEL DATUM.
2. HORIZONTAL CONTROL IS BASED ON ASSUMED SITE GRID SYSTEM. TO CONVERT LOCALIZED GRID AS PREVIOUSLY SURVEYED TO STATE PLANE, ADD 2,107,563.5 FEET TO THE NORTHING AND 1,097,477.69 FEET TO THE EASTING AT LOCAL GRID COORDINATE N: 00.0, E: 0.00 AND THEN ROTATE CLOCKWISE TO 00°18'00.4".
3. FOR CLARITY, NOT ALL SITE FEATURES MAY BE SHOWN.
4. EXISTING GAS SYSTEM SHOWN TAKEN FROM DRAWING 3, "MASTER GAS PLAN", BY WEAVER CONSULTANTS GROUP, FEBRUARY 14, 2024.

JUN 27 2025

REVIEWER: MED

PREPARED BY

EIL ENVIRONMENTAL INFORMATION LOGISTICS, LLC

PREPARED FOR

BFI Waste Systems

FIGURE 1

SITE 1 GAS MANAGEMENT SYSTEM PLAN

GFL - ZION LANDFILL
GAS COLLECTION AND CONTROL SYSTEM PLANS
CITY OF ZION, ILLINOIS

MAY 2025

Appendix E-14

Hazardous Waste Tank Assessment for Existing Leachate Collection Tank

ST Environmental LLC
PO Box 2557, Chesterton, IN 46304

February 24, 2014

SENT VIA ELECTRONIC MAIL

BFI Waste Systems of North America, Inc.
BFI Zion Landfill – Site 1A
701 Green Bay Rd.
Zion, IL. 60099

Subject: **Hazardous Waste Tank Assessment for Existing Leachate Collection Tank**
Tank ID Number A-108467
Zion Landfill - Site 1A

As requested, attached is a certified assessment of the affected storage tank at your facility. The assessment of the tank was conducted in accordance with 40 CFR 264.192. Please contact me if there are any questions.

Respectfully,
ST Environmental LLC

Susan Grenzebach, P.E.
Environmental Consultant

cc: Mike Maxwell, Weaver Boos

BFI Zion Landfill – Site 1A

Hazardous Waste Tank Assessment
Leachate Storage Tank
ID No. A-108467
Zion, Illinois Landfill

Report Date: January 15, 2014

Table of Contents

Appendices

Attachments

1.0 Introduction [40 CFR 264.192(a)]

The Site 1A leachate storage tank servicing the Zion landfill receives leachate from the landfill's Site 1A leachate forcemain collection system (see Attachment 1, *Site Map*). Based on inquiry and review of the most recent analytical report, the leachate does not exhibit flammable or volatile characteristics and has a neutral pH (see Attachment 3, *Waste Analysis Report*). The leachate is classified as a hazardous waste because it comes into contact with multi-sourced listed hazardous wastes placed in the landfill (*USEPA Hazardous Waste Number F039, Multisource Leachate Waste*). The storage tank is therefore subject to RCRA standards under 40 CFR 264, Subpart J, *Standards For Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*. The specifications of the tank are provided in the table below.

Manufacturer:	Modern Welding Co. of Ohio Inc. P.O. Box 2265 72 Waldo St, Newark, OH. 43055 (614)344-9425
Serial Number:	A-108467
Fabrication Per:	UL-142
Dimensions:	96" x 21'8"
Secondary Containment:	Double-Walled Tank
Capacity:	8,000 gallons
Mfg Date:	October 1997

2.0 Design standards [264.192(a)(1)]

The tank was custom fabricated per UL-142 Standard (*Aboveground Flammable Liquid Tanks*). General information on UL-142 is provided in Attachment 4, *UL-142 Standard.* Detailed construction and design diagrams are provided in Attachment 2, *Tank Detail Drawings*.

UL-142 dictates standards for steel atmospheric storage tanks intended for noncorrosive, stable flammable and combustible liquids with a specific gravity not exceeding 1.0 in aboveground applications. The standard includes a comprehensive set of requirements in the following areas:

- Construction requirements – These include specification for tank materials, joints, connections, fittings, manholes (if provided), fill, drain and gauge openings, and painting. They also include specific construction requirements for the primary and secondary containment means, support, etc.
- Performance tests – These requirements include tank leakage, hydrostatic strength, top loading, buoyancy, hydrostatic load, tank support load, and lift lug tests that are designed to verify that the tank design does not exhibit signs of leakage and/or structural damage as a result of these tests.
- Markings and production line test – UL-142 requires tanks to include specific markings. In addition, all listed primary and secondary containment tanks must be tested for leakage by the manufacturer.

3.0 Hazardous characteristics of the waste [264.192(a)(2)]

Based on inquiry and review of the most recent analytical report, the leachate does not exhibit flammable or volatile characteristics and has a neutral pH (see Attachment 3, *Waste Analysis Report*). The leachate is classified as a hazardous waste because it comes into contact with multi-sourced hazardous wastes placed in the landfill (*USEPA Hazardous Waste Number F039, Multisource Leachate Waste*).

4.0 Factors affecting the potential for corrosion [264.192(a)(3)]

The tank is painted to aid in corrosion resistance. The paint is in very good condition. There are minor rust stains visible on the sides of the tank from top flange and pipe connections that were not a concern (see Appendix 1, *Field Examination Report*). The field examination found no signs of subsurface rust. According to the original construction report, the interior of the tank is also coated for corrosion protection (see Attachment 5, *Excerpts from February 16, 1998, RMT Inc., Construction Acceptance Report*).

5.0 Inspection during installation [264.192(b)]

The tank was installed prior to this assessment, therefore, a documented inspection of the system during installation by a qualified installation inspector cannot be verified. However, the original facility construction report was available for review and historical research.

6.0 Tightness testing [264.192(d)]

Documentation on the tank's original tightness test was not available, however, the manufacturer was contacted and provided verbal confirmation that the tank was tested for leaks in accordance with UL-142 requirements prior to delivery. According to the manufacturer, all of their UL-142 designed tanks are pressurized to a range of 3-5 psi and all seams are examined with a leak detection solution. According to plant personnel, there have been no leaks reported on the tank since it was placed into operation. The visual inspection on January 14, 2014, which was done as part of this certification, did not indicate any signs of leaks.

7.0 Ancillary equipment [264.192(e)]

Ancillary equipment includes piping, fittings, flanges, valves, and pumps. The tank system piping is double-lined and insulated where exposed. The piping and ancillary equipment are not in danger of physical damage due to their location. Expansion and contraction would be minimal. Heat tracing and insulation prevent freezing.

8.0 Containment and detection of releases [264.193]

The tank is double-walled and meets the requirements of 40 CFR 264.193(c) and 264.193(d). The annular space is equipped with a leak monitoring system. Ancillary leachate piping is double-walled. The storage tank is adjacent to a concrete load out catch basin that is designed to contain any tank overflow and/or releases from tanker truck loading operations. The catch basin sump automatically pumps liquids back into the tank based on fluid levels. To prevent overflows, the tank is also equipped with visual and audible level monitoring systems.

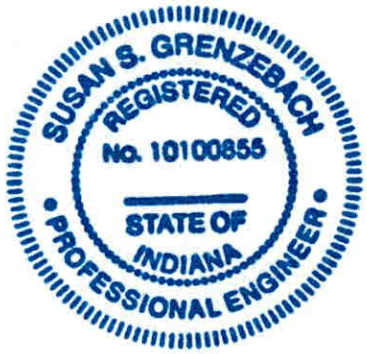
9.0 P.E. Certification Statement

In accordance with the review conducted, the existing tank system has sufficient structural integrity and is acceptable for storing the hazardous waste discussed herein in accordance with 40 CFR 264, Subpart J. I certify under penalty of law that this document and all attachments were gathered, prepared and evaluated by me. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for documenting false information, including the possibility of fine and imprisonment for knowing violations.

Susan Grenzebach, P.E.
Principal Environmental Consultant
ST Environmental LLC
PO Box 2557, Chesterton, IN 46304
(219) 728-6312

PE License: 10100855, State of Indiana

Seal:



APPENDIX 1
HW TANK ASSESSMENT – FIELD EXAMINATION REPORT
Developed in Accordance with API
Guide for Inspection of Refinery Equipment Chapter 13-Atmospheric and Low-Pressure Tanks

Field Examination Date(s): **January 14, 2014**

Location: **Zion Landfill Site 1A – Zion, Illinois**

P.E. Name: **Susan Grenzebach (Indiana License No. 10100855)**

Description
The Site 1A leachate storage tank servicing the Zion landfill receives leachate from the landfill's Site 1A leachate forcemain collection system (see Attachment 1, *Site Map*). Based on inquiry and review of the most recent analytical report, the leachate does not exhibit flammable or volatile characteristics and has a neutral pH (see Attachment 3, *Waste Analysis Report*). The leachate is classified as a hazardous waste because it comes into contact with multi-sourced listed hazardous wastes placed in the landfill (*USEPA Hazardous Waste Number F039, Multisource Leachate Waste*). The storage tank is therefore subject to RCRA standards under 40 CFR 264, Subpart J, *Standards For Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*. The specifications of the tank are provided in the table below.

Manufacturer:	Modern Welding Co. of Ohio Inc. P.O. Box 2265 72 Waldo St, Newark, OH. 43055 (614) 344-9425
Serial Number:	A-108467
Fabrication Standard:	UL-142
Dimensions:	96" x 21'8"
Secondary Containment:	Double-Walled Tank
Capacity:	8,000 gallons
Mfg Date:	October 1997

13.4.2.1 and 13.4.2.2 Ladders, Stairways, Platforms and Walkways
There is an attached open ladder at the west end of the tank. The top of the tank is accessible and viewable from the top of the ladder for inspection. The ladder is constructed of painted steel and shows no signs of rust or structural defects at the attachment point that would affect the structural integrity of the tank. There are no other walkways or platforms associated with the tank system. See Attachment 2, *Tank Detail Drawings* and photograph below.

APPENDIX 1
HW TANK ASSESSMENT – FIELD EXAMINATION REPORT
Developed in Accordance with API
Guide for Inspection of Refinery Equipment Chapter 13-Atmospheric and Low-Pressure Tanks

13.4.2.3 and 13.4.2.4 Foundations and Anchor Bolts

The tank sits on a compacted granular base at ground level. The construction detail drawings are provided in Attachment 2, *Tank Detail Drawings*. The drawing shows typical and adequate foundation construction for tanks of this size and type. No cracks, defects or seepage stains were found upon inspection on the ground around the tank. Although the tip of the bottom arc of the tank touches the ground, there appeared to be no signs of deterioration or concern for corrosion based on the visual inspection of the condition of the tank surface on either side of the bottom arc.

13.4.2.5 Pipe Connections

The piping connections on the tank are in good condition and most connections are visible from the top of the tank. The pipes leading into the tank are insulated and appeared to be in good condition. No leaks, defects or structural issues were found in the visible piping system. According to the construction report, all of the leachate conveyance piping in the Site I, Phase A forcemain system are double-walled (see Attachment 5, *Excerpts from February 16, 1998, RMT Inc., Construction Acceptance Report*).

APPENDIX 1
HW TANK ASSESSMENT – FIELD EXAMINATION REPORT
Developed in Accordance with API
Guide for Inspection of Refinery Equipment Chapter 13-Atmospheric and Low-Pressure Tanks

13.4.2.6 Ground Connections

Grounding connections are not required for this tank system. Flammable substances are not stored in the storage tank.

13.4.2.7 Protective Coatings

The exterior paint coating on the tank is in very good condition. There are minor rust stains visible on the sides of the tank from top flange and pipe connections that were not a concern (see photo below). Paint scrapings were not necessary as there were no signs of subsurface rust. According to the original construction report, the interior of the tank is also coated for corrosion protection (see Attachment 5, *Excerpts from February 16, 1998, RMT Inc., Construction Acceptance Report*).

13.4.2.8 Insulation

The tank is not insulated, however, the tank is equipped with an electric heating element that prevents freezing.

13.4.2.9 Tank Walls

The walls of the tank are sound. Visible weld seams were in good condition with no rust or degradation.

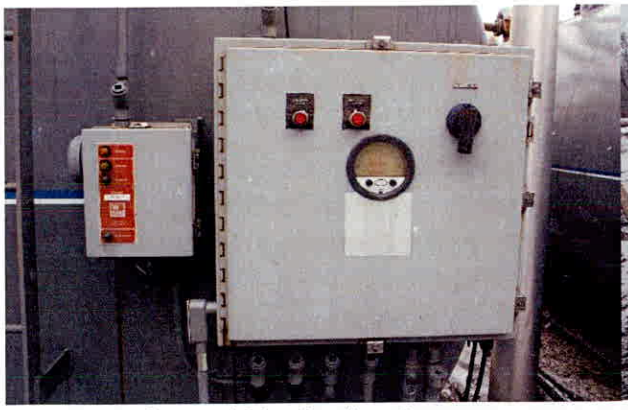
APPENDIX 1
HW TANK ASSESSMENT – FIELD EXAMINATION REPORT
Developed in Accordance with API
Guide for Inspection of Refinery Equipment Chapter 13-Atmospheric and Low-Pressure Tanks

13.4.2.10 Tank Roofs

The tank is cylindrical and there is no roof structure on the tank. The flanges and connections at the top of the tank are in good condition.

13.4.2.11 Auxiliary Equipment (dikes, drains, dike stairways and walkways)

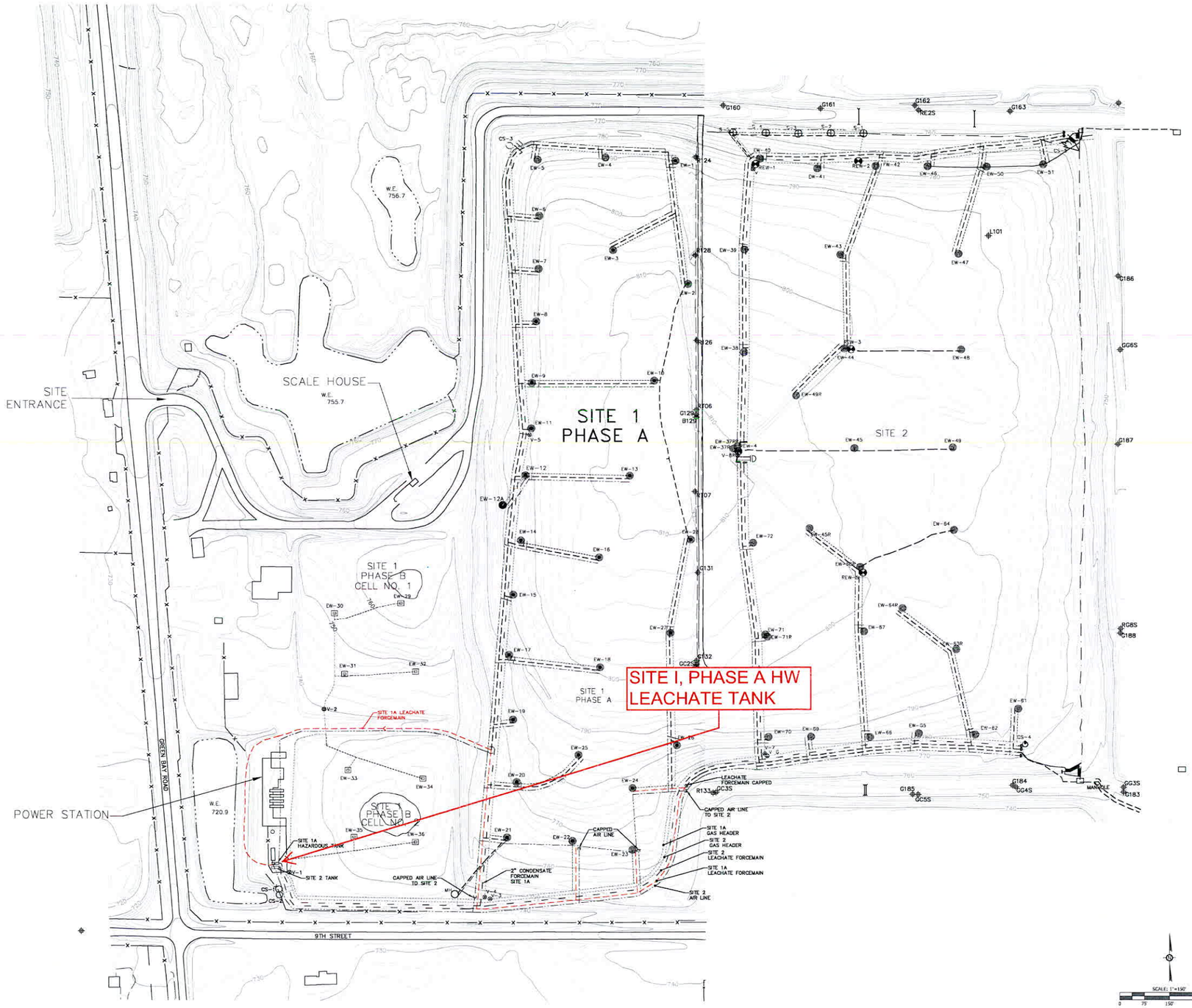
The storage tank is adjacent to a concrete load out catch basin that is designed to contain any tank overflow and/or releases from tanker truck loading operations. The catch basin sump automatically pumps liquids back into the tank based on fluid levels. To prevent overflows, the tank is equipped with a level monitoring system.



Tank Level Monitoring System

Loadout Catch Basin/Containment

ATTACHMENT 1 - SITE MAP | **HW TANK ASSESSMENT** | **Page 1 of 1**



LEGEND

- EXISTING GAS HEADER PIPING
- EXISTING CONDENSATE DISCHARGE PIPING
- EXISTING AIR SUPPLY PIPING
- EXISTING LEACHATE FORCEMAIN PIPING
- EXISTING LATERAL GAS PIPING
- EW-43 — EXTRACTION WELL
- EW-39 — EXTRACTION WELL WITH PUMP
- RW-7 — REMOTE EXTRACTION WELLHEADS
- S- — NORTH TRENCH SUMP
- CS-5 — CONDENSATE SUMP
- R133 — GROUNDWATER MONITORING WELL
- GMP-7 — GAS MONITORING PROBE
- V-8 — VALVE BOX

IEPA - DIVISION OF RECORDS MANAGEMENT
RELEASABLE

JUN 27 2025

REVIEWER: MED

PREPARED FOR: BFI WASTE SYSTEMS OF NORTH AMERICA, LLC

EXISTING LEACHATE FLOW
ZION LANDFILL
SITE 1, PHASE A
ZION, ILLINOIS

NO.	DATE	REVISION DESCRIPTION

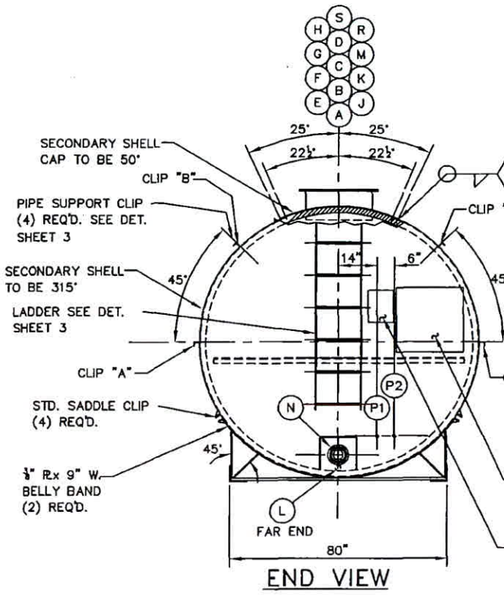
WEAVER BOOS CONSULTANTS

COLUMBUS, OH
DENVER, CO — FORT WORTH, TX
GRAND RAPIDS, MI — GRIFFITH, IN
MARTINSVILLE, IL — SOUTH BEND, IN
SPRINGFIELD, IL — ST. LOUIS, MO

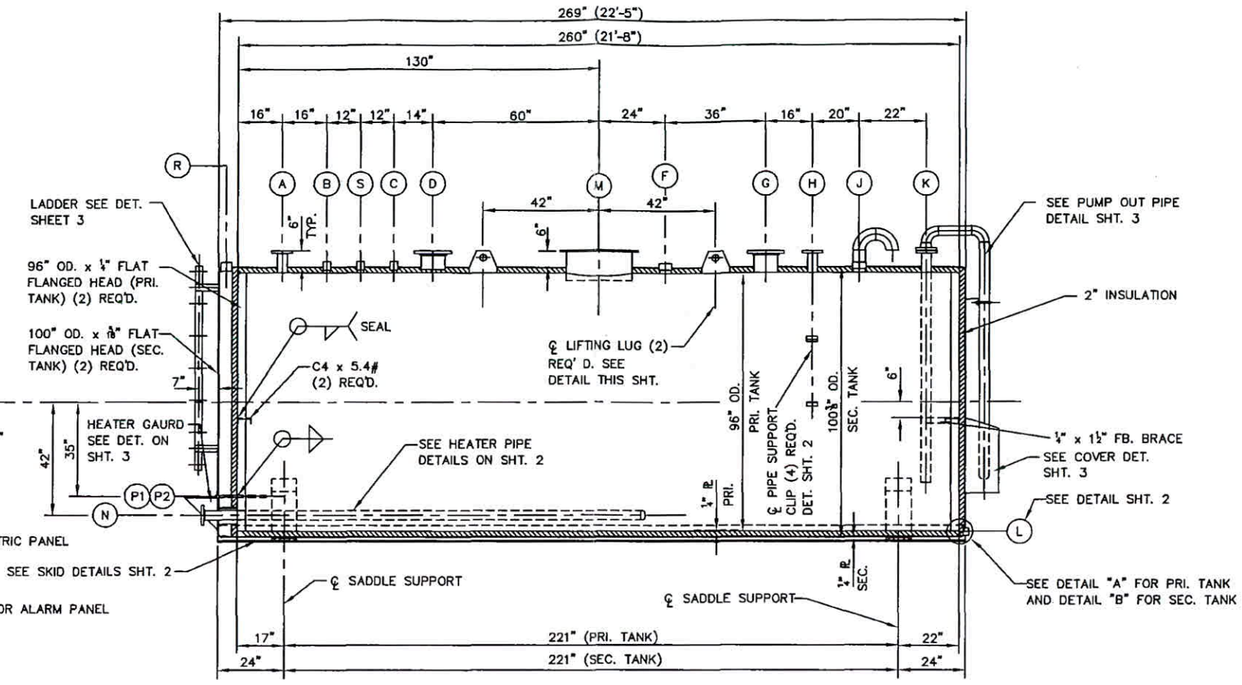
REUSE OF DOCUMENTS
This document, and the ideas & concepts and designs, as an instrument of professional service, is the property of Weaver Boos Consultants North Central, LLC, and is not to be used in whole or in part, without the written authorization of Weaver Boos Consultants North Central LLC.

DRAWN BY:	NMP
DESIGNED BY:	BS
REVIEWED BY:	BS
DATE:	11/22/2010
FILE:	0120-37-XX
CAD:	ZN000219.DWG

SHEET 4 OF 4



END VIEW



SIDE ELEVATION VIEW

NOTES:

MODERN WELDING CO. TO SUPPLY AND INSTALL THE FOLLOWING EQUIPMENT.

1.) (1) N.E.M.A. 4 CONTROL PANEL WITH PRIMARY AND BACKUP CONTRACTOR CONTROL VOLTAGE TRANSFORMER FOR 120 VOLT SECONDARY.
2.) (2) EC 1-6A120 THERMOSTATS 0'-100° W/120" CAPILLARY TERMIAL BLOCK FOR CUST. LWCO DISCONNECT SWITCH AND (2) THERMOSTAT WELLS CAT. #WSS6B
3.) (1) INDEECO PIPE INSERT HEATER TUBULAR TYPE WITH 5KW, 240 VOLT SINGLE PHASE W/ "B" DIMENSION = 150". W/ 12" COLD END, 3" STANDARD PIPE FLANGE MOUNT (CARBON STEEL) N.E.M.A. 4/7 TERMINAL BOX W/ SPACERS FOR INSERTION INTO 3" PIPE.
4.) (1) OHMART MODEL #P-301 DUAL-POINT ULTRASONIC LEVEL SWITCH
5.) (1) MORRISON CLOCK SIGHT GAUGE
6.) (2) #244F 8" 8 OZ. EMRGENCY VENT
7.) (1) #354 2" UP DRAFT VENT
8.) (1) #749 2" 8 OZ. PRESS./VAC. VENT
9.) (1) DLP-2 FLOAT SWITCH SENSOR
10.) (1) DCS-12B JUNCTION BOX HOUSING
11.) (1) TA-301-T ALARM PANEL W/PRESS TO TEST BUTTON

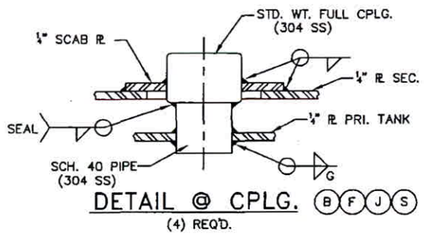
GENERAL NOTES

FABRICATION PER: UL-142
LABEL REQUIRED ☒ YES ☐ NO
DESIGN PRESSURE: ATMOS PSI
DESIGN TEMPERATURE: AMB° F
CORROSION ALLOWANCE: NONE
P.W.H.T. ☐ YES ☒ NO
RADIOGRAPH: NONE
SHOP TEST: PER UL-142
INSPECTION BY: CUSTOMER
MATERIAL SHELL: SA-36
FLANGES: SA-105/SA-182-F-304 SS COUPLINGS: SA-182-F-304 SS/ CS
NOZZLE NECKS: SA-106/SA-312-TP-304 M.W. NECK: CS
INT. PIPE: SA-312-TP-304 SS
SUPPORTS: SA-36
INT. APPURTANCES: SS. OR LINED
EXT. APPURTANCES: CS
BOLTS: CS NUTS: CS
GASKETS: PER UL-142
SANDBLAST EXT.: SSPC-SP6 S.B. INT.: SSPC-SP5
PAINT: EXT.: PRIMER AMERON-AMERLOCK 400 (5-8 MILS DFT.)
FINISH: AMERON-AMERSHIELD GRAY GR-3 (5-6 MILS DFT.)
PAINT: INT.: CORROCOTE II URETHANE

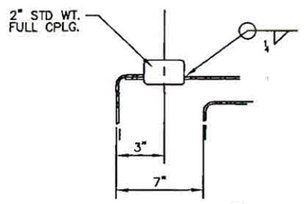
ALL NOZZLE AND MANWAY BOLT HOLES TO STRADDLE NORTH, SOUTH CENTERLINES OR THEIR PARALLEL LINES UNLESS OTHERWISE SHOWN.

EST. WT. EMPTY: 18,000 LBS.
EST. WT. FULL OF WATER: 84,760 LBS.

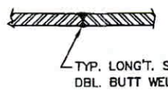
NOTE:
1.) GRIND ALL INTERNAL WELDS SMOOTH BUT NOT FLUSH GRIND ALL SHARP EDGES TO ⅛" MIN RADIUS
2.) ALL ELECTRICAL CONDUIT TO BE THREADED. PROVIDE EYS SEALS BETWEEN ALARM JUNCTION BOX HOUSING AND PANEL, HEATER, AND PANEL, AND LEVEL SWITCH AND PANEL.



DETAIL @ CPLG. (B)(F)(J)(S)
(4) REQ'D.

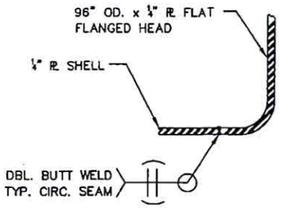


DET @ CPLG (R)

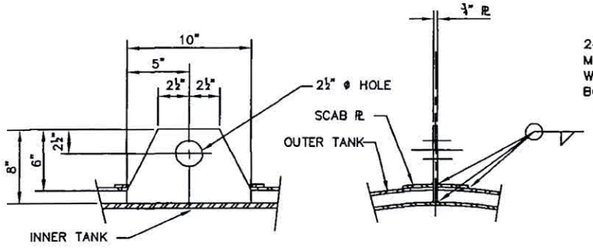


DETAIL @ LONG'T. SEAMS
(PRIMARY & SECONDARY TANK)

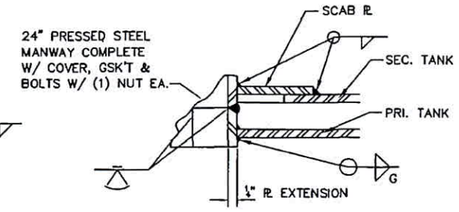
NOTE: DBL. BUTT WELD CIRC. SEAMS ON SEC. TANK, EXCEPT FOR FOR HEADS. SEE DETAIL "B"



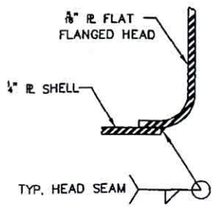
DETAIL "A"
PRIMARY TANK



DETAIL @ LIFTING LUG
(2) REQ'D.



DETAIL @ MANWAY (M)



DETAIL "B"
SECONDARY TANK

"•" DENOTES 304 SS

MARK	REQ'D.	SIZE	NK. THKS.	RATING	TYPE	REPAD	SERVICE
S •	1	2"	STD. WT	F. CPLG.			NORM. PRI. TANK VENT
R	1	2"	STD. WT	F. CPLG.			MONITOR
P1-2"	2	½"	STD. WT	F. CPLG.			THERMOSTAT WELL
N •	1	3"	SEE DETAIL SHEET 2				HEATER PIPE
M		24"	PRESSED	STEEL	MANWAY		MANWAY
L		2"	STD. WT	F. CPLG.			DRAIN OUTER TANK
K •		3"	SCH. 40	150#	RFSO	-	PUMP OUT
J •		4"	STD. WT	F. CPLG.		-	NORM. PRI. TANK VENT
H •		4"	SCH. 40	150#	RFSO	-	INLET
G		8"	SCH. 40	150#	RFSO		EMERG. PRI. TANK VENT
F •		4"	STD. WT.	F. CPLG.	-	-	SAMPLE
E		-	-		-		-
D		8"	SCH. 40	150#	RFSO		EMERG. INTERST. VENT
C		2"	STD. WT.	F. CPLG	-	-	NORM. INTERST. VENT
B •		2"	STD. WT.	F. CPLG	-	-	CLOCK GAUGE
A •	1	3"	SCH. 40	150#	RFSO	-	LEVEL GAUGE

SCHEDULE OF OPENINGS

THIS IS TO CERTIFY THAT THIS IS A TRUE COPY OF DRAWINGS FROM WHICH THIS ITEM WILL BE FABRICATED.
Date 7-2-96 Signature JEFFREY CAVEY

KS / JC	ISSUED FOR FABRICATION	7-2 1996	0
BY / AP	REVISION	DATE	NO

NO. REQ'D ONE | ITEM NO. ZION, IL

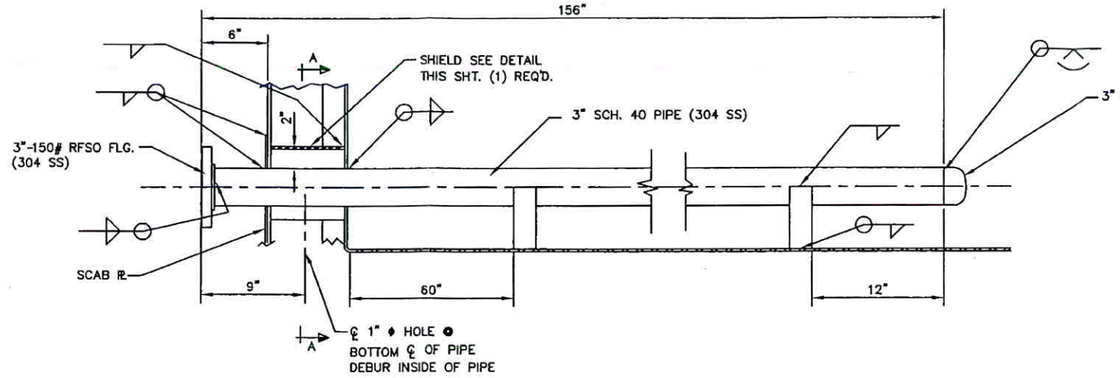
MODERN WELDING CO. of OHIO INC.

P.O. Box 2265
72 Waldo Street
modern
Newark, Ohio 43055
(614)344-9425

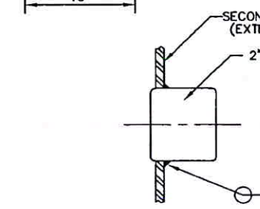
BROWNING FERRIS GAS SERVICES INC
96"x 21'-8" LG. DBL. WALL ABOVE GROUND TANK

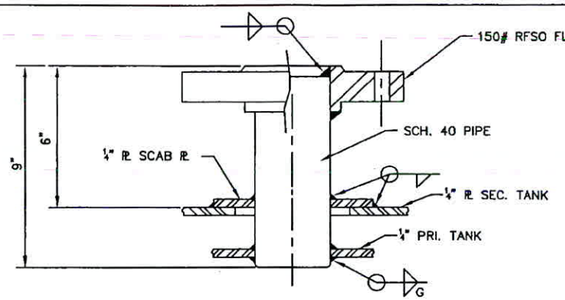
DWN. BY	KS	DATE	7-2-96	SCALE:	NONE
CHK. BY	JJC	JOB NO.	3783	DWG. NO.	3783 0
APR. BY	JJC	P.O. NO.	04145	SHT. NO.	1 OF 3

R 002269

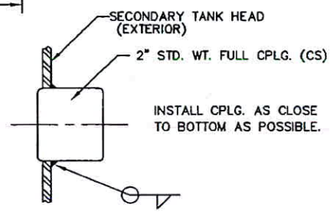


DETAIL @ HEATER PIPE

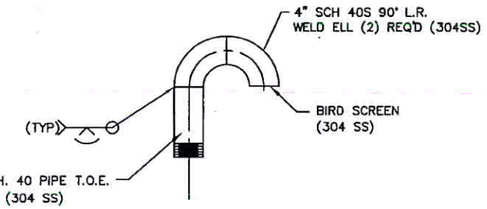




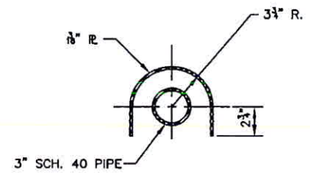
DETAIL @ TYP. NOZZLE (A)(G)(H)



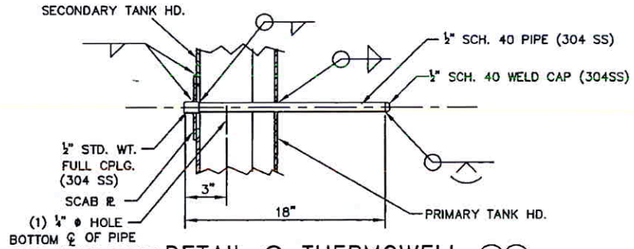
DETAIL @ CPLG. (L)



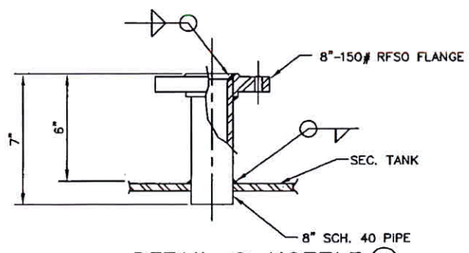
DET. @ GOOSENECK VENT (L)



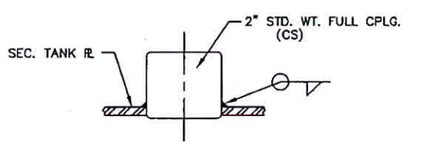
SECTION A–A



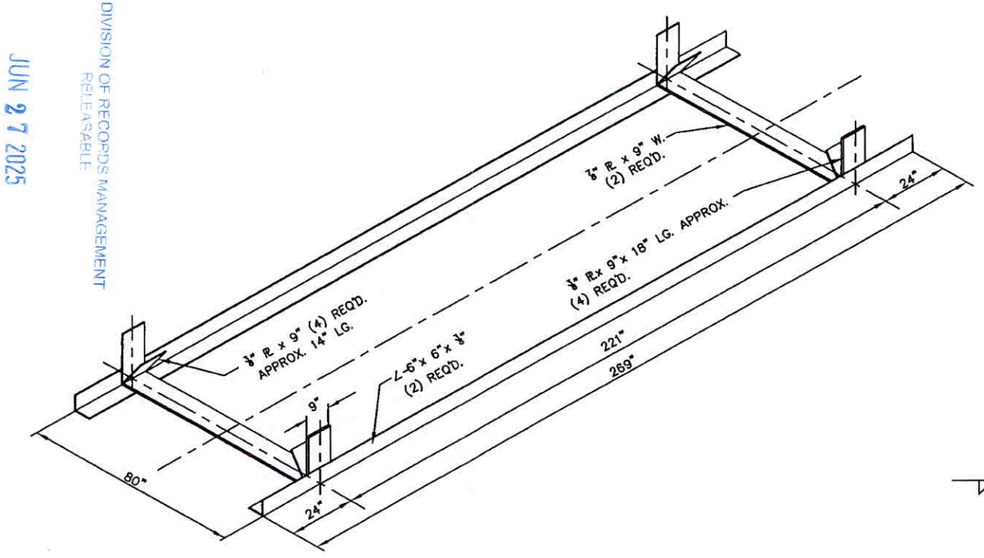
DETAIL @ THERMOWELL (P1)(P2) (2) REQ'D.



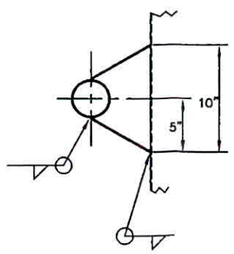
DETAIL @ NOZZLE (D)



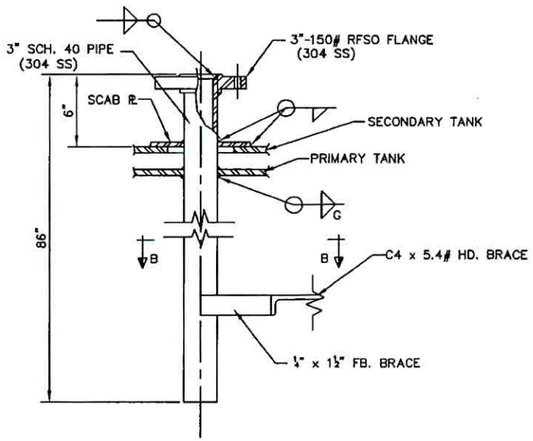
DETAIL @ CPLG. (C)



DETAIL @ SKID



SECTION B–B



DETAIL @ NOZZLE (K)

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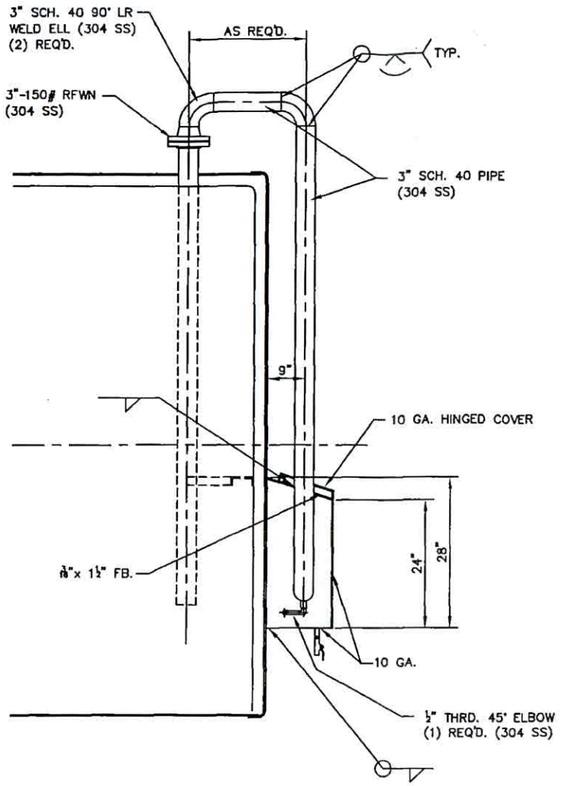
Date 7-2-96 Signature JEFFREY CAVEY

KS / JC	ISSUED FOR FABRICATION	7-2 1996	0
BY / AP	REVISION	DATE	NO
NO. REQ'D ONE		ITEM NO. ZION, IL	

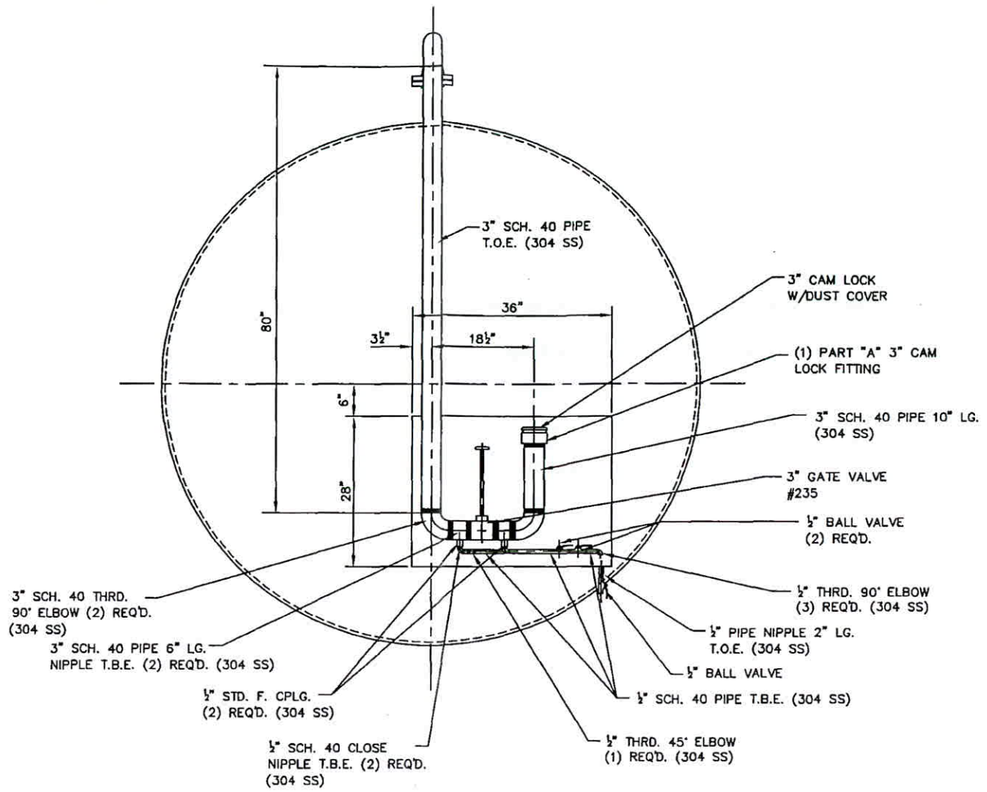
MODERN WELDING CO. of OHIO INC.
P.O. Box 2265, 72 Waldo Street, Newark, Ohio 43055, (614)344-9425

BROWNING FERRIS GAS SERVICES INC.
96"x 21'-8" LG. DBL WALL ABOVE GROUND TANK

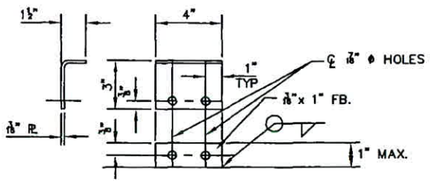
DWN. BY	KJS	DATE 7-2-96	SCALE: NONE		
CHK. BY	JJC	JOB NO. 3783	DWG. NO. 3783	0	
APR. BY	JJC	P.O. NO. 04145	SHT. NO. 2 OF 3		



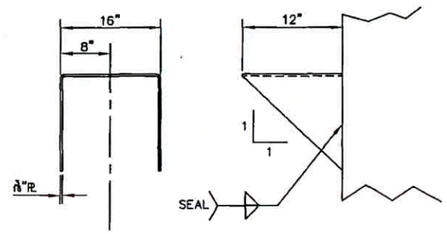
SIDE VIEW



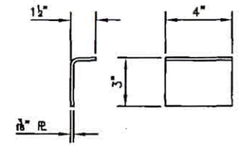
END VIEW



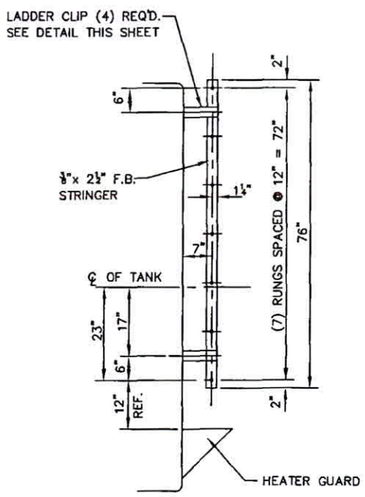
DETAIL @ PIPE SUPPORT BRK'T. "A"
(2) REQ'D.



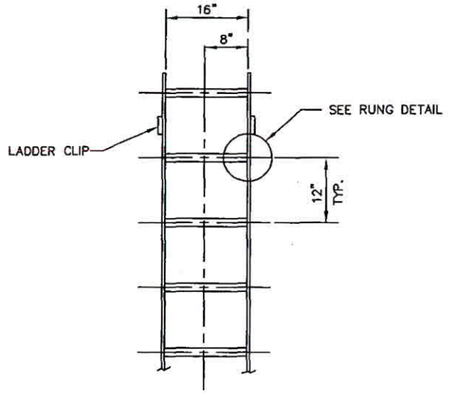
DETAIL @ HEATER GAURD
(1) REQ'D.



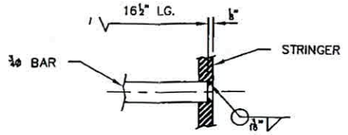
DETAIL @ PIPE SUPPORT BRK'T. "B"
(2) REQ'D.



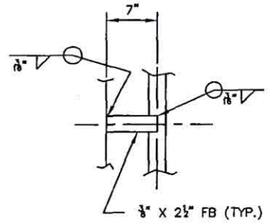
ELEVATION VIEW @ LADDER



FRONT VIEW @ LADDER



DETAIL @ LADDER RUNG
(7) REQUIRED



LADDER CLIP
(4) REQUIRED

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Date 7-2-96 Signature JEFFREY CAVEY

KS / JC	ISSUED FOR FABRICATION	7-2 1996	0
BY / AP	REVISION	DATE	NO
NO. REQ'D ONE		ITEM NO. ZION, IL	

MODERN WELDING CO. of OHIO INC.

P.O. Box 2265
72 Waldo Street
modern
Newark, Ohio 43055
(614)344-9425

BROWNING FERRIS GAS SERVICS INC.
96"x 21'-8" LG. DBL. WALL ABOVE GROUND TANK

DWN. BY	KJS	DATE 7-2-96	SCALE: NONE		
CHK. BY	JJC	JOB NO. 3783	DWG. NO. 3783	0	
APR. BY	JJC	P.O. NO. 04145	SHT. NO. 3 OF 3		

R 002271

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF
Sample ID: 1A LT Tank
Sample No: 12-6333-006

Date Collected: 11/30/12
Time Collected: 10:25
Date Received: 11/30/12
Date Reported: 01/04/13

Analyte	Result	R.L.	Units	Date Analyzed	Method	Flag
Alkalinity, Bicarbonate (CaCO3)	5,750	10	mg/L	12/04/12	2320B	
Ammonia (as N)	1,020	5	mg/L	12/14/12	350.1R2.0	
BOD, 5 Day	283	1	mg/L	11/30/12 13:30	5210B	
COD	2,590	40	mg/L	12/05/12	5220D	
Chloride	3,210	10	mg/L	12/05/12	4500Cl, E	
Cyanide, Total	< 0.050	0.05	mg/L	12/05/12	4500CN,C,E	
Fluoride	1.20	0.50	mg/L	12/04/12	4500F,C	
Nitrate (as N)	< 5.00	5	mg/L	12/04/12	353.2R2.0	
Oil (Hexane soluble)	25	20	mg/L	12/06/12	1664A	
Phenols	110	100	ug/L	12/03/12	420.1	
Phosphorus (as P)	< 0.50	0.5	mg/L	12/04/12	4500P,B,E	
Sulfate	< 75	50	mg/L	12/11/12	375.2R2.0	W
Total Dissolved Solids	8,140	10	mg/L	12/05/12	2540C	
Total Suspended Solids	1,500	40	mg/L	12/03/12	2540D	
TOC	370	10	mg/L	12/17/12	9060	
Fecal Coliform	< 1	1	MPN/100mL	12/03/12	COLILERT	N S
Cyanide, Reactive	< 10	10	mg/L	12/03/12	7.3.3.2.	
Chromium, Hexavalent	< 47.0	25	ug/L	01/03/13	3500Cr,B	

ATTACHMENT 3 - WASTE ANALYSIS REPORT

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF
Sample ID: 1A LT Tank
Sample No: 12-6333-006

Date Collected: 11/30/12
Time Collected: 10:25
Date Received: 11/30/12
Date Reported: 01/04/13

Analyte	Result	R.L.	Units	Flags
Total Metals **Method: 6010B**		**Preparation Method 3010A**		
Analysis Date: 01/03/13		Preparation Date: 12/03/12		
Aluminum	< 1.00	1	mg/L	
Antimony	< 0.060	0.06	mg/L	
Arsenic	0.041	0.02	mg/L	
Barium	0.034	0.001	mg/L	
Beryllium	< 0.040	0.04	mg/L	
Boron	4.50	0.1	mg/L	
Cadmium	< 0.025	0.025	mg/L	
Calcium	89.5	10	mg/L	
Chromium	0.047	0.025	mg/L	
Cobalt	< 0.200	0.2	mg/L	
Copper	< 0.050	0.05	mg/L	
Iron	32.2	0.2	mg/L	
Lead	< 0.025	0.025	mg/L	
Magnesium	2,000	10	mg/L	
Manganese	1.22	0.05	mg/L	
Nickel	0.466	0.1	mg/L	
Potassium	182	10	mg/L	
Selenium	< 0.050	0.05	mg/L	
Silver	< 0.050	0.05	mg/L	
Sodium	991	10	mg/L	
Thallium	< 0.050	0.05	mg/L	
Zinc	0.613	0.02	mg/L	
Total Mercury **Method: 7470A**				
Analysis Date: 12/13/12				
Mercury	< 0.0040	0.004	mg/L	
Total Metals **Method: 6020A**		**Preparation Method 3010A**		
Analysis Date: 01/03/13		Preparation Date: 12/03/12		
Tin	< 0.10	0.1	mg/L	N
Volatile Organic Compounds **Method: 5030B/8260B**				
Analysis Date: 12/06/12				
Acetone	< 500	500	ug/L	
Benzene	< 20.0	20	ug/L	
Bromobenzene	< 20.0	20	ug/L	
Bromochloromethane	< 20.0	20	ug/L	
Bromodichloromethane	< 20.0	20	ug/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF
Sample ID: 1A LT Tank
Sample No: 12-6333-006

Date Collected: 11/30/12
Time Collected: 10:25
Date Received: 11/30/12
Date Reported: 01/04/13

Analyte	Result	R.L.	Units	Flags
Volatile Organic Compounds **Method: 5030B/8260B** Analysis Date: 12/06/12				
Bromoform	< 20.0	20	ug/L	
Bromomethane	< 20.0	20	ug/L	
n-Butanol	< 2,500	2500	ug/L	
2-Butanone (MEK)	< 100	100	ug/L	
n-Butylbenzene	< 20.0	20	ug/L	
sec-Butylbenzene	< 20.0	20	ug/L	
tert-Butylbenzene	< 20.0	20	ug/L	
Carbon disulfide	< 20.0	20	ug/L	
Carbon tetrachloride	< 20.0	20	ug/L	
Chlorobenzene	< 20.0	20	ug/L	
Chlorodibromomethane	< 20.0	20	ug/L	
Chloroethane	< 20.0	20	ug/L	
2-Chloroethyl vinyl ether	< 20.0	20	ug/L	
Chloroform	< 20.0	20	ug/L	
Chloromethane	< 20.0	20	ug/L	
2-Chlorotoluene	< 20.0	20	ug/L	
4-Chlorotoluene	< 20.0	20	ug/L	
1,2-Dibromo-3-chloropropane	< 30.0	30	ug/L	
1,2-Dibromoethane (EDB)	< 20.0	20	ug/L	
Dibromomethane	< 20.0	20	ug/L	
1,4-Dichloro-2-butene	< 20.0	20	ug/L	
Dichlorodifluoromethane	< 20.0	20	ug/L	
1,1-Dichloroethane	< 20.0	20	ug/L	
1,2-Dichloroethane	< 10.0	10	ug/L	
1,1-Dichloroethene	< 20.0	20	ug/L	
cis-1,2-Dichloroethene	< 20.0	20	ug/L	
trans-1,2-Dichloroethene	< 20.0	20	ug/L	
1,2-Dichloropropane	< 10.0	10	ug/L	
1,3-Dichloropropane	< 20.0	20	ug/L	
2,2-Dichloropropane	< 50.0	50	ug/L	
1,1-Dichloropropene	< 20.0	20	ug/L	
1,3-Dichloropropene (total)	< 20.0	20	ug/L	
trans-1,3-Dichloropropene	< 20.0	20	ug/L	
Ethyl acetate	< 200	200	ug/L	
Ethylbenzene	< 20.0	20	ug/L	
2-Hexanone	< 100	100	ug/L	

ATTACHMENT 3 - WASTE ANALYSIS REPORT

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF
Sample ID: 1A LT Tank
Sample No: 12-6333-006

Date Collected: 11/30/12
Time Collected: 10:25
Date Received: 11/30/12
Date Reported: 01/04/13

Analyte	Result	R.L.	Units	Flags
Volatile Organic Compounds	**Method: 5030B/8260B**			
Analysis Date: 12/06/12				
Iodomethane	< 20.0	20	ug/L	
Isopropylbenzene	< 20.0	20	ug/L	
p-Isopropyltoluene	< 20.0	20	ug/L	
4-Methyl-2-pentanone (MIBK)	< 100	100	ug/L	
Methylene chloride	< 40.0	40	ug/L	
1-Propanol	< 2,500	2500	ug/L	
2-Propanol	< 2,500	2500	ug/L	
n-Propylbenzene	< 20.0	20	ug/L	
Styrene	< 20.0	20	ug/L	
1,1,1,2-Tetrachloroethane	< 20.0	20	ug/L	
1,1,2,2-Tetrachloroethane	< 20.0	20	ug/L	
Tetrachloroethene	< 20.0	20	ug/L	
Tetrahydrofuran	175	20	ug/L	
Toluene	< 20.0	20	ug/L	
1,2,3-Trichlorobenzene	< 50.0	50	ug/L	
1,2,4-Trichlorobenzene	< 50.0	50	ug/L	
1,1,1-Trichloroethane	< 20.0	20	ug/L	
1,1,2-Trichloroethane	< 20.0	20	ug/L	
Trichloroethene	< 20.0	20	ug/L	
Trichlorofluoromethane	< 20.0	20	ug/L	
1,2,3-Trichloropropane	< 50.0	50	ug/L	
1,2,4-Trimethylbenzene	< 50.0	50	ug/L	
1,3,5-Trimethylbenzene	< 15.0	15	ug/L	
Vinyl acetate	< 50.0	50	ug/L	
Vinyl chloride	< 20.0	20	ug/L	
Xylene, Total	< 20.0	20	ug/L	
m&p-Xylene	< 20.0	20	ug/L	
o-Xylene	< 20.0	20	ug/L	
Semi-Volatile Compounds	**Method: 8270C**	**Preparation Method 3510C**		
Analysis Date: 12/11/12		Preparation Date: 12/03/12		
Acenaphthene	< 100	100	ug/L	
Anthracene	< 100	100	ug/L	
Benzo(a)anthracene	< 100	100	ug/L	
Benzo(a)pyrene	< 100	100	ug/L	
Benzo(b)fluoranthene	< 100	100	ug/L	
Benzo(ghi)perylene	< 100	100	ug/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF
Sample ID: 1A LT Tank
Sample No: 12-6333-006

Date Collected: 11/30/12
Time Collected: 10:25
Date Received: 11/30/12
Date Reported: 01/04/13

Analyte	Result	R.L.	Units	Flags
Semi-Volatile Compounds **Method: 8270C** Analysis Date: 12/11/12		**Preparation Method 3510C** Preparation Date: 12/03/12		
Benzo(k)fluoranthene	< 100	100	ug/L	
4-Bromophenyl phenyl ether	< 100	100	ug/L	
Butyl benzyl phthalate	< 100	100	ug/L	
bis(2-Chloroethoxy)methane	< 100	100	ug/L	
bis(2-Chloroethyl)ether	< 100	100	ug/L	
bis(2-Chloroisopropyl)ether	< 100	100	ug/L	
bis(Chloromethyl)ether	ND		ug/L	N Q
2-Chloronaphthalene	< 100	100	ug/L	
2-Chlorophenol	< 500	500	ug/L	
4-Chlorophenyl phenyl ether	< 100	100	ug/L	
Chrysene	< 100	100	ug/L	
Dibenzo(a,h)anthracene	< 100	100	ug/L	
Di-n-butyl phthalate	< 100	100	ug/L	
3,3'-Dichlorobenzidine	< 500	500	ug/L	
1,2-Dichlorobenzene	< 50	50	ug/L	
1,3-Dichlorobenzene	< 15	15	ug/L	
1,4-Dichlorobenzene	< 75	75	ug/L	
2,4-Dichlorophenol	< 500	500	ug/L	
Diethyl phthalate	< 100	100	ug/L	
2,4-Dimethylphenol	< 500	500	ug/L	
Dimethyl phthalate	< 100	100	ug/L	
4,6-Dinitro-2-methylphenol	< 500	500	ug/L	
2,4-Dinitrophenol	< 500	500	ug/L	
2,4-Dinitrotoluene	< 100	100	ug/L	
2,6-Dinitrotoluene	< 500	500	ug/L	
Di-n-octylphthalate	< 100	100	ug/L	
bis(2-Ethylhexyl)phthalate	< 100	100	ug/L	
Fluoranthene	< 100	100	ug/L	
Fluorene	< 100	100	ug/L	
Hexachlorobenzene	< 100	100	ug/L	
Hexachlorobutadiene	< 100	100	ug/L	
Hexachlorocyclopentadiene	< 100	100	ug/L	
Hexachloroethane	< 100	100	ug/L	
Indeno(1,2,3-cd)pyrene	< 100	100	ug/L	
3 & 4-Methylphenol	637	500	ug/L	
Naphthalene	< 100	100	ug/L	

ATTACHMENT 3 - WASTE ANALYSIS REPORT

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF
Sample ID: 1A LT Tank
Sample No: 12-6333-006

Date Collected: 11/30/12
Time Collected: 10:25
Date Received: 11/30/12
Date Reported: 01/04/13

Analyte	Result	R.L.	Units	Flags
Semi-Volatile Compounds Analysis Date: 12/11/12	**Method: 8270C**	**Preparation Method 3510C** Preparation Date: 12/03/12		
Nitrobenzene	< 100	100	ug/L	
2-Nitrophenol	< 500	500	ug/L	
4-Nitrophenol	< 500	500	ug/L	
n-Nitrosodimethylamine	< 100	100	ug/L	
n-Nitrosodiphenylamine	< 100	100	ug/L	
n-Nitrosodi-n-propylamine	< 100	100	ug/L	
Pentachlorophenol	< 500	500	ug/L	
Phenanthrene	< 100	100	ug/L	
Pyrene	< 100	100	ug/L	
2,4,6-Trichlorophenol	< 500	500	ug/L	
Tentatively Identified Compounds Analysis Date: 12/11/12	**Method: 8270C**	**Preparation Method 3510C** Preparation Date: 12/03/12		
Tetrachlorodibenzo-p-Dioxins	ND		ug/L	N Q
Pesticides/PCBs Analysis Date: 12/05/12	**Method: 8081A/8082**	**Preparation Method 3510C** Preparation Date: 12/04/12		
Aldrin	< 10.0	10	ug/L	
Polychlorinated biphenyls (Total)	< 1.0	1	ug/L	
alpha-BHC	< 10.0	10	ug/L	
beta-BHC	< 1.00	1	ug/L	
delta-BHC	< 1.00	1	ug/L	
gamma-BHC (Lindane)	< 1.00	1	ug/L	
Chlordane (Technical)	< 10.0	10	ug/L	
4,4'-DDD	< 1.00	1	ug/L	
4,4'-DDE	< 1.00	1	ug/L	
4,4'-DDT	< 10.0	10	ug/L	
Dieldrin	< 10.0	10	ug/L	
Endosulfan I	< 1.00	1	ug/L	
Endosulfan II	< 1.00	1	ug/L	
Endosulfan sulfate	< 1.00	1	ug/L	
Endrin	< 2.00	2	ug/L	
Endrin aldehyde	< 5.00	5	ug/L	
Heptachlor	< 1.00	1	ug/L	
Heptachlor epoxide	< 10.0	10	ug/L	
Methoxychlor	< 10.0	10	ug/L	
Toxaphene	< 10.0	10	ug/L	

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF
Sample ID: 1A LT Tank
Sample No: 12-6333-006

Date Collected: 11/30/12
Time Collected: 10:25
Date Received: 11/30/12
Date Reported: 01/04/13

Analyte		Result	R.L.	Units	Flags
Semi-Volatile Pesticides	**Method: 8270C**		**Preparation Method 3510C**		
Analysis Date: 12/11/12			Preparation Date: 12/03/12		
Alachlor		< 20.0	20	ug/L	N
Atrazine		< 30.0	30	ug/L	N
Parathion		< 10.0	10	ug/L	
Carbamate Pesticides	**Method: 531.1R3.1**				
Analysis Date: 12/18/12					
Aldicarb		< 30.0	30	ug/L	S
Carbofuran		< 400	400	ug/L	S
Herbicides Method 8321A	**Method: 8321A**				
Analysis Date: 12/05/12					
2,4-D		< 20	20	ug/L	S
Silvex (2,4,5-TP)		< 20	20	ug/L	S

UL 142 Aboveground Flammable Liquid Tanks

Ten things to know about these Listed products.

Fire code officials and contractors who are involved with designing, installing and approving installations that contain aboveground flammable liquid tanks are used to seeing shop fabricated tanks that bear a UL Listing (Certification) Mark. However, they may not fully understand what the certification covers, or some key installation considerations that are applicable for the installation of the tank and related system.

This article describes ten items one should know about these certified tanks and related code applications.

1. Codes recognize the use of UL 142 listed tanks

The NFPA 30 Flammable and Combustible Liquids Code requires atmospheric tanks to be designed and constructed in accordance with one of several recognized engineering standards, one of which is the UL 142, Standard for Safety for Steel Aboveground Tanks for Flammable and Combustible Liquids. The International Fire Code in turn requires tanks to be designed, constructed and installed in accordance with NFPA 30.

2. Types of tanks covered by ul 142

UL 142 includes requirements that cover steel primary, secondary and diked type atmospheric storage tanks intended for noncorrosive, stable flammable and combustible liquids that have a specific gravity not exceeding 1.0 in aboveground applications. UL 142 includes requirements for tanks fabricated in a combination of various shapes (cylindrical, rectangular or round) and orientations (horizontal, vertical) with or without multiple compartments.

UL 142 covers shop fabricated tanks only, and does not cover portable tanks intended for transporting flammable or combustible liquids (such as shipping containers), or mobile use applications (such as mounted on a trailer).

3. UL 142 requirements

UL 142 includes requirements that manufacturers use to design and fabricate aboveground steel tanks, and that certification organizations such as UL use to investigate and List (certify)

Wire and Cable Marking Considerations (continued)

these tanks. The standard includes a comprehensive set of requirements in the following areas:

- Construction requirements – These include specification for the tank materials, joints, connections, fittings, manholes (if provided), fill, drain and gauge openings, and painting. They also include specific construction requirements for the primary and secondary containment means, supports, etc.
- Performance tests – These requirements include tank leakage, hydrostatic strength, top loading, buoyancy, hydrostatic load, tank support load, and lift lug tests that are designed to verify that the tank design does not exhibit signs of leakage and/or structural damage as a result of these tests.
- Markings and production line test – UL 142 requires tanks to include specific markings discussed below. In addition, 100% of production of each Listed primary and secondary containment tank must be tested for leakage by the manufacturer.

4. Listing marks

Aboveground tanks that have been found to comply with applicable UL 142 requirements include a UL Listing Mark permanently affixed to the tank. The Listing Mark includes the UL symbol, the word "LISTED," a control number and the name of the tank construction as indicated in the manufacturer's Listings (e.g. Secondary Containment Aboveground Tank, Generator Base Tank, etc.)

5. Product categories

Information on tanks certified in accordance with UL 142 can be found in the Online Certifications Directory at www.ul.com/database. The guide information for the Aboveground Flammable-liquid Tanks (EEEV) product category includes useful information on the products covered under this category. In addition, the Special-purpose Tanks (EFVT) product category covers Listed UL 142 aboveground steel tanks that include generator base, work-top, lube oil, waste oil, day/utility and other special-purpose type tanks.

6. Features covered

The basic features of tanks covered by the UL 142 Listing include all containment spaces and their respective openings (manways, emergency vents, normal vents, fill/withdraw, gauging, monitoring and other functional openings) with connections (threaded- or flanged-type fittings) and integral tank accessories such as ladders, stairs, lifting lugs and heating coils or hot wells.

All primary-tank compartment(s) are provided with openings to accommodate filling, withdrawing and inventory control; and all secondary-tank interstitial spaces are provided with openings for leak-detection monitoring.

7. Features not covered

UL 142 tank Listings covers the features and accessories described above, which are described in the individual Listings. Any other accessories or components that are shipped with the tanks, attached to the tanks or added to the tanks are not included in the scope of the tank Listing. It is anticipated that the code authority will approve the use and/or installation of any such accessories independent of the tank Listing.

8. Venting and leak detection

All primary-tank compartment(s) are provided with normal and emergency vent openings. All secondary-tank interstitial space(s) are provided with emergency vent openings. It is anticipated that venting will be provided at the actual installation in accordance with applicable code requirements.

9. Intended use

UL 142 Listed tanks are intended for installation in accordance with a variety of installation codes, including NFPA 30, NFPA 30A, NFPA 31, NFPA 37, NFPA 1 and the International Fire Code. They have not been investigated for use underground. However, they are suitable for use in UL 2245 Listed below grade vaults as allowed by the applicable installation code.

10. UL 80 Tanks

In comparison to UL 142, the UL 80 Standard for Steel Tanks for Oil-Burner Fuels and Other Combustible Liquids covers aboveground 60 to 660 gallon steel tanks intended for the storage of heating fuels for oil burning equipment, diesel fuels for compression ignition engines and new and used motor oils at automotive service stations.

CONSTRUCTION ACCEPTANCE REPORT

BFI ZION LANDFILL
SITE I/II
LANDFILL GAS EXTRACTION SYSTEM
LAKE COUNTY
ZION, ILLINOIS

Submitted By
BFI Waste Systems of North America, Inc.

Prepared By
RMT, Inc.

February 1998

REGISTERED PROFESSIONAL ENGINEER
CURTIS DEAN MADSEN
062-051101
STATE OF ILLINOIS

Curtis D. Madsen, P.E.
Project Manager

Mark J. Torresani, P.E.
Senior Project Engineer

RMT, INC.
744 HEARTLAND TRAIL = 53717-1934
P.O. BOX 8923 = 53708-8923
MADISON, WI
608/831-4444 = 608/831-3334 FAX

4.3.2 Condensate Storage Tanks

The condensate sumps pump condensate to the collection tanks located near the blower building (see Photograph No. 10 in Appendix B). A separate 8,000-gallon tank for Site I, Phase A is provided to allow for the collection and testing of condensate generated from landfill gas produced in Site I, Phase A. The other 8,000-gallon tank will serve the remainder of the gas system (Site I, Phase B and Site II). The condensate storage tanks were constructed by Modern Welding Company, Inc., of Newark, Ohio. The tanks are aboveground skid mounted and include the following features:

- 8,000-gallon capacity each
- Above ground skid mounted for ease of installation
- 12 inch thick compacted granular base material
- Secondary containment (a double-walled tank) with an insulated annular space with leak monitoring capability
- Visual and audible alarms to signal high levels of condensate
- Corrosion protective coating (interior and exterior surfaces)

Certification testing results and shop drawings for the condensate tanks are included in Appendix H. This certification test report was not available but the manufacturer was contacted to confirm testing was completed.

Condensate transfer pipes from condensate collection sumps CS-1 and CS-2 are insulated and heat traced aboveground to prevent freezing within the pipes.

4.4 Integrated Blower and Control System

4.4.1 Blower Station

The blower and control system has been designed and constructed to meet the specific requirements of the Zion Landfill gas and leachate extraction system. The blower building and system controls are located as shown on Plan Sheets A-3 and 20. This area is enclosed by a fence to limit access to authorized site personnel. The blower building is shown in Photograph No. 11 in Appendix B. Within the blower building are two condensate knockout pots, two 50 Hp blowers, monitoring instruments, a 10 Hp compressor (for pneumatic pumps), valves, and fittings.

A 12-inch minimum thickness gravel pad was prepared prior to the installation of the skid-mounted blower building. The building was lifted by a crane onto the gravel pad.

The blower unit was connected to the 16-inch and 12-inch gas header pipes, and the necessary power, control panel, and other related items were installed. The pre-fabricated building and the blower/controls were delivered to the site pre-wired. The blower building and internal components were supplied by Mobil International of Pryor, Oklahoma. Detailed drawings of the blower building and components within the building are included in Appendix I.

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)
- 50-Hp, explosion-proof motor
- Spark-resistant housings

4.4.2 Enclosed Flare System

The enclosed flare system that burns the landfill gas from the site was installed within fenced in area of the blower building area and flare compound as shown on Plan Sheets A-2 and A-20. The flare is approximately 40 feet tall and has an 11-foot diameter. The flare is positioned on a 16 foot by 16 foot reinforced concrete slab (see Photograph No. 12 in Appendix B). Photograph Nos. 13 and 14 in Appendix B show the flare and reinforced concrete slab. Further details of the flare system, including shop drawings and specifications, are included in Appendix I.

4.4.3 Electrical and Control System

Electrical work (*e.g.*, electric power, controls) for the LFG extraction system was performed by Aldrich Electric, Inc., under contract with Terra. Electrical power was accessed from a transformer located at the facility.

Electrical drawings for the blower buildings, condensate tanks, controls, and flare are included in Appendices H and I.

4.5 Leachate Collection System

Components of the leachate collection system includes 36 pneumatic pumps installed in each extraction well (EW-37 to EW-72) in Site II, and leachate and air lines.

Leachate conveyance lines and air supply lines were installed in Site I, Phase A and Site II to each extraction well as shown on Plan Sheet A-3 and in detail on Plan Sheet 24. The leachate

line consists of 2 inch and 3 inch SDR 17 HDPE pipe and is double contained outside the limits of waste. The air supply line consists of a 2-inch SDR 11 HDPE pipe.

The air lines and leachate lines installed in Site I, Phase A are not connected to a pump, but were placed with this construction for future use. Leachate pumps were installed only in Site II.

The double contained leachate pipe was ended near the location of where the new leachate storage tank for the site will be located. The location of the double encased leachate lines are shown on Plan Sheet A-3. The leachate line from Site II will be connected to the leachate storage tank during installation of the tank.

Appendix E-15

(Reserved)

Appendix E-16

Job Descriptions

Environmental Manager

Job Description

POSITION SUMMARY: The Environmental Manager is responsible for the preparation of the Landfill budget, managing all spending for the Engineering department, and overseeing consultants and contractors during site development. The Environmental Manager is also responsible for permitting and ensuring the Landfill remains in compliance with all applicable regulations during operation.

PRINCIPAL RESPONSIBILITIES:

- Manages construction projects for Landfill cells and sites, including capacity calculations, scheduling/timeline, management of third-party CQA and contractors, and resource and material coordination.
- Maintain financial responsibility for construction/cell development, closure/post-closure, engineering, operations, and cost tracking.
- Coordinates completion of permit applications and designs, including regulatory interface, site expansion, modification or changes to the operating plan application, and other related data.
- Prepares notifications/responses to regulatory inspections, administrative warnings.
- Assists Landfill and Site Managers with development of fill sequencing plans.
- Participates in review of targeted acquisitions, including Phase I assessment/property survey coordination, engineering review of design and operations, and pro-forma modeling assistance.
- Performs ongoing public relations and due diligence activities through communication with corporate office, regulatory agency representatives, third party consultants and investors.
- Completes monthly soil tracking reports and other status reports.
- Regularly supervises Environmental Technicians and Specialists, including responsibility for hiring, training, mentoring, developing, scheduling, directing, managing performance and other related issues; review the work of, and is accountable for the performance of Environmental Technicians and Specialists.
- Attends regulatory and association sponsored informational and policy meetings.
- Ensures continued compliance by coordinating air, water monitoring, environmental data review and reporting.
- Performs other job-related duties as assigned.

QUALIFICATIONS:

- Certified Professional Engineer and/or Certified Professional Geologist designation.
- Thorough knowledge of environmental regulations relating to air, water, solid waste, and material recovery/recycling.
- Strong written and oral communication skills.
- Effective interpersonal communication across various levels of the organization and with

View Job Posting Details

external customers, vendors and government agency representatives.

- Strong project management skills.
- Strong analytical skills and a focus on adding value to the Company.
- Ability to effectively manage multiple projects and meet deadlines.
- Ability to read, analyze, and interpret business documents, professional journals, technical procedures, and governmental regulations.

MINIMUM REQUIREMENTS:

- Bachelor's degree in Engineering, Geology, Biology or related science.

EEO Statement

Republic Services is an equal opportunity employer. All qualified applicants will receive consideration for employment without regard to race, color, religion, gender, sexual orientation, gender identity or expression, national origin, age, disability, protected veteran status, relationship or association with a protected veteran (spouses or other family members), genetic information, or any other characteristic protected by applicable law.

Internal: Environmental Manager

Job Details

Job Requisition ID	R-014565
Location	SC-N Charleston-141 Fennell Rd (045001)
Posting Date	01/13/2020 - 14 days ago
Job Family	Engineering & Environmental Management
Time Type	Full time
Job Type	Regular
Supervisory Organization	G&A Area Overhead Department (Mark Stanley) (ORG000075)

Recruiter

April Cuda

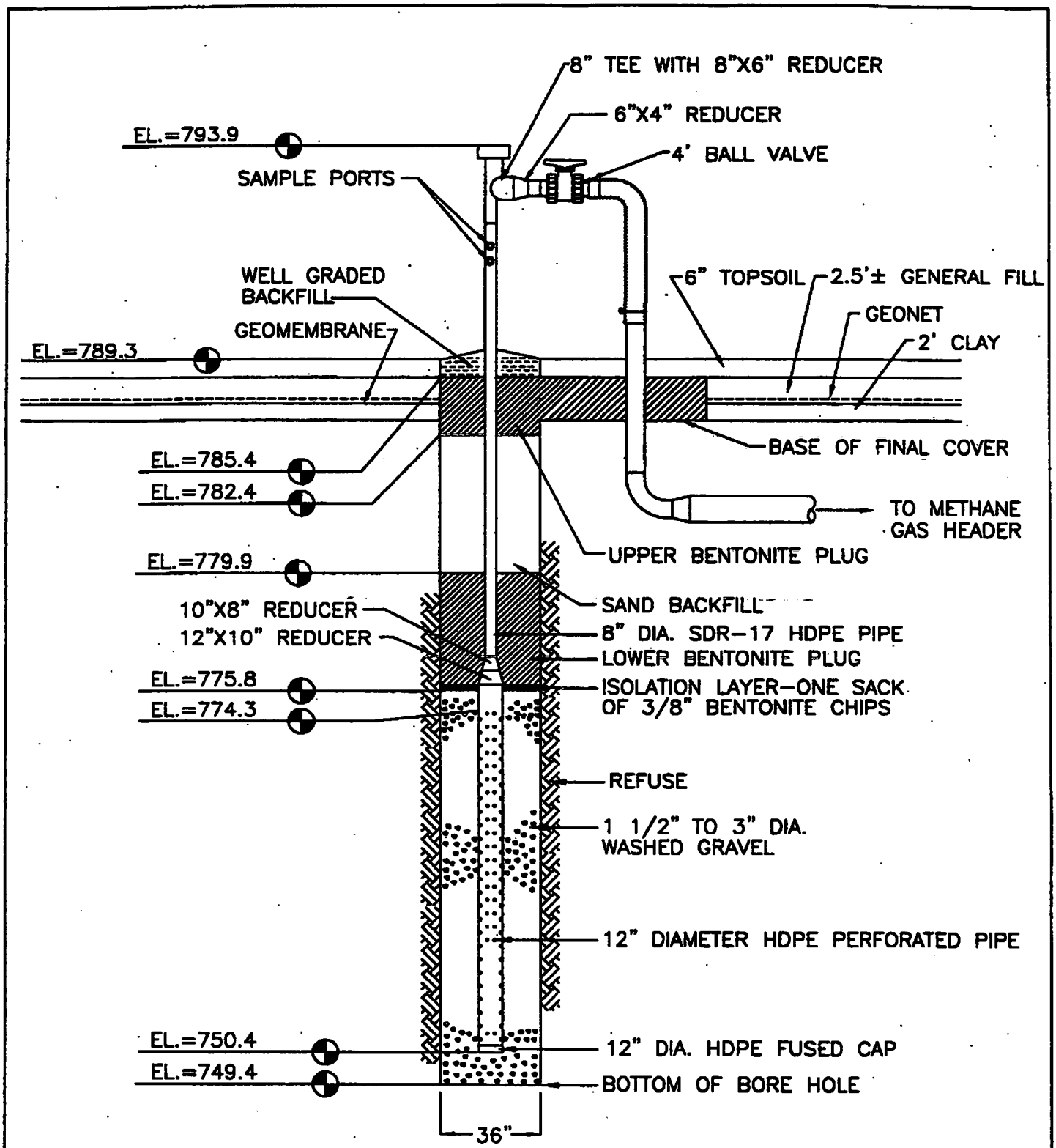
Hiring Manager

Mark Stanley

Team Members

Appendix E-17

As Built Extraction Well Detail and Boring Logs



Extraction Well No. EW-1		
SCALE: N.T.S.	APPROVED BY:	DRAWN BY: TLS
DATE: Nov 1997	TJA	REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		

4/148

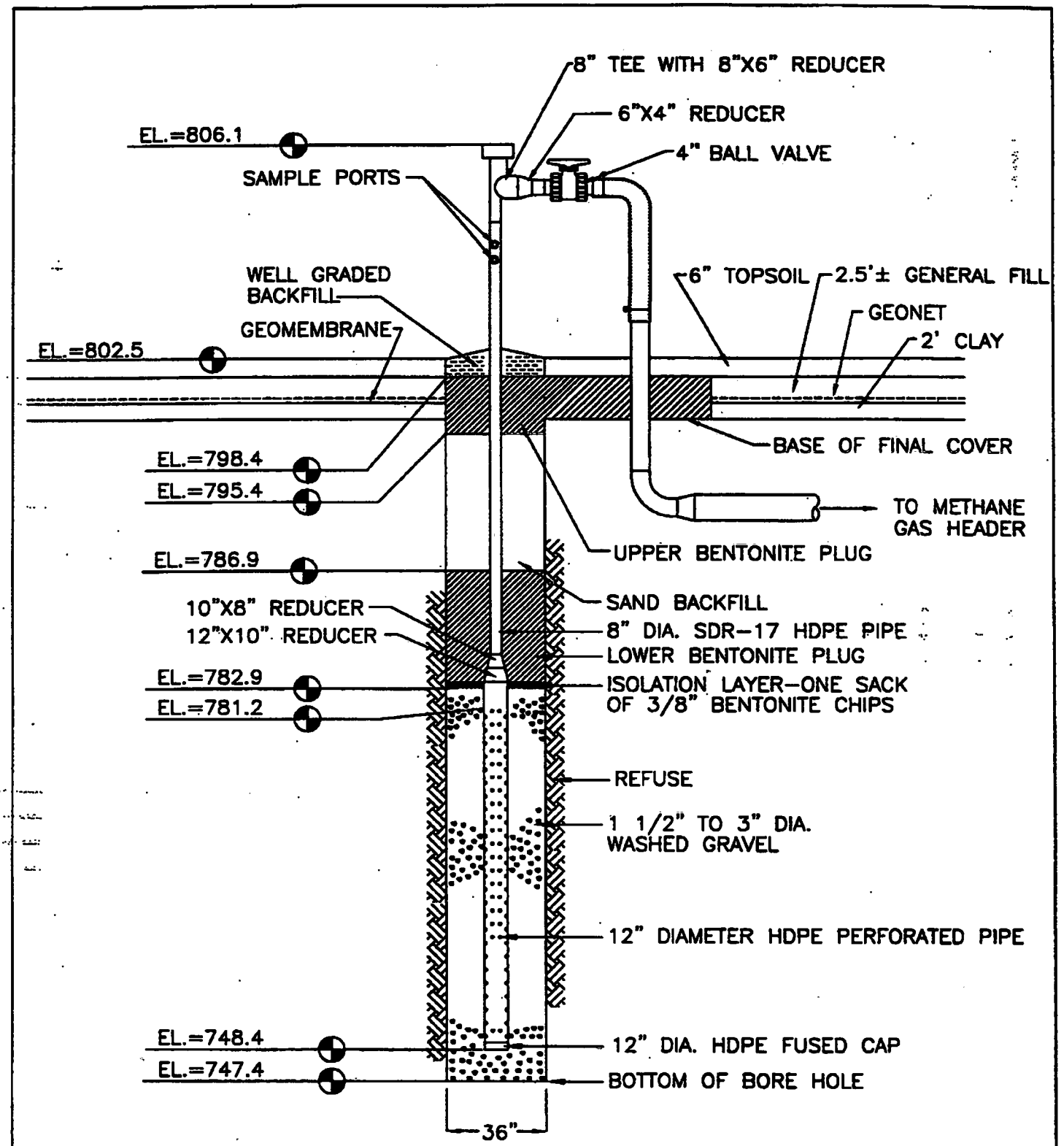
CQM, Inc.
2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-1	Surface Elevation:	789.3
Exact Location (Coordinates):	12416N 9311E	Total Depth:	39.9'
Installation Date:	2/3/97	Date Completed:	2/3/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	23.9'	Length of Solid Pipe:	19.6'

Depth	Material Drilled	Comments
0-6	Clay / Dirt	
7-13	Clay / Dirt	Very little refuse in waste
14-20		
21-27		
28-34		
35-41	End of Borehole @ 39.9'	Dry
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-2		
SCALE: N.T.S.	APPROVED BY:	DRAWN BY: TLS
DATE: Nov 1997	TJA	REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		3

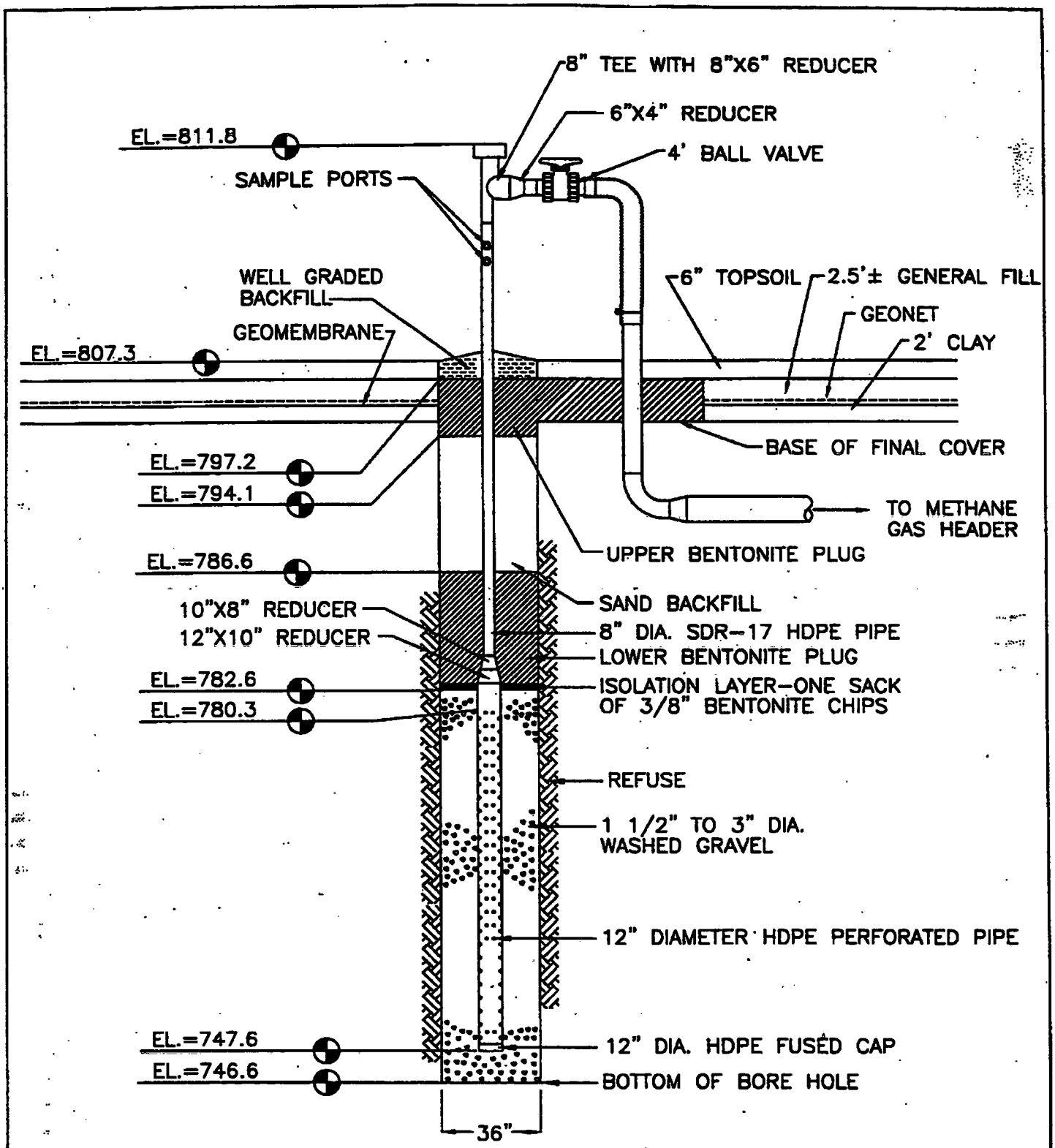
COM, Inc.
2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-2	Surface Elevation:	802.5
Exact Location (Coordinates):	12031N 9350E	Total Depth:	55.1'
Installation Date:	2/3/97	Date Completed:	2/3/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	32.8'	Length of Solid Pipe:	24.9'

Depth	Material Drilled	Comments
0-6	0-8' Clay	
7-13	Refuse/Clay	Very little refuse in clay material.
14-20	Clay	
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 55.1'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-3		
SCALE: N.T.S.	APPROVED BY:	DRAWN BY: TLS
DATE: Nov 1997	TJA	REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		

5

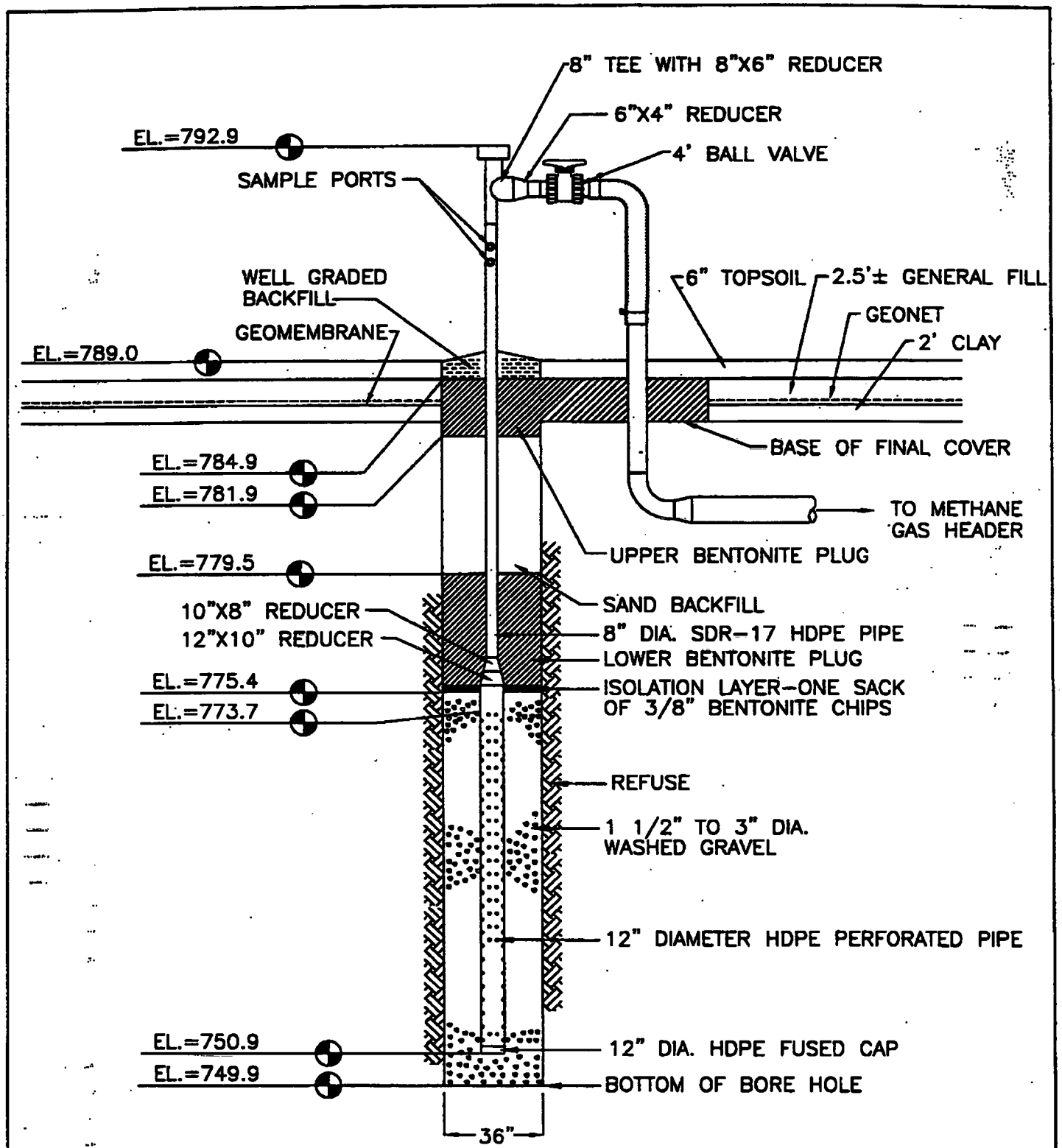
CQM, Inc.
2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-2911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-3	Surface Elevation:	807.3
Exact Location (Coordinates):	12137N 9119E	Total Depth:	60.7'
Installation Date:	2/3/97	Date Completed:	2/3/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	32.7'	Length of Solid Pipe:	31.5'

Depth	Material Drilled	Comments
0-6	0-5' Clay-Brown	
7-13	Refuse	Dark gray color mixed with clay
14-20	Refuse (paper, plastic, and wood)	
21-27	Refuse	Dry
28-34		
35-41		
42-48		
49-55		
56-62	End of Borehole @ 60.7'	Dry
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-4		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		7

CQM, Inc.
2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-4	Surface Elevation:	789
Exact Location (Coordinates):	12426N 9097E	Total Depth:	39.1'
Installation Date:	2/3/97	Date Completed:	2/3/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	22.8'	Length of Solid Pipe:	19.2'

Depth	Material Drilled	Comments
0-6	0-3.5' Clay	
7-13	Refuse	Black/Damp
14-20		Dry
21-27		
28-34		
35-41	End of Borehole @ 39.1'	Dry
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
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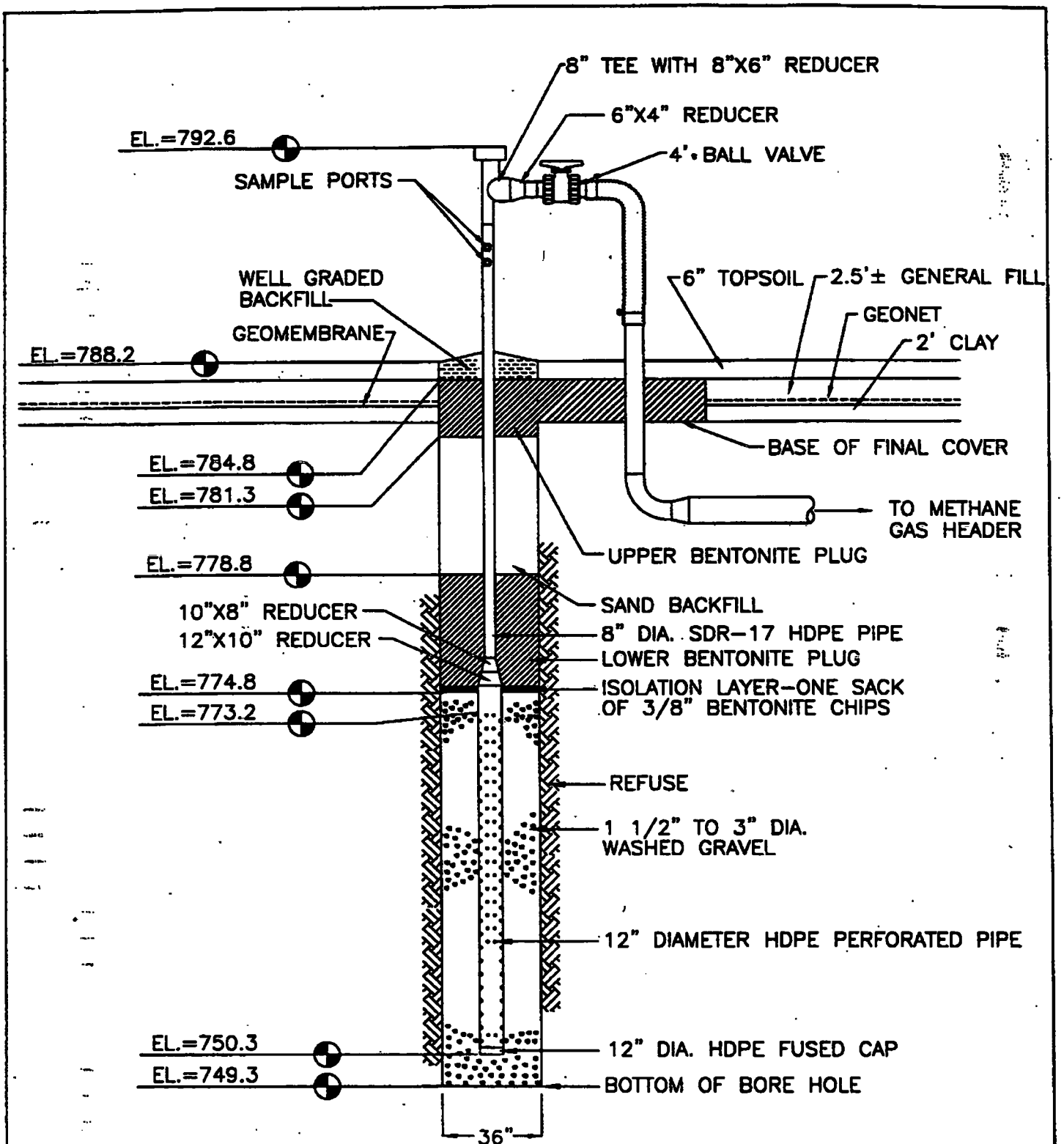
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-5		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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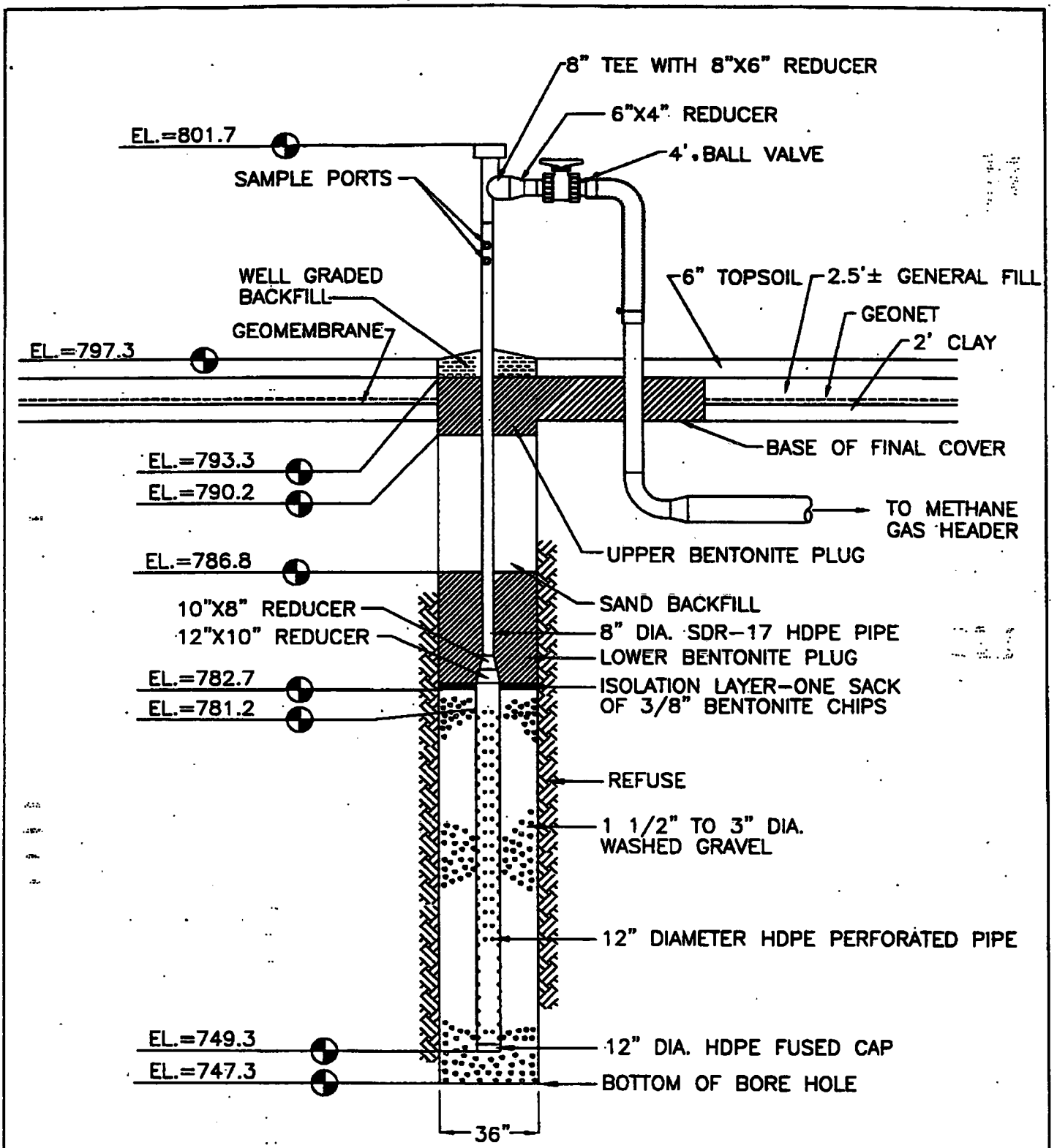
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-5	Surface Elevation:	788.2
Exact Location (Coordinates):	12420N 8890E	Total Depth:	38.9'
Installation Date:	2/5/97	Date Completed:	2/5/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	22.9'	Length of Solid Pipe:	19.4'

Depth	Material Drilled	Comments
0-6	0-4.5' Clay	
7-13	Refuse (paper, plastic, and wood)	Black-Clay/Refuse
14-20		Dry
21-27		
28-34		
35-41	End of Borehole @ 38.9'	Dry
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-6		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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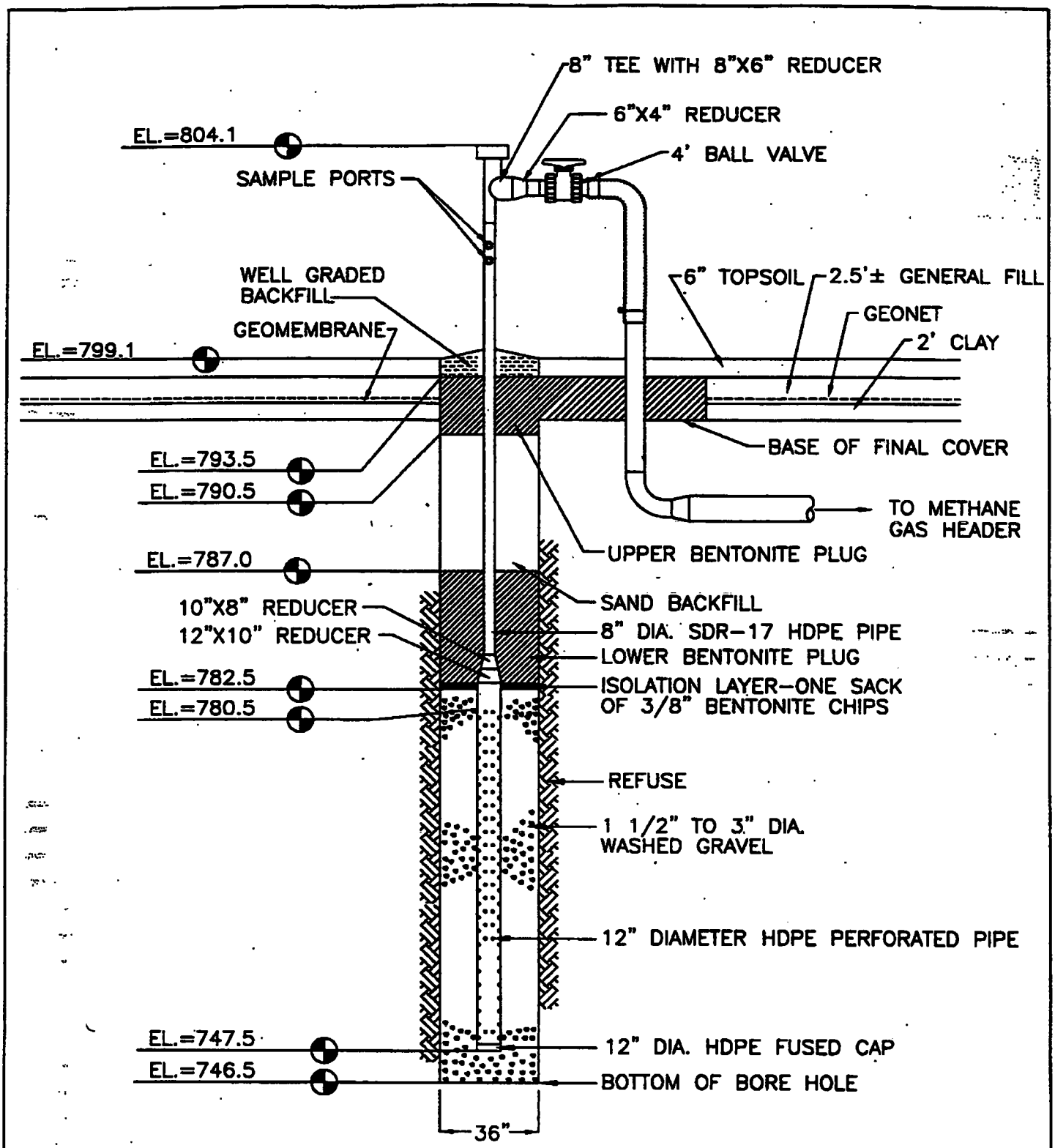
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-6	Surface Elevation:	797.3
Exact Location (Coordinates):	12245N 8894E	Total Depth:	50.0'
Installation Date:	2/3/97	Date Completed:	2/3/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	31.9'	Length of Solid Pipe:	20.5'

Depth	Material Drilled	Comments
0-6	0-4' Topsoil/Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 50.0'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-7		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		13

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-7	Surface Elevation:	799.1
Exact Location (Coordinates):	12078N 8892E	Total Depth:	52.6'
Installation Date:	2/5/97	Date Completed:	2/5/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	33.0'	Length of Solid Pipe:	23.6'

Depth	Material Drilled	Comments
0-6	0-4' Topsoil, 4' - 6.5' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 52.6'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
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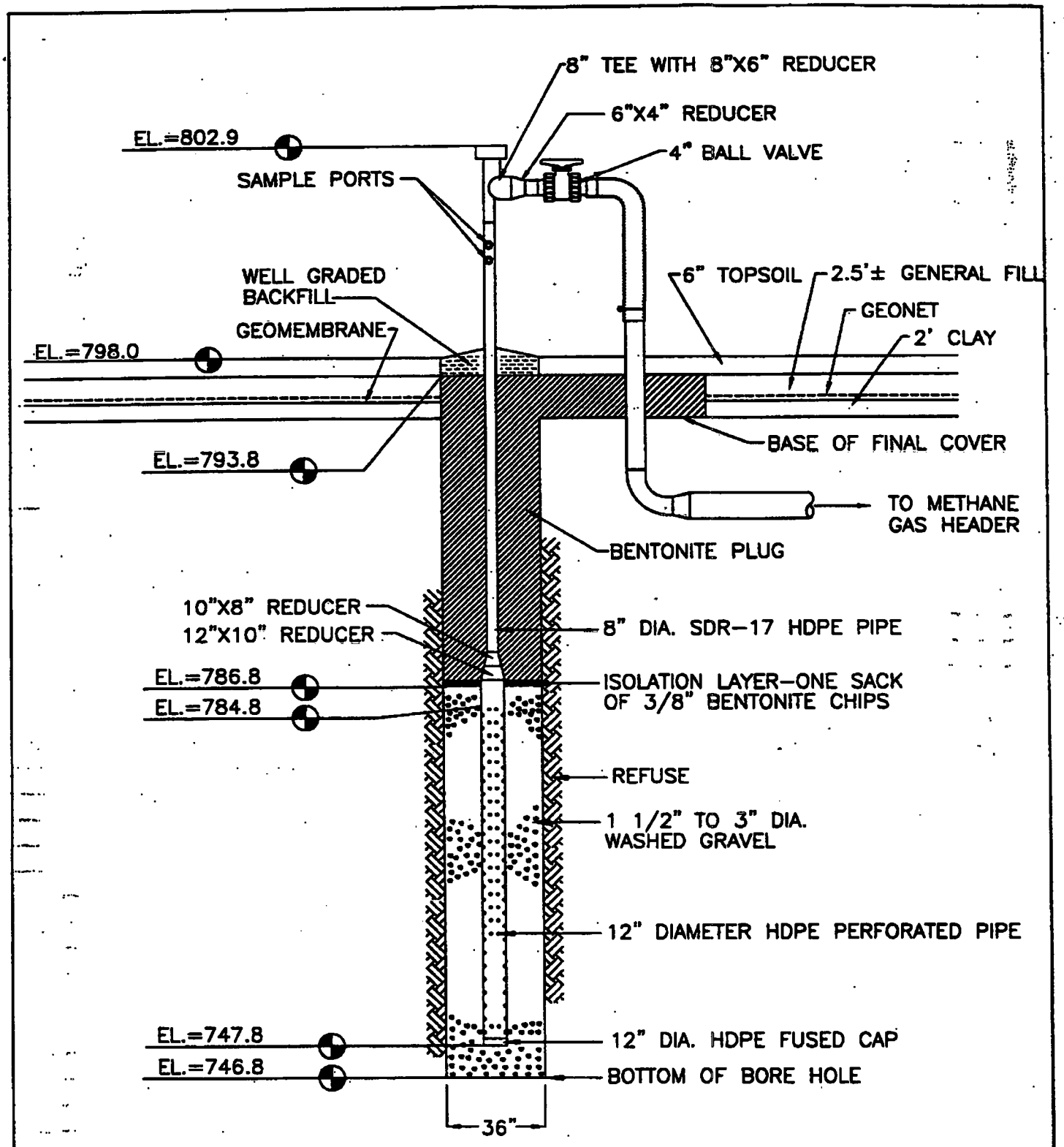
182-188		
189-200		



Extraction Well No. EW-8

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 1A
Zion, Illinois

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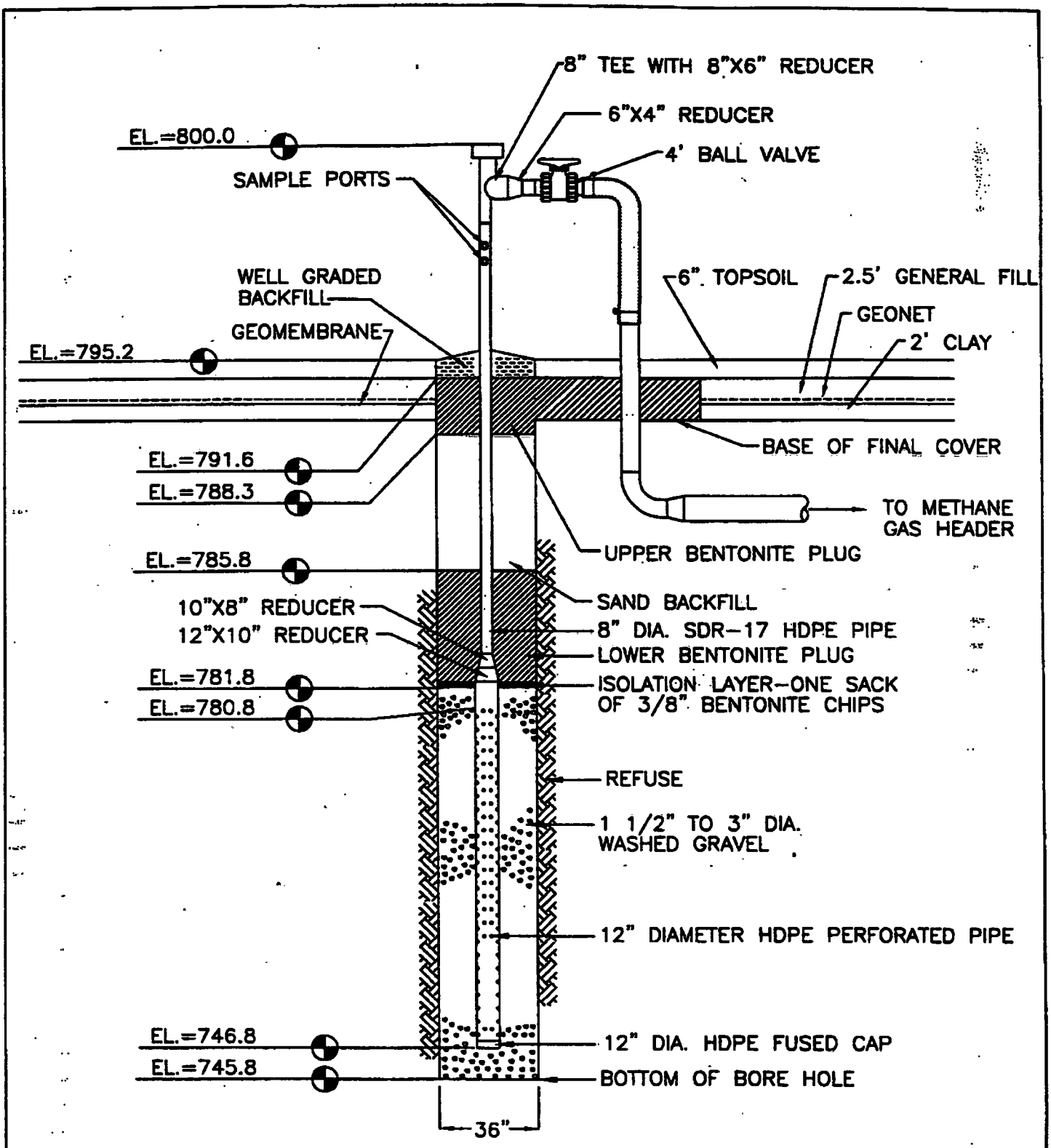
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-8	Surface Elevation:	798.0
Exact Location (Coordinates):	11913N 8884E	Total Depth:	51.2'
Installation Date:	2/5/97	Date Completed:	2/5/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	37.0'	Length of Solid Pipe:	18.1'

Depth	Material Drilled	Comments
0-6	0-2' Topsoil, 2'-10' Clay	
7-13	Refuse	Dry
14-20		
21-27		Wet 26 ft.
28-34		
35-41		87° @ 40'
42-48		
49-55	End of Borehole @ 51.2'	Damp
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-9		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-9	Surface Elevation:	795.2
Exact Location (Coordinates):	11720N 8871E	Total Depth:	49.4'
Installation Date:	2/5/97	Date Completed:	2/5/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	34.0'	Length of Solid Pipe:	19.2'

Depth	Material Drilled	Comments
0-6	0-3' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 49.4'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
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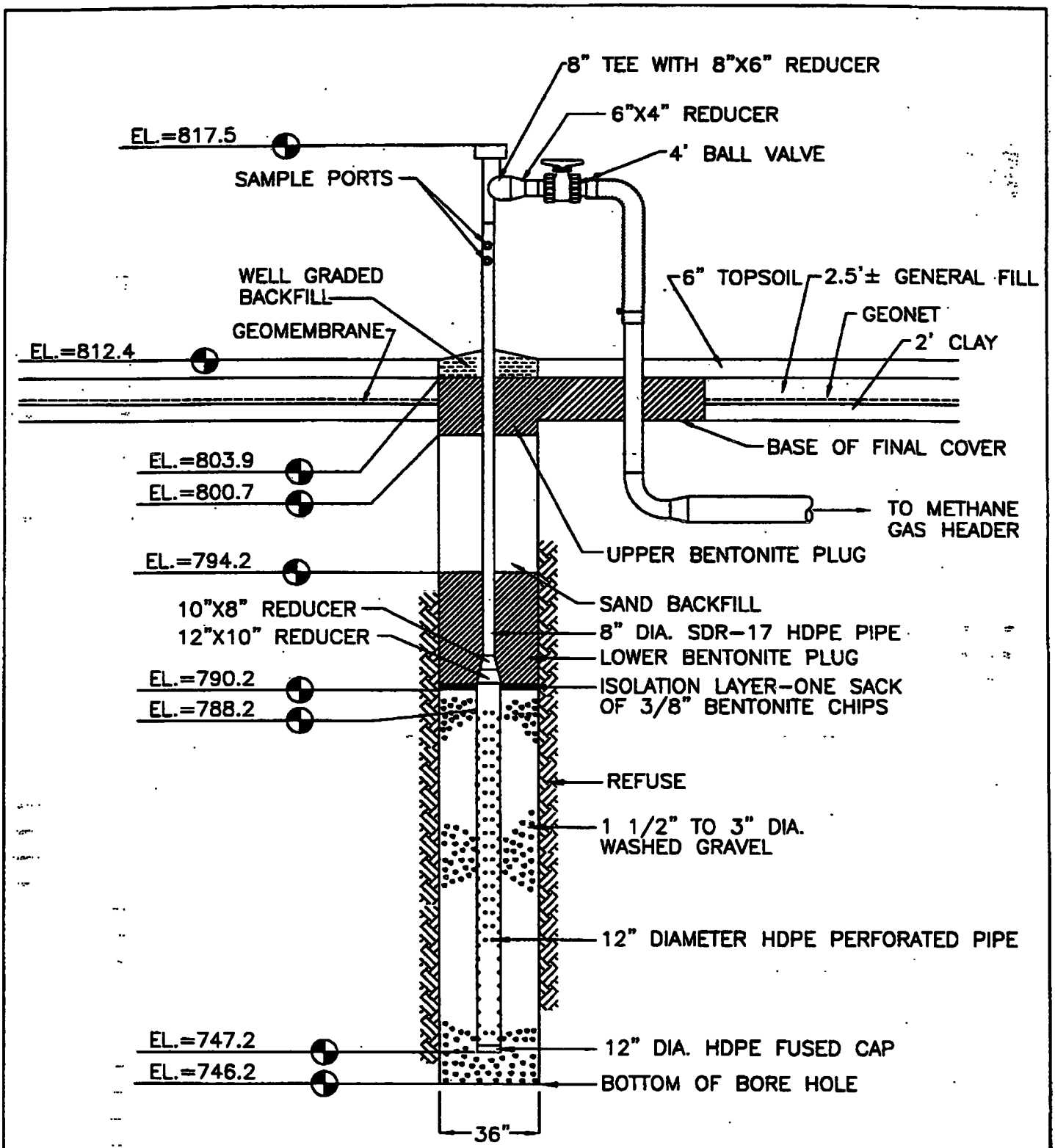
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-10

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 1A
Zion, Illinois

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-10	Surface Elevation:	812.4
Exact Location (Coordinates):	11726N 9245E	Total Depth:	66.2'
Installation Date:	2/5/97	Date Completed:	2/5/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	41.0'	Length of Solid Pipe:	29.3'

Depth	Material Drilled	Comments
0-6	0-2' Clay	
7-13	Refuse	
14-20		Wet 15' / Liquid
21-27		
28-34		
35-41		
42-48		
49-55		
56-62		
63-69	End of Borehole @ 66.2'	Wet
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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140-146		
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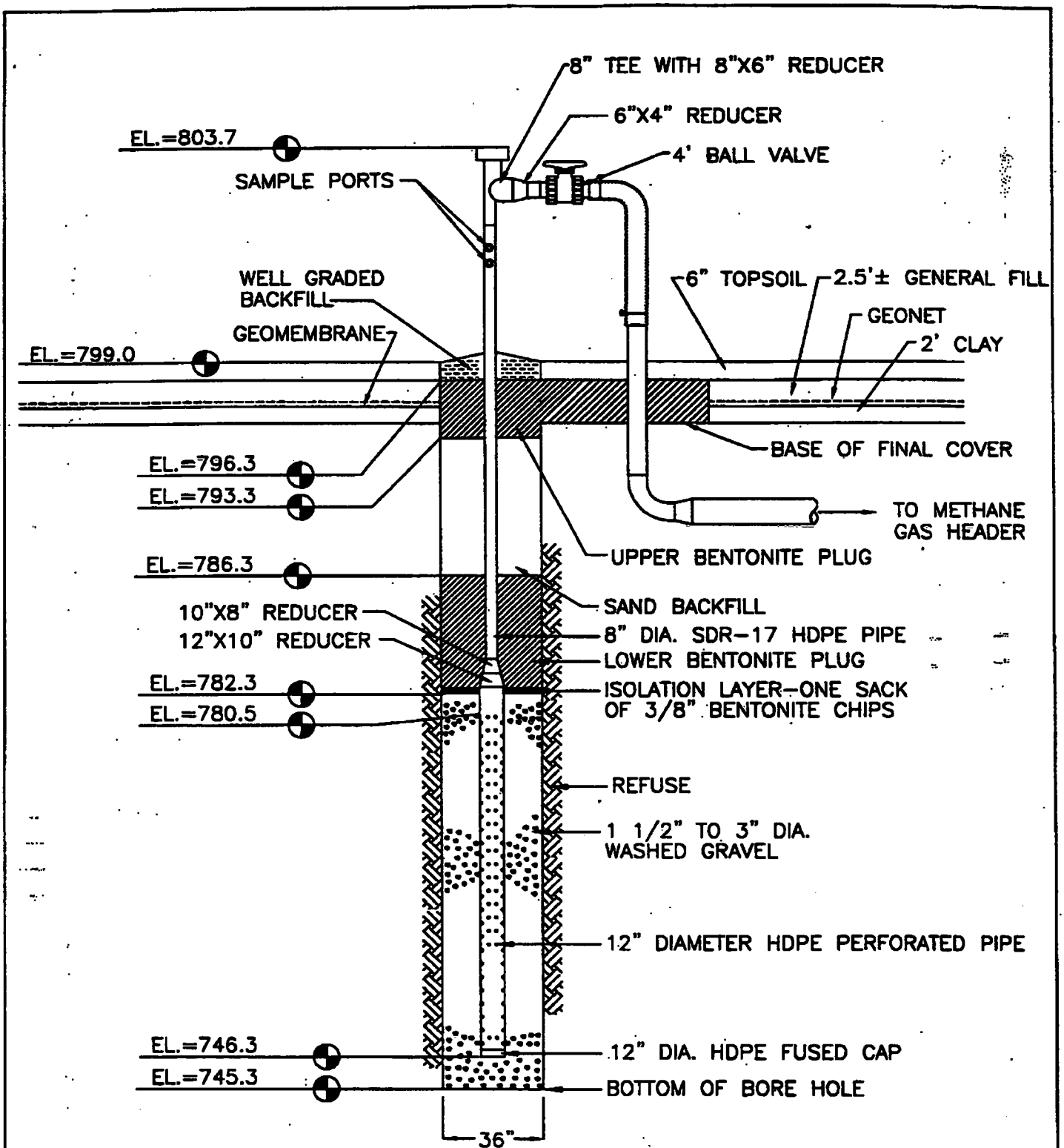
175-181		
182-188		
189-200		



Extraction Well No. EW-11		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-11	Surface Elevation:	799.0
Exact Location (Coordinates):	11577N 8869E	Total Depth:	53.7'
Installation Date:	2/5/97	Date Completed:	2/5/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	34.2'	Length of Solid Pipe:	23.2'

Depth	Material Drilled	Comments
0-6	0-3' Clay	
7-13	Clay/dirt	Dry
14-20		
21-27	Refuse (paper, plastic, and wood) @ 27'	
28-34		
35-41		
42-48		
49-55	End of Borehole @ 53.7'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
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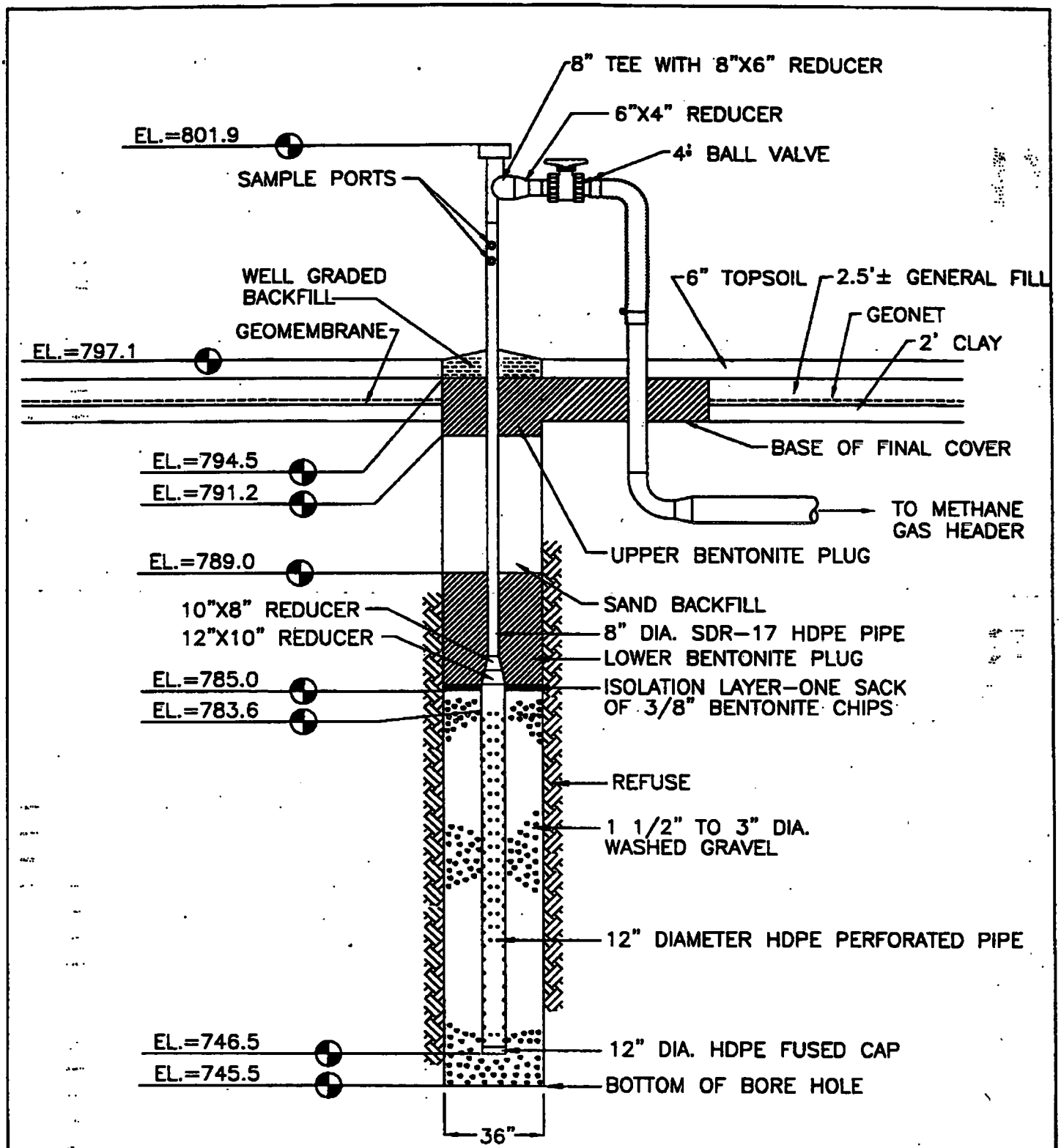
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-12		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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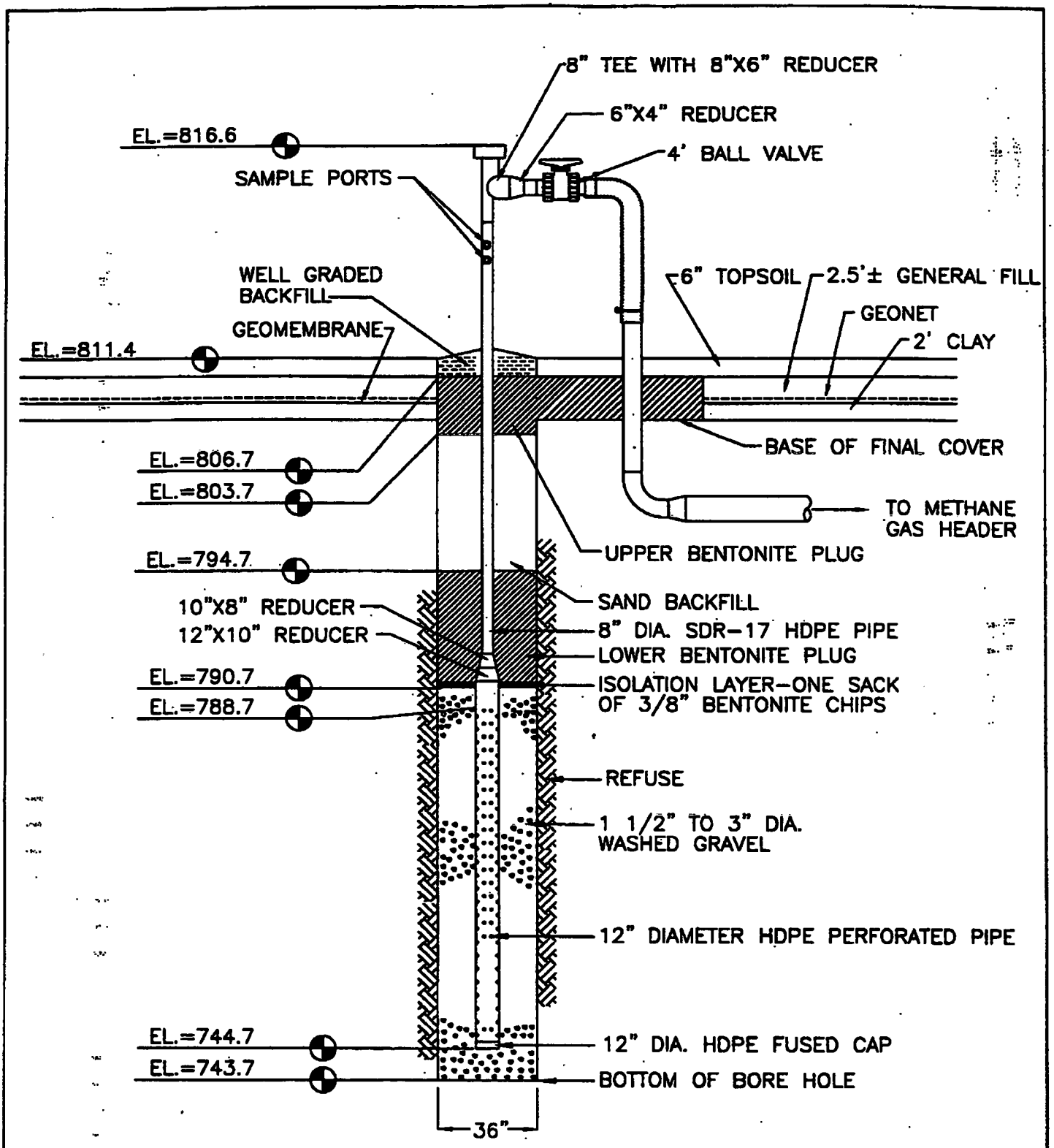
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-12	Surface Elevation:	797.1
Exact Location (Coordinates):	11430N 8851E	Total Depth:	51.6'
Installation Date:	2/6/97	Date Completed:	2/6/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	37.1'	Length of Solid Pipe:	18.3'

Depth	Material Drilled	Comments
0-6	0-2.5' Clay 2.5'-7' Clay/Refuse	
7-13	Refuse	Black/Damp
14-20		
21-27		
28-34		
35-41		Wet @ 35'
42-48		
49-55	End of Borehole @ 51.6'	Wet
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-13		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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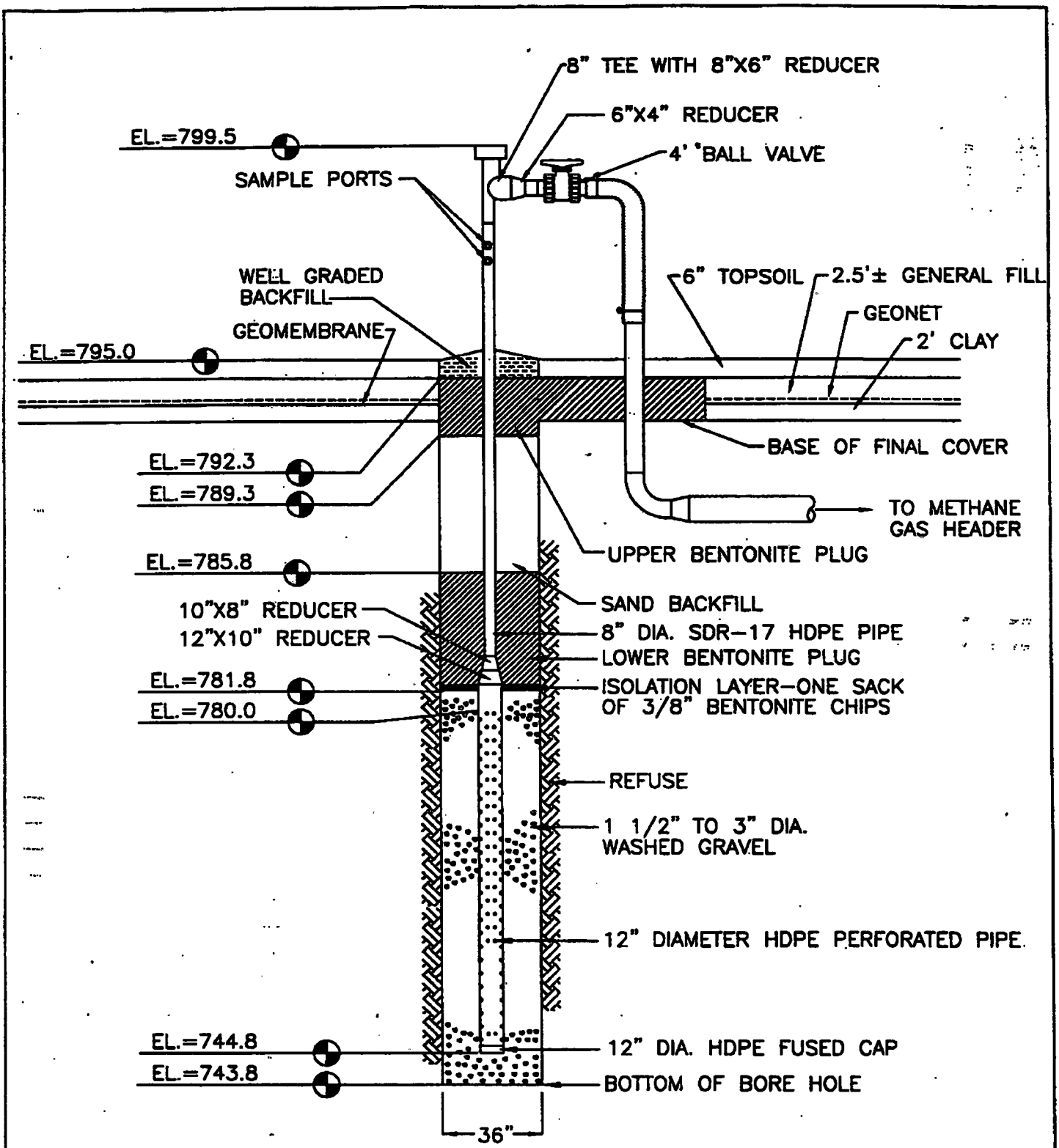
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-13	Surface Elevation:	811.4
Exact Location (Coordinates):	11427N 9169E	Total Depth:	67.7'
Installation Date:	2/6/97	Date Completed:	2/6/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	44.0'	Length of Solid Pipe:	27.9'

Depth	Material Drilled	Comments
0-6	0-3' Clay 3'-7' Clay/Refuse	
7-13	Sludge/Clay	Damp
14-20	Refuse (paper, plastic, and wood)	
21-27		
28-34		
35-41		
42-48		Wet @ 48'
49-55		
56-62		
63-69	End of Borehole @ 67.7'	Wet
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-14		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-14	Surface Elevation:	795.0
Exact Location (Coordinates):	11225N 8837E	Total Depth:	51.2'
Installation Date:	2/6/97	Date Completed:	2/6/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	35.2'	Length of Solid Pipe:	19.5'

Depth	Material Drilled	Comments
0-6	0-3' Clay 3'-9' Clay/Refuse	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 51.2'	Damp
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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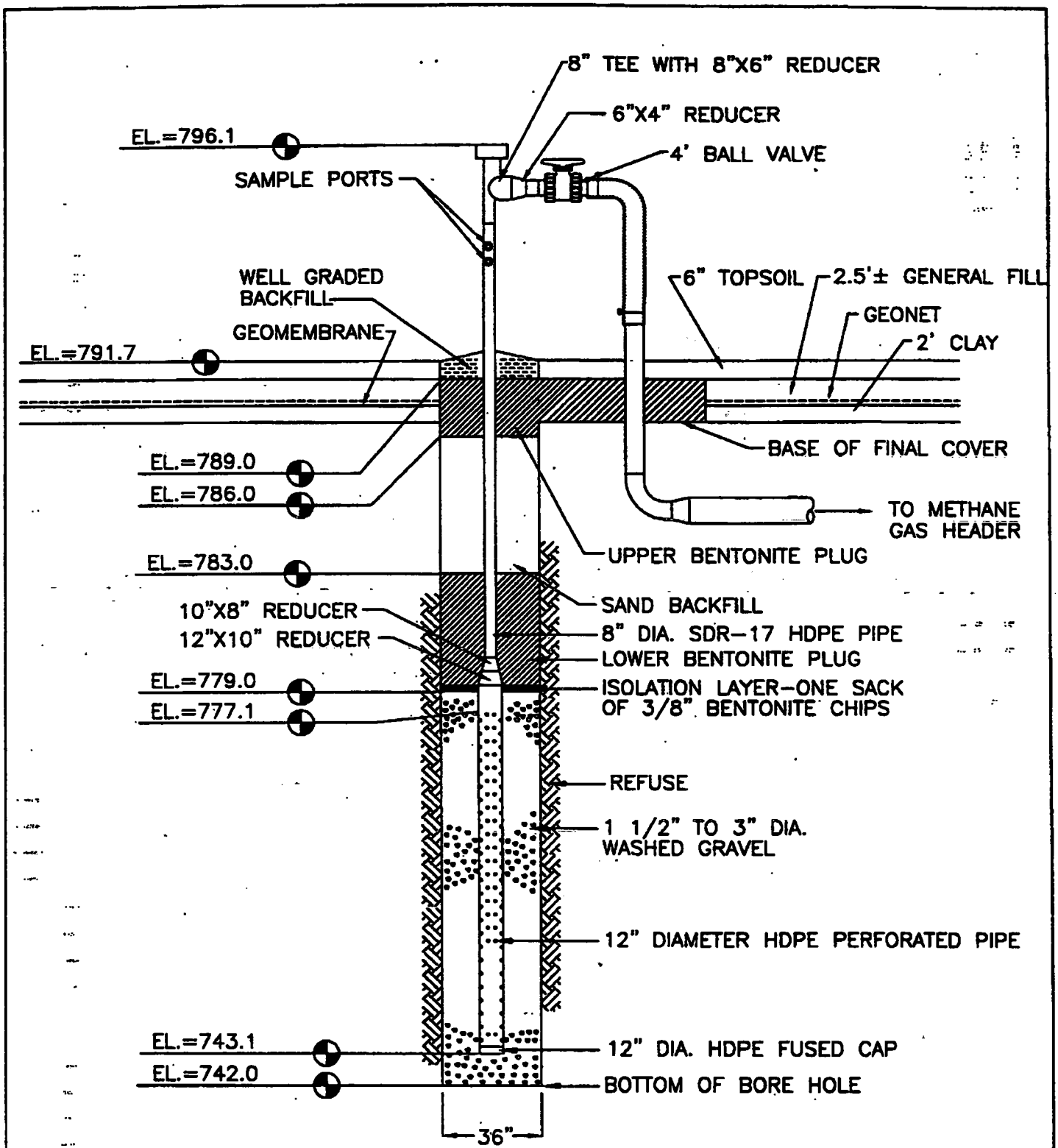
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-15		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-15	Surface Elevation:	791.7
Exact Location (Coordinates):	11054N 8814E	Total Depth:	49.7'
Installation Date:	2/6/97	Date Completed:	2/6/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	34.0'	Length of Solid Pipe:	19.0'

Depth	Material Drilled	Comments
0-6	0-3' Clay 3'-7' Clay/Refuse	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 49.7'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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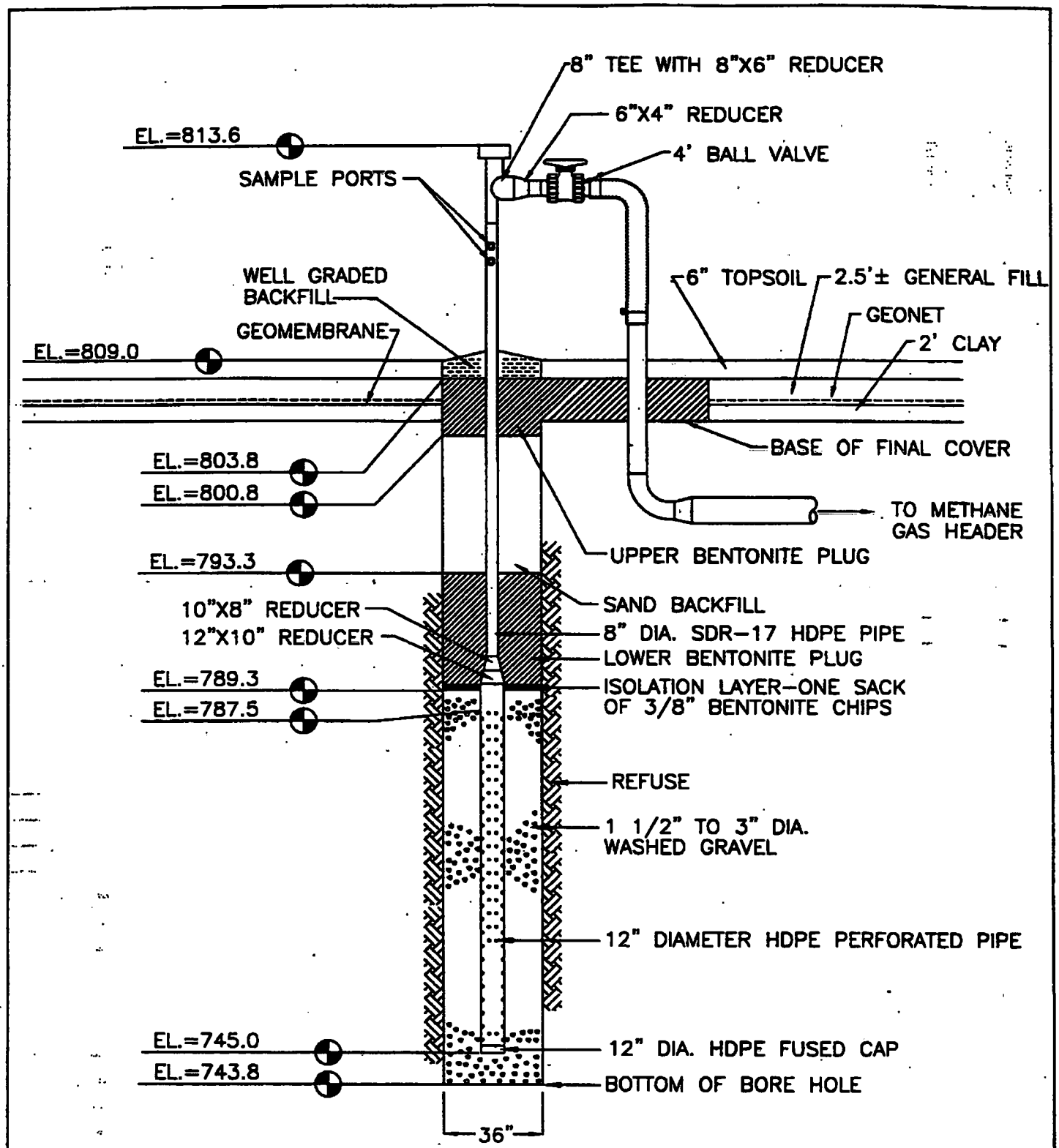
175-181		
182-188		
189-200		



Extraction Well No. EW-16		
SCALE: N.T.S.	APPROVED BY:	DRAWN BY: TLS
DATE: Nov 1997	TJA	REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		31

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-16	Surface Elevation:	809.0
Exact Location (Coordinates):	11171N 9075E	Total Depth:	65.2'
Installation Date:	2/6/97	Date Completed:	2/6/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	42.5	Length of Solid Pipe:	26.1'

Depth	Material Drilled	Comments
0-6	0-3.5' Clay	
7-13	Refuse	Black/Wet Refuse @ 8'
14-20		
21-27		Dryer/Damp
28-34		Wet/Black
35-41		
42-48		
49-55		
56-62		
63-69	End of Borehole @ 65.2'	Wet
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
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161-167		
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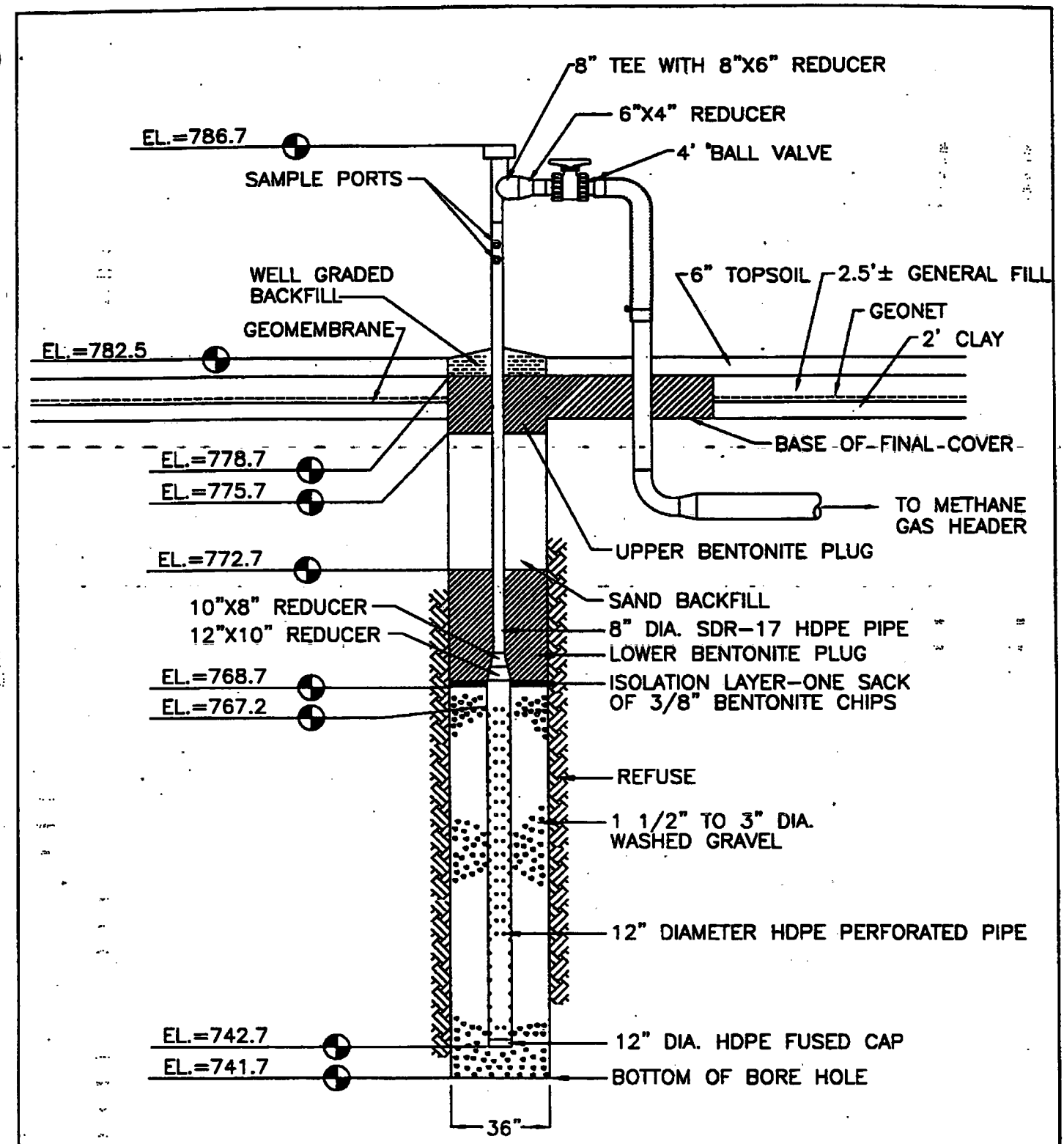
175-181		
182-188		
189-200		



Extraction Well No. EW-17		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-17	Surface Elevation:	782.5
Exact Location (Coordinates):	10865N 8801E	Total Depth:	40.8'
Installation Date:	2/7/97	Date Completed:	2/7/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	24.5'	Length of Solid Pipe:	19.5'

Depth	Material Drilled	Comments
0-6	0-3.5' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41	End of Borehole @ 40.8'	Dry
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
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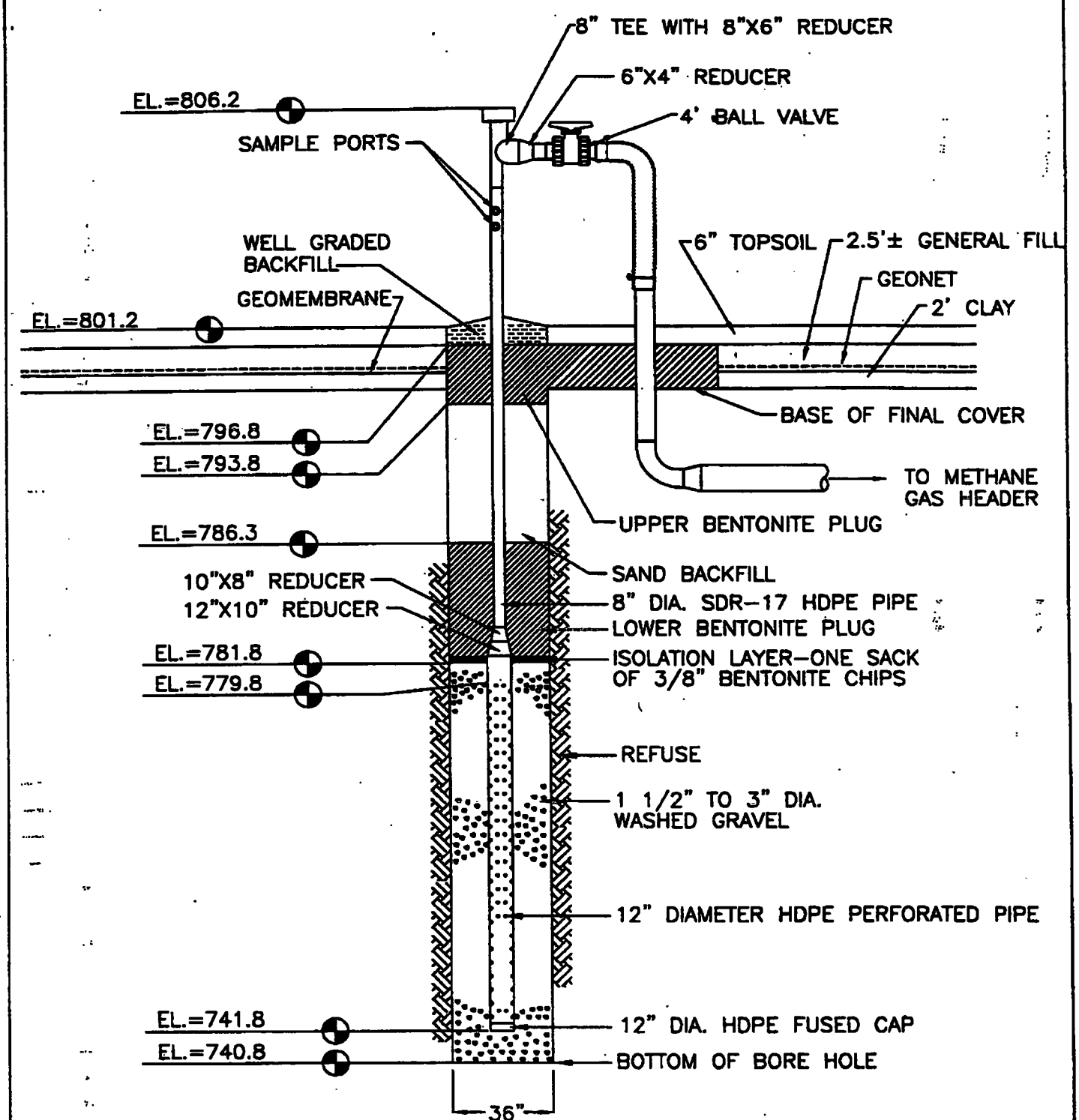
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-18		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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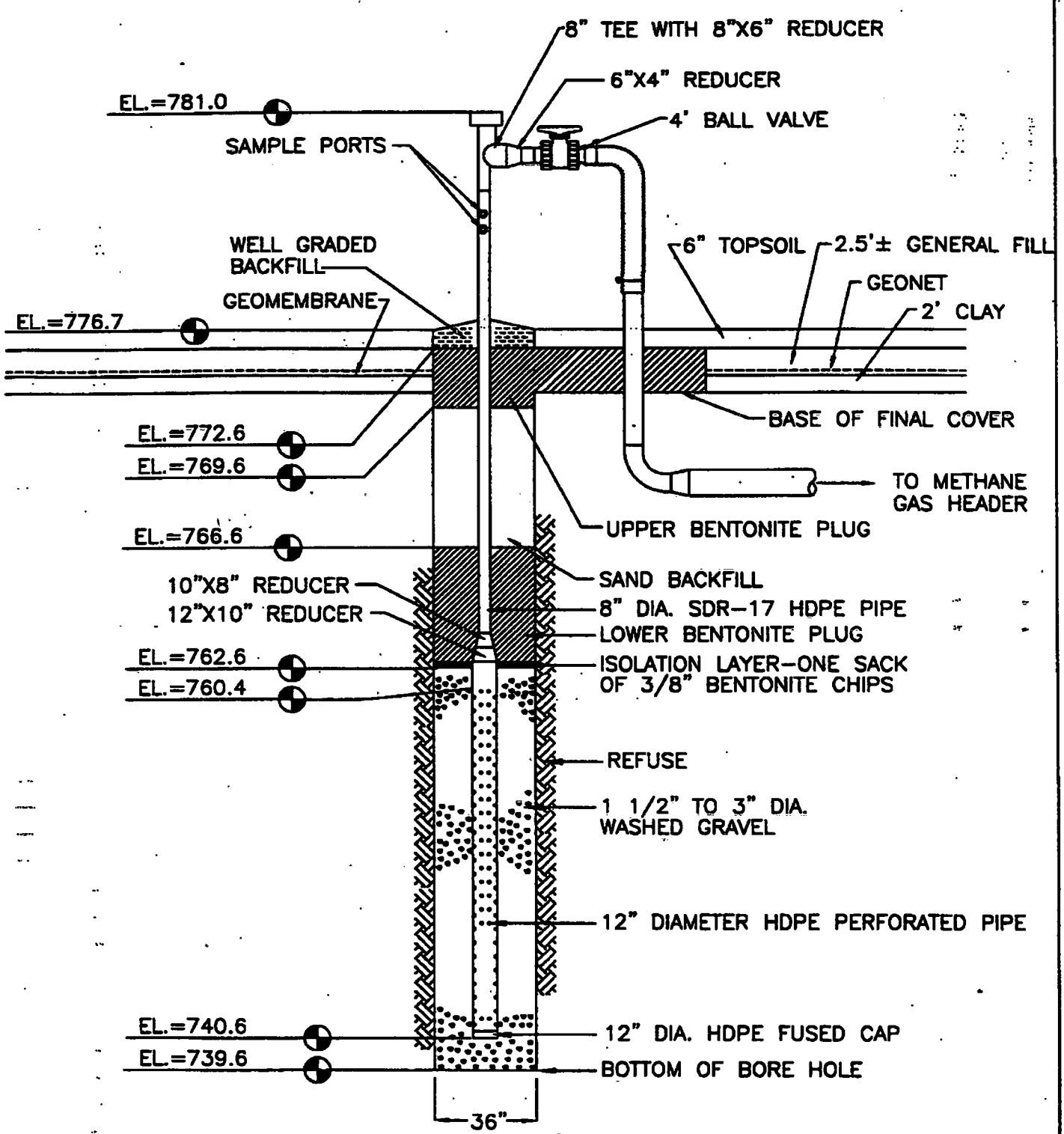
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-18	Surface Elevation:	801.2
Exact Location (Coordinates):	10825N 9077E	Total Depth:	60.4'
Installation Date:	2/10/97	Date Completed:	2/10/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	38.0'	Length of Solid Pipe:	26.4'

Depth	Material Drilled	Comments
0-6	0-3' Clay	
7-13	Refuse (paper, plastic, and wood)	Dry
14-20		
21-27		
28-34		
35-41		
42-48		Wet @ 45.0'
49-55		
56-62	End of Borehole @ 60.4'	Damp/Wet
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-19		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		

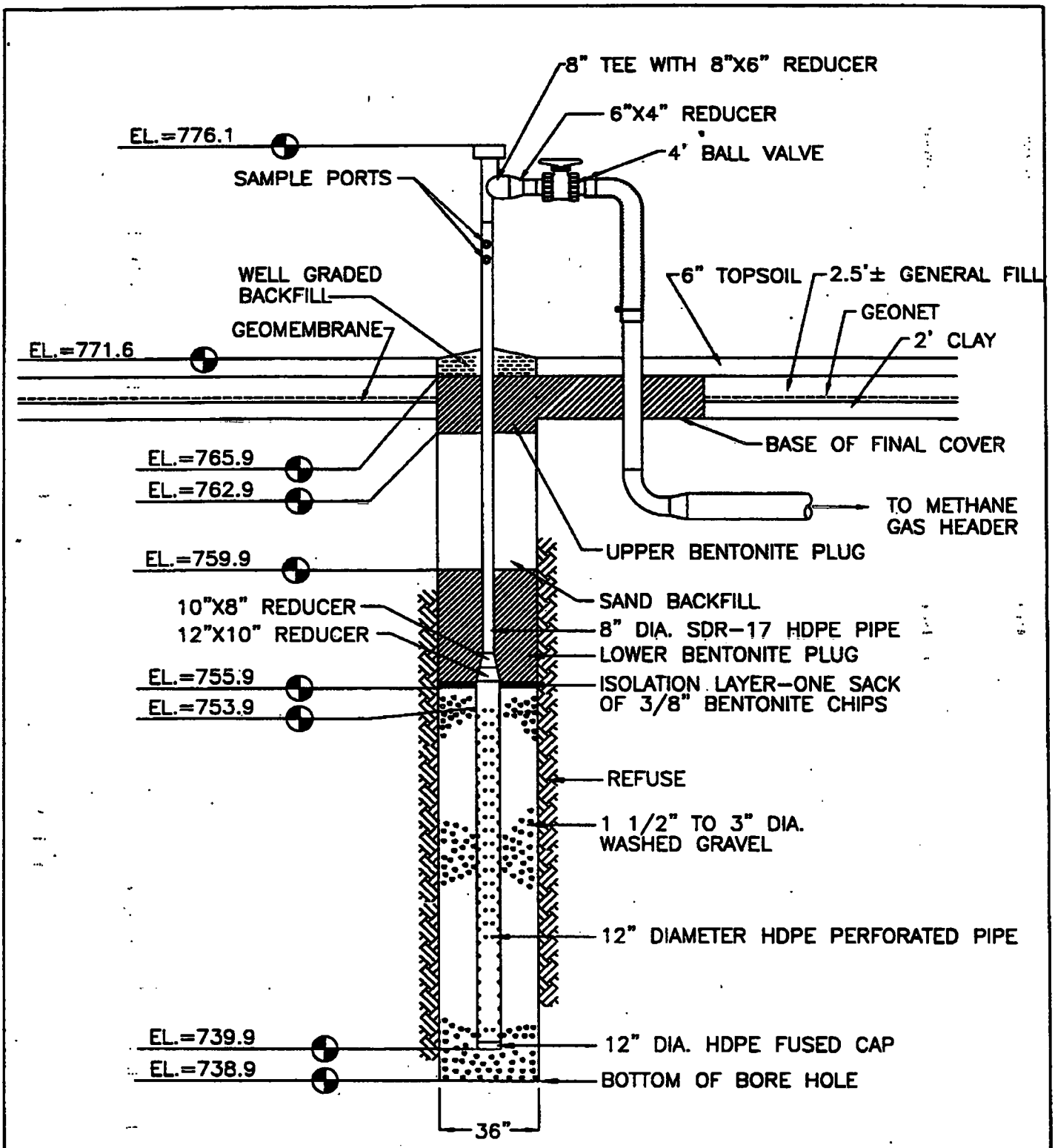
CQM, Inc.
2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-19	Surface Elevation:	776.7
Exact Location (Coordinates):	10662N 8813E	Total Depth:	37.1'
Installation Date:	2/10/97	Date Completed:	2/10/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	19.8'	Length of Solid Pipe:	20.6'

Depth	Material Drilled	Comments
0-6	0-3' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41	End of Borehole @ 37.1'	Dry
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-20		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		39

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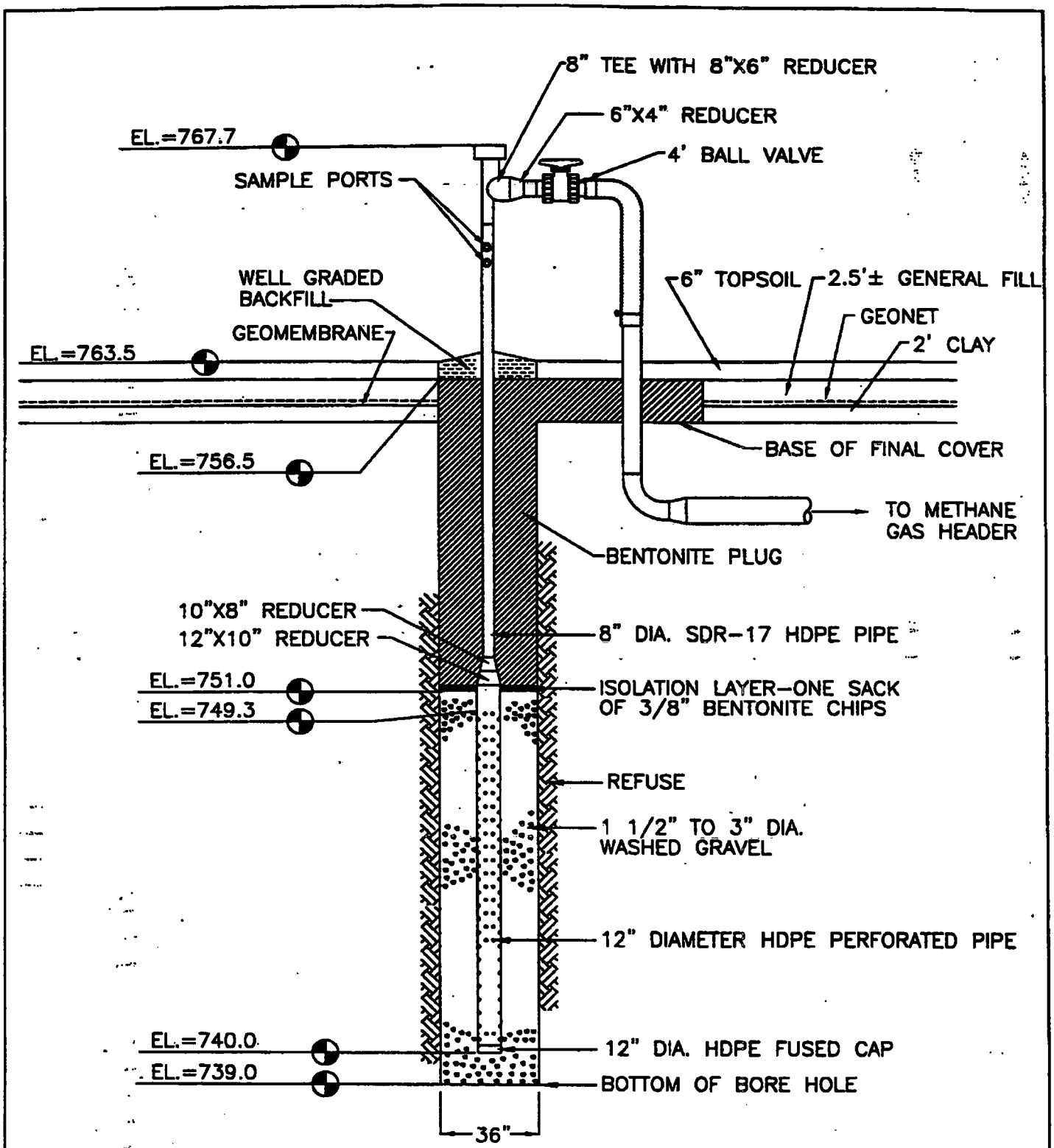
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-20	Surface Elevation:	771.6
Exact Location (Coordinates):	10466N 8823E	Total Depth:	32.7'
Installation Date:	2/10/97	Date Completed:	2/10/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	14.0'	Length of Solid Pipe:	22.2'

Depth	Material Drilled	Comments
0-6	0-1' Topsoil, 1'-5' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34	End of Borehole @ 32.7'	
35-41		
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-21		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		41

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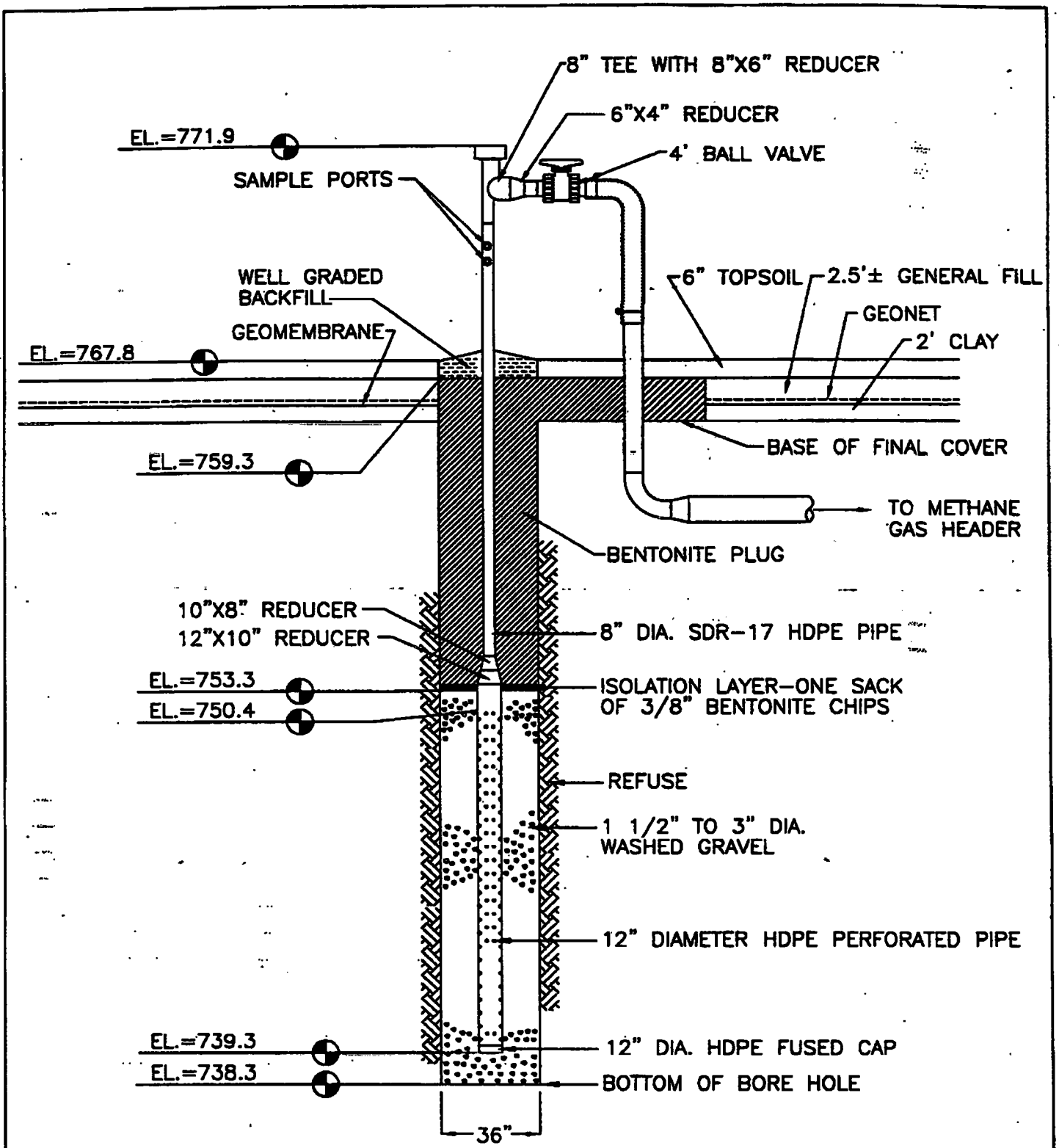
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-21	Surface Elevation:	763.5
Exact Location (Coordinates):	10293N 8794E	Total Depth:	24.5'
Installation Date:	2/10/97	Date Completed:	2/10/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	9.3	Length of Solid Pipe:	18.4'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-3.5' Clay	
7-13	Refuse	Wet
14-20		
21-27	End of Borehole @ 24.5'	Wet
28-34		
35-41		
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-22		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		43

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-22	Surface Elevation:	767.8
Exact Location (Coordinates):	10281N 8992E	Total Depth:	29.5'
Installation Date:	2/10/97	Date Completed:	2/10/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	11.1	Length of Solid Pipe:	21.5'

Depth	Material Drilled	Comments
0-6	0-3' Topsoil, 3'-7' Clay	
7-13		Dry
14-20		
21-27		
28-34	End of Borehole @ 29.5'	Dry
35-41		
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
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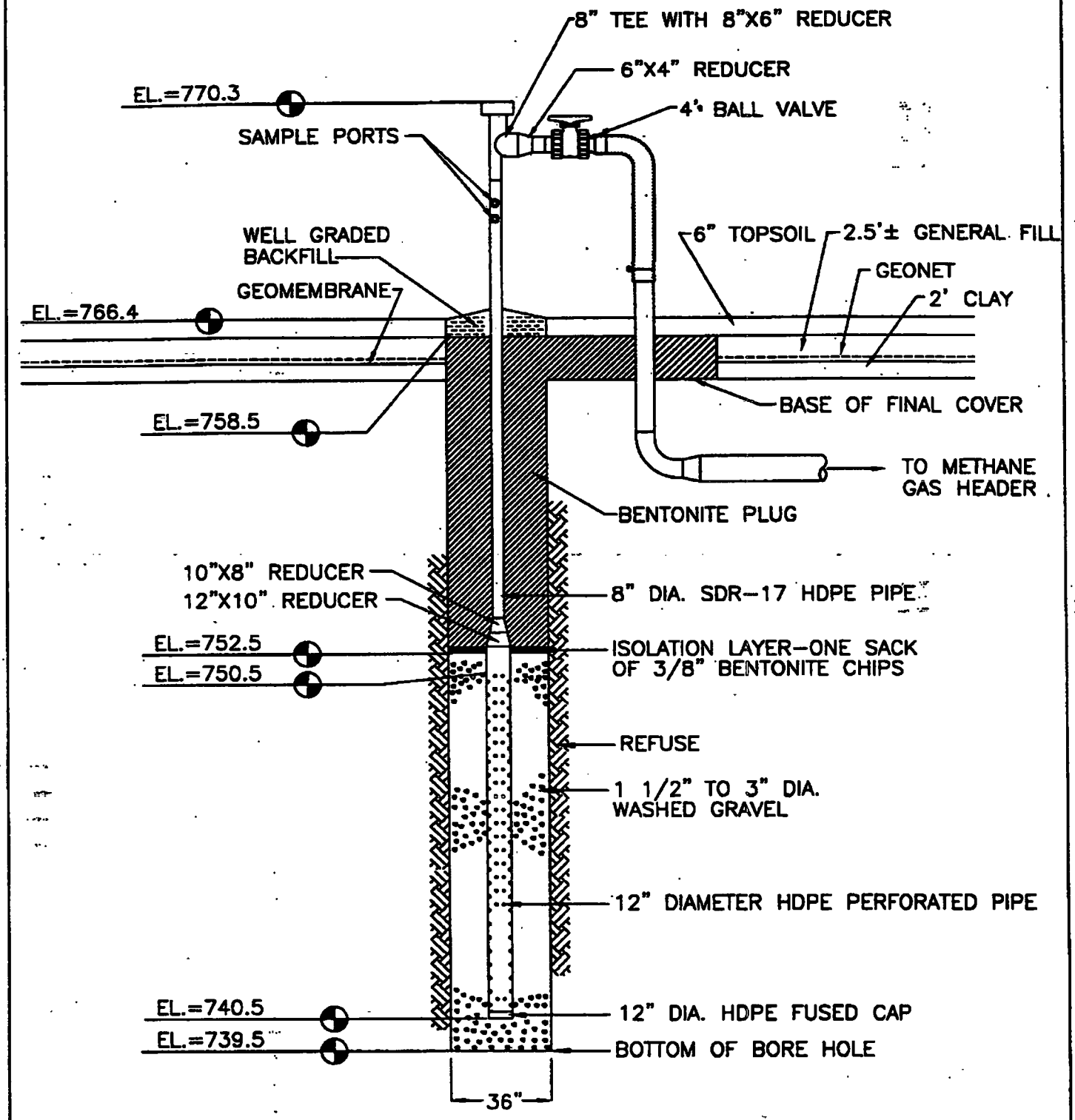
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-23		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		45

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-23	Surface Elevation:	766.4
Exact Location (Coordinates):	10253N 9175E	Total Depth:	26.9'
Installation Date:	2/10/97	Date Completed:	2/10/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	10.0'	Length of Solid Pipe:	19.8'

Depth	Material Drilled	Comments
0-6	0-3' Topsoil, 3'-8' Clay	
7-13	Refuse	
14-20		
21-27	End of Borehole @ 26.9'	Dry
28-34		
35-41		
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
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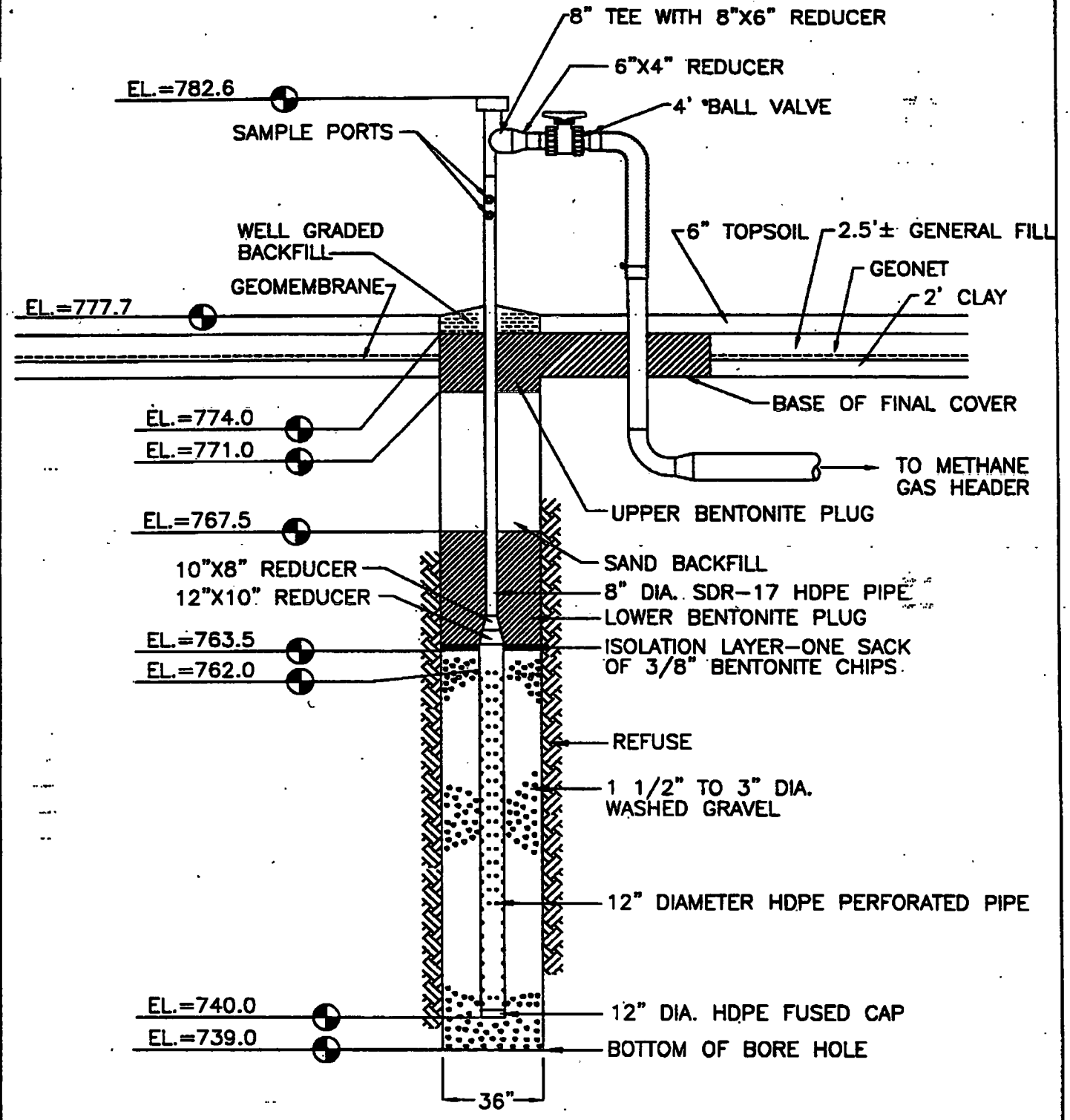
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-24

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 1A
Zion, Illinois

CQM, Inc. 47

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Green Bay, WI 54311
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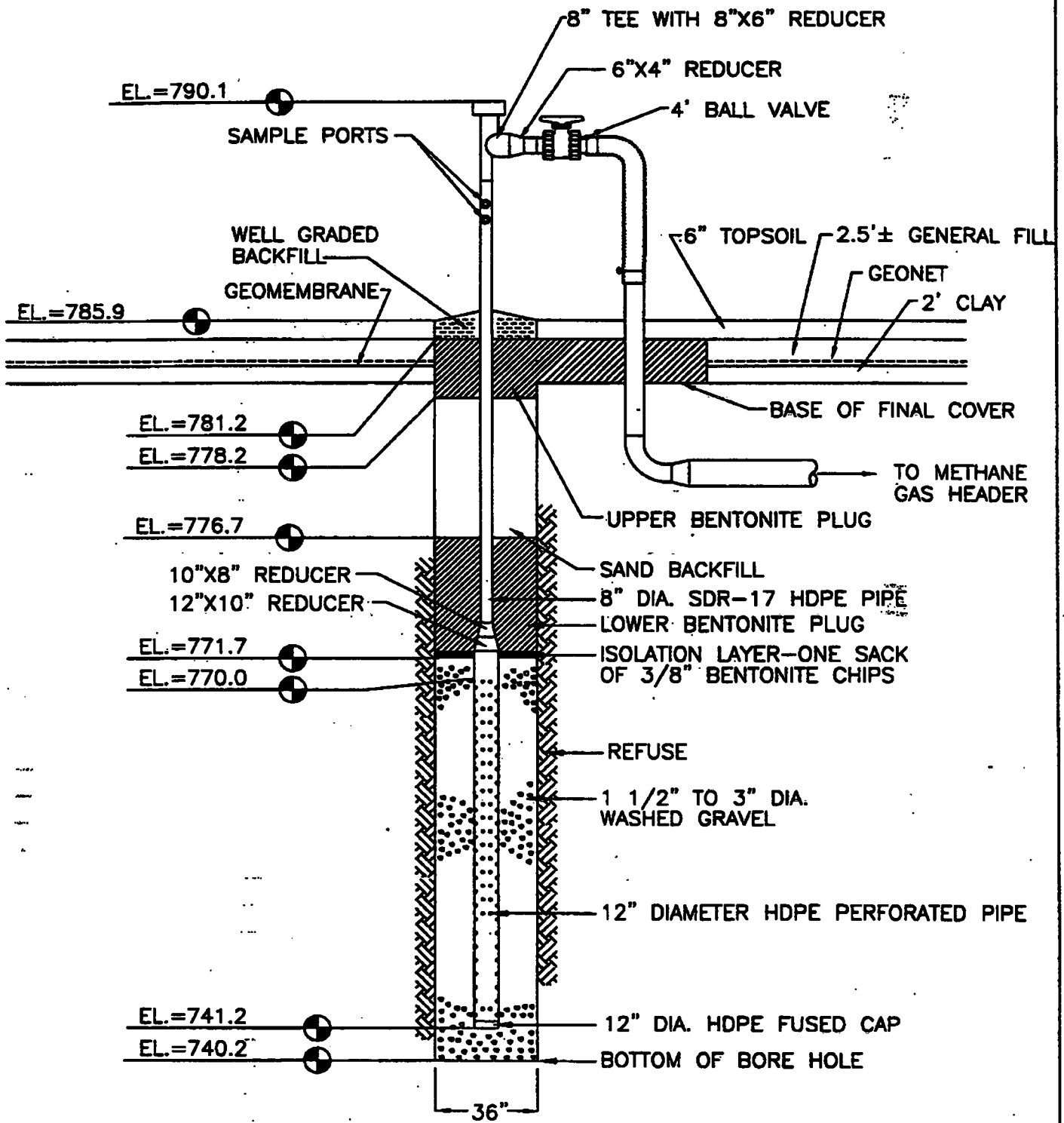
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-24	Surface Elevation:	777.7
Exact Location (Coordinates):	10446N 9176E	Total Depth:	38.7'
Installation Date:	2/11/97	Date Completed:	2/11/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	22.0'	Length of Solid Pipe:	20.6'

Depth	Material Drilled	Comments
0-6	0-6.5' Clay	
7-13	Refuse/Clay	Dry
14-20		
21-27		
28-34		
35-41	End of Borehole @ 38.7'	Dry
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-25		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		49

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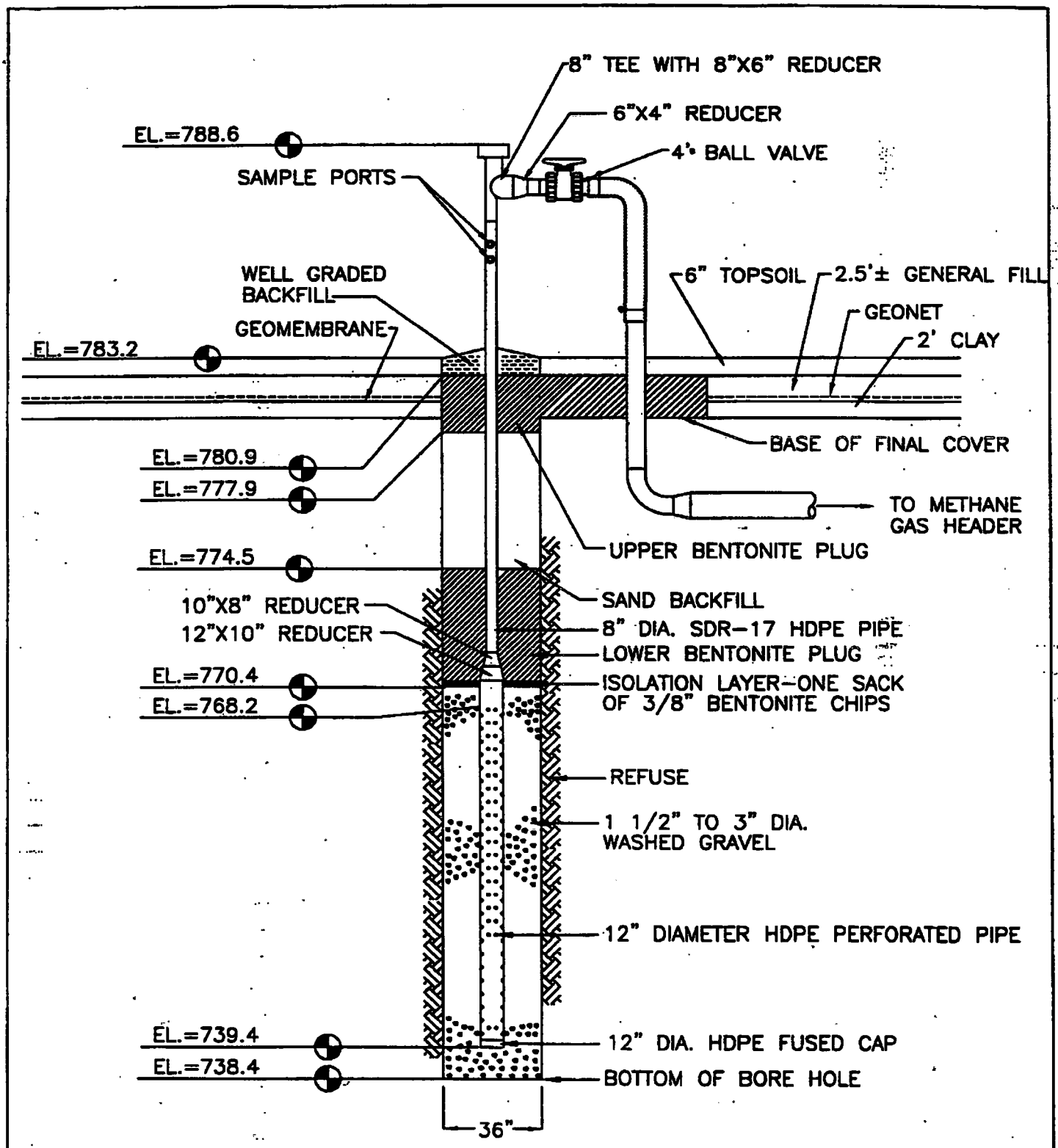
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-25	Surface Elevation:	785.9
Exact Location (Coordinates):	10551N 9011E	Total Depth:	45.7'
Installation Date:	2/11/97	Date Completed:	2/11/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	28.8'	Length of Solid Pipe:	20.1'

Depth	Material Drilled	Comments
0-6	0'-4' Clay	
7-13	Refuse/Clay	
14-20	(paper, plastic, and wood)	Dry
21-27		
28-34		
35-41		
42-48	End of Borehole @ 45.7'	Dry
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-26		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		

CQM, Inc.
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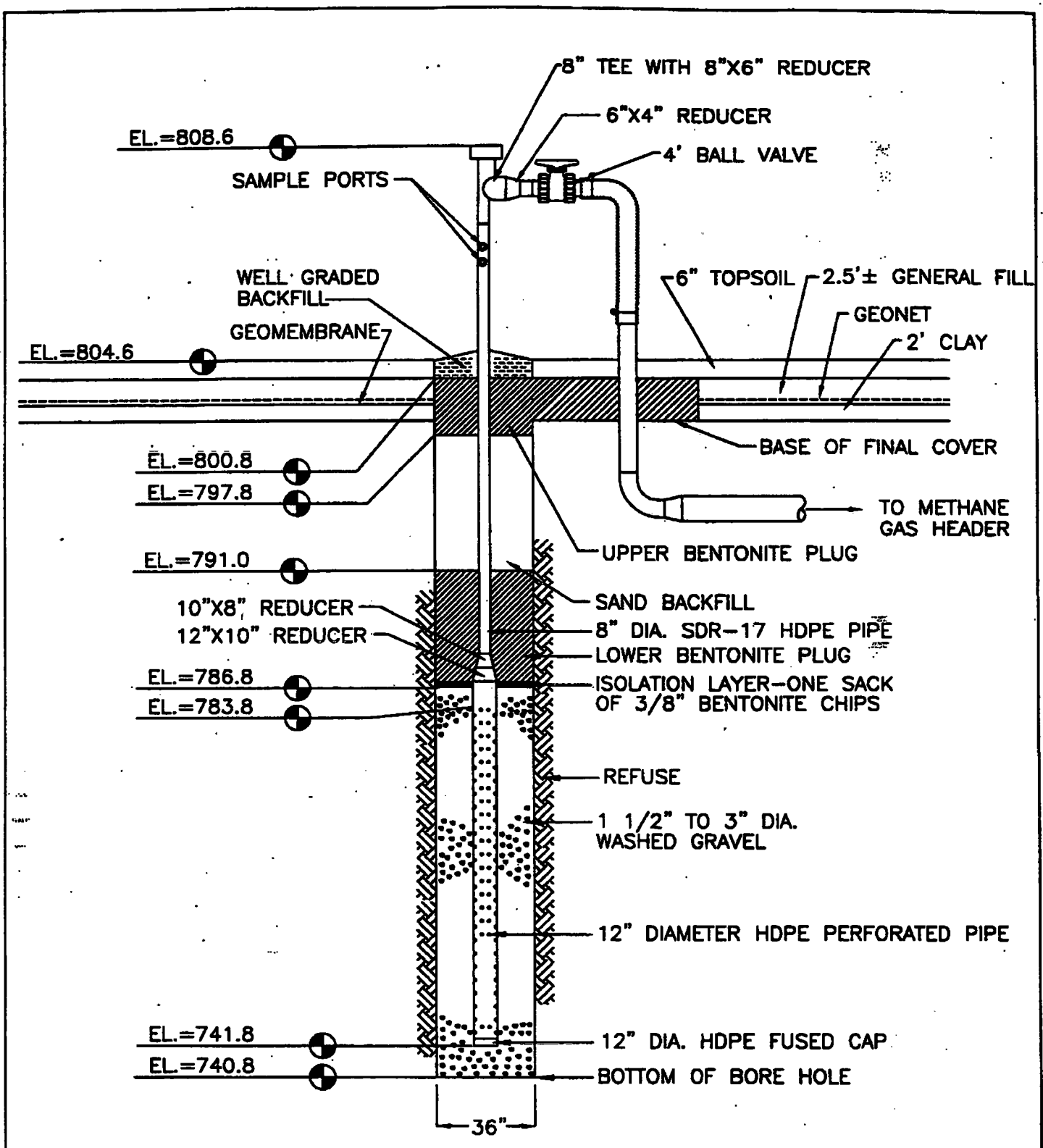
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-26	Surface Elevation:	783.2
Exact Location (Coordinates):	10580N 9312E	Total Depth:	44.8'
Installation Date:	2/11/97	Date Completed:	2/11/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	28.8'	Length of Solid Pipe:	20.4'

Depth	Material Drilled	Comments
0-6	0-6' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48	End of Borehole @ 44.8'	Dry
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-27		
SCALE: N.T.S.	APPROVED BY:	DRAWN BY: TLS
DATE: Nov 1997	TJA	REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		53

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-27	Surface Elevation:	804.6
Exact Location (Coordinates):	10933N 9293E	Total Depth:	63.8'
Installation Date:	2/11/97	Date Completed:	2/11/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	42.0'	Length of Solid Pipe:	24.8'

Depth	Material Drilled	Comments
0-6	0-15' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55		
56-62		
63-69	End of Borehole @ 63.8'	Dry
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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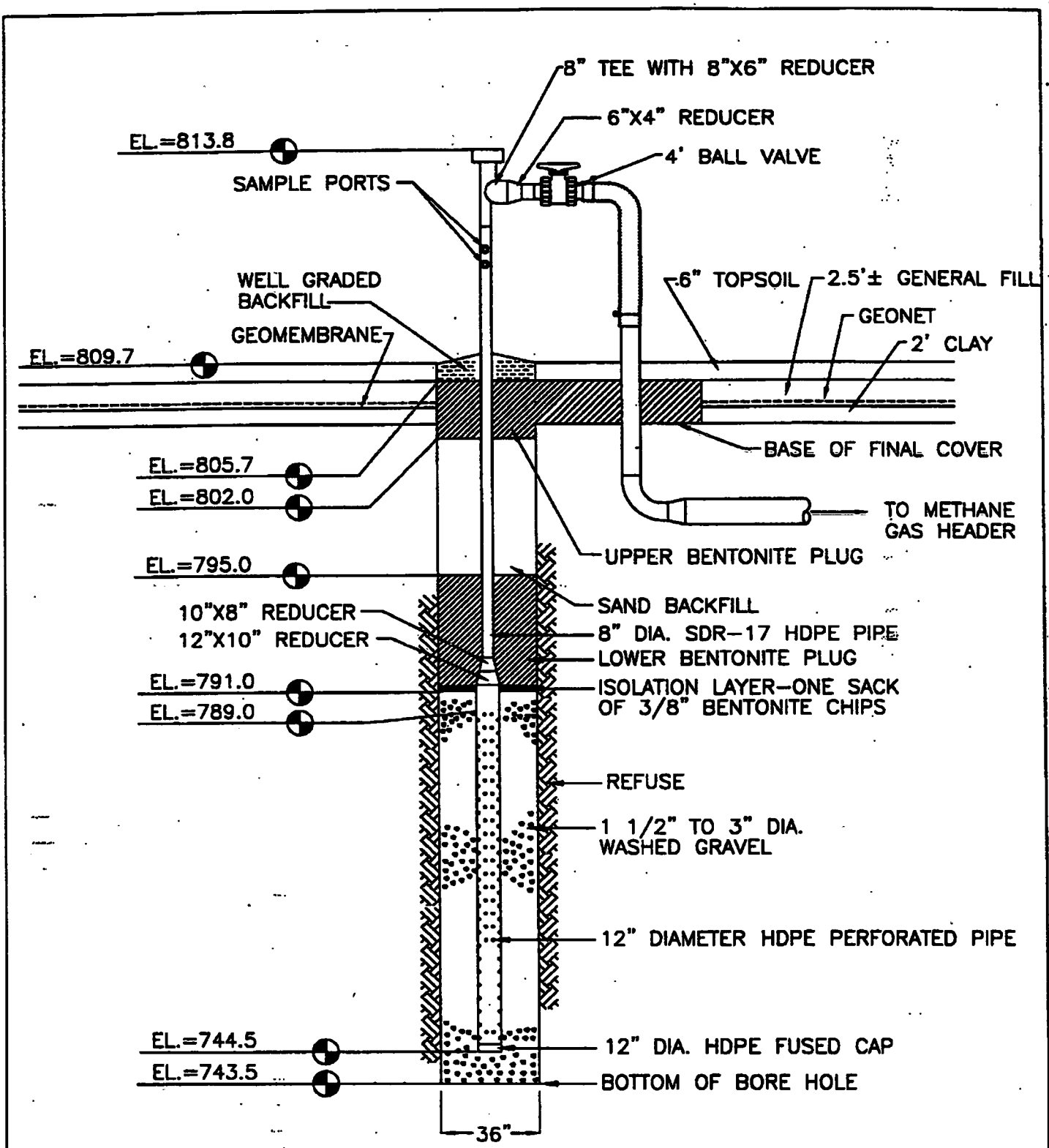
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-28		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		55

COM, Inc.
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Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-28	Surface Elevation:	809.7
Exact Location (Coordinates):	11226N 9357E	Total Depth:	66.2'
Installation Date:	2/11/97	Date Completed:	2/11/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	44.5'	Length of Solid Pipe:	24.8'

Depth	Material Drilled	Comments
0-6	0-2.5' Clay	
7-13	Refuse/Clay	Dry/Damp
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	Clay/Refuse	
56-62		
63-69	End of Borehole @ 66.2'	Damp
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
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140-146		
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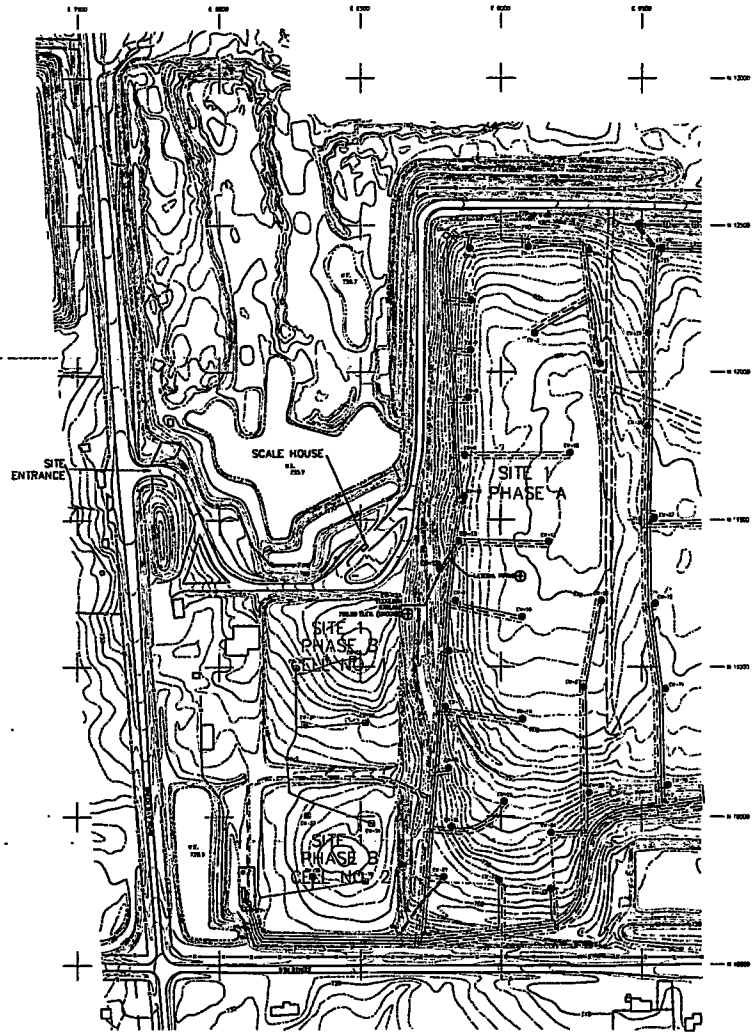
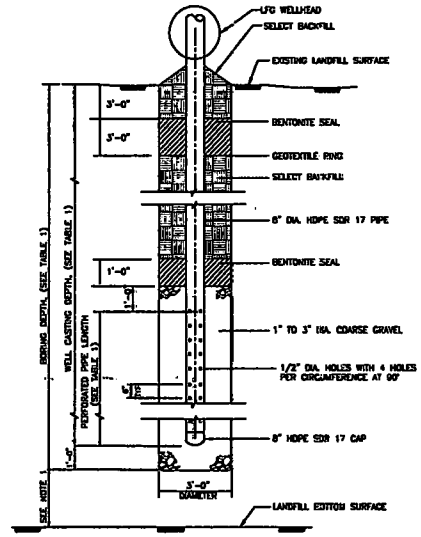
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



1/1 EW-12A LOCATION

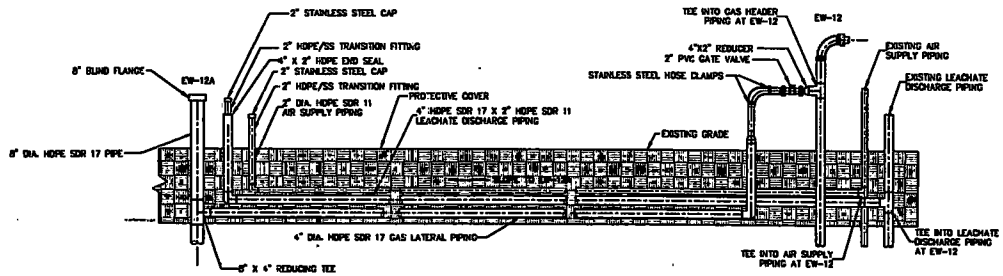


NOTES: 1. BOTTOM OF BORE HOLE APPROXIMATELY 85 FT FROM LANDFILL REPORTED BOTTOM SURFACE.

2/1 EW-12A WELL COMPLETION DETAIL
NTS

TABLE 1
LFG EXTRACTION WELL LOCATION

WELL NO.	GROUND ELEVATION (FT)	APPROX. BOTTOM OF WASTE ELEVATION (FT)	WELL BOTTOM (FT)	'A' BORING DEPTH (FT)	'B' WELL CASING DEPTH (FT)	'C' PERFORATED PIPE LENGTH (FT)	SOLID PIPE LENGTH (FT)	APPROX. LOCATION NORTHING	APPROX. LOCATION EASTING
EW-12A	786.90	735.00	751.90	35.00	34.00	25.33	8.67	113343.71	87192.80



3/1 CONNECTION BETWEEN EW-12A & EW-12
NTS

NOTES
1. ALL LFG PIPING TO BE SLOPED TO PROVIDE MAXIMUM POSITIVE CONDENSATE DRAINAGE.

☐ DRAFT
☒ PERMIT APPLICATION
☐ APPROVED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY: _____

DATE: 02/14/03
FILE: 0120-37-D10
CAD: D0037-EW2

DRAWN BY: MAH
DESIGN BY: AAH
REVIEWED BY: AAH

PREPARED FOR
BFI WASTE SYSTEMS OF NORTH AMERICA, INC.
13832 SOUTH KOSTNER
CRESTWOOD, ILLINOIS 60445

REVISIONS		
NO.	DATE	DESCRIPTION

EXTRACTION WELL LOCATION AND DETAILS

ONYX ZION LANDFILL
ZION, ILLINOIS

Weaver Boos Consultants, Inc.

DRAWING 1 OF 1

R002346

WEDER Services
WOODWARD OK
580-256-9371

4420 Anderson Road • Woodward, OK 7380
P.O. Box 1087 • Woodward, OK 7
Fax (580) 256-6997 • Tel (580) 256-937

GAS EXTRACTION WELL BORING LOG

Site Name	Zion Sanitary Landfill	Hole Size	36
Location	Zion, IL	Driller	T. Nemmid
Date	11-26-02	Tripper	C. Koutnas
Well No	EW-12A	Rig No	10

Depth	Composition	Decomposition	Moisture	Comments (Temp, Dates, Etc.)
0-5	Topsoil			
5-10	Clay, Dirt Wood	mod	mois	70°
10-15	Hvy Wood Dirt	mod	mod	70°
15-20	Hvy Wood Dirt	mod	mod	70°
20-25	Hvy Wet Clay	mod	wet	76°
25-32	Hvy Clay	Hvy	wet	76°
32-35	Hvy Clay	Hvy	wet	80°
Total Depth	35'			

Appendix E-18

Historical O&M Records

QUARTERLY
POST-CLOSURE INSPECTION CHECKLIST FOR
ZION LANDFILL, SITE 1A

Date: 3/18/20 **Time:** 12:00pm **Name (Print):** Gregory Komperda

Signature: Gregory Komp

Weather Conditions: N/A - Maintenance events performed on different days.

Temp., Wind, etc.

S means satisfactory
U means unsatisfactory

QUARTERLY

S	U	Item
		Leachate Collection System
☑	☐	Leachate headwell levels, total well depth, and pump recordings taken and documented
☑	☐	Leachate collection wells - Inspection for leaks in exposed piping, fittings and valves; vandalism; and settlement of well or surrounding area
☑	☐	Performance of extraction pumps of leachate collection system (poor yield, excess sediment accumulation, poorly operating pump)
		Gas Collection System
☑	☐	Exercise isolation valve on the gas collection header
☑	☐	Exercise manual valve on condensate sumps and pump stations
☑	☐	Leakage on pipe fittings and valves to condensate sumps and pump stations
☐ NA	☐	Enclosed flare - Clean flame scanner viewing window and vent port
☐ NA	☐	Enclosed flare - Inspect solenoid valves
☑	☐	Enclosed flare - Lubricate purge blower fan and motor and louver doors on flare **Maintenance performed on as-needed and/or manufacturer specs basis*
☑	☐	Extraction blowers - Lubricate blower bearings and motor bearings **Maintenance performed on as-needed and/or manufacturer specs basis*
		Gas Collection - Knockout Pot (if applicable)
☑	☐	Remove top of pot and check for corrosion and grime build up **Maintenance performed on as-needed and/or manufacturer specs basis*
☑	☐	Clean demister pad and inside of knockout pot, if necessary **Maintenance performed on as-needed and/or manufacturer specs basis*

Blower building

☑ ☐ Check compressor for maintenance activities (e.g., oil change)

☑ ☐ Check and lubricate building exhaust fans

**Maintenance performed on as-needed and/or manufacturer specs basis*

☑ ☐ Calibrate explosive gas sensor

**Manufacturer recommends testing not calibration; testing performed as recommended*

(*) Indicates protocol already in place differs from check list. Protocol in place is followed as recommended by manufacturer and/or best management practices.

COMMENTS:

RESPONSE:

QUARTERLY
POST-CLOSURE INSPECTION CHECKLIST FOR
ZION LANDFILL, SITE 1A

Date: 6/28/20 Time: 12:00 Name (Print): Gregory Komperda

Signature: Gregory Komperda

Weather Conditions: N/A - Maintenance events performed on different days.

Temp., Wind, etc. 81°F Wind SE@6mph
Barometric Pressure 29.10in Humidity 90%

S means satisfactory
U means unsatisfactory

QUARTERLY

S	U	Item
		Leachate Collection System
☑	☐	Leachate headwell levels, total well depth, and pump recordings taken and documented
☑	☐	Leachate collection wells - Inspection for leaks in exposed piping, fittings and valves; vandalism; and settlement of well or surrounding area
☑	☐	Performance of extraction pumps of leachate collection system (poor yield, excess sediment accumulation, poorly operating pump)
		Gas Collection System
☑	☐	Exercise isolation valve on the gas collection header
☑	☐	Exercise manual valve on condensate sumps and pump stations
☑	☐	Leakage on pipe fittings and valves to condensate sumps and pump stations
☐	NA ☐	Enclosed flare - Clean flame scanner viewing window and vent port
☐	NA ☐	Enclosed flare - Inspect solenoid valves
☐	NA ☐	Enclosed flare - Lubricate purge blower fan and motor and louver doors on flare **Maintenance performed on as-needed and/or manufacturer specs basis*
☐	NA ☐	Extraction blowers - Lubricate blower bearings and motor bearings **Maintenance performed on as-needed and/or manufacturer specs basis*
		Gas Collection - Knockout Pot (if applicable)
☑	☐	Remove top of pot and check for corrosion and grime build up **Maintenance performed on as-needed and/or manufacturer specs basis*
☑	☐	Clean demister pad and inside of knockout pot, if necessary **Maintenance performed on as-needed and/or manufacturer specs basis*

Blower building

☑ ☐ Check compressor for maintenance activities (e.g., oil change)

☑ ☐ Check and lubricate building exhaust fans
**Maintenance performed on as-needed and/or manufacturer specs basis*

☑ ☐ Calibrate explosive gas sensor
**Manufacturer recommends testing, not calibration; testing performed as recommended*

(*) Indicates protocol already in place differs from check list. Protocol in place is followed as recommended by manufacturer and/or best management practices.

COMMENTS:

RESPONSE:

QUARTERLY
POST-CLOSURE INSPECTION CHECKLIST FOR
ZION LANDFILL, SITE 1A

Date: 7/23/20 Time: 12:00 Name (Print): Gregory Kamperdh

Signature:

Weather Conditions: N/A - Maintenance events performed on different days.

Temp., Wind, etc. 79° F 50% humidity Winds NE @ 5mph Pressure = 29.38 in Mostly Cloudy

S means satisfactory
U means unsatisfactory

QUARTERLY

S	U	Item
		Leachate Collection System
☑	☐	Leachate headwell levels, total well depth, and pump recordings taken and documented
☑	☐	Leachate collection wells - Inspection for leaks in exposed piping, fittings and valves; vandalism; and settlement of well or surrounding area
☑	☐	Performance of extraction pumps of leachate collection system (poor yield, excess sediment accumulation, poorly operating pump)
		Gas Collection System
☑	☐	Exercise isolation valve on the gas collection header
☑	☐	Exercise manual valve on condensate sumps and pump stations
☑	☐	Leakage on pipe fittings and valves to condensate sumps and pump stations
☐ NA	☐	Enclosed flare - Clean flame scanner viewing window and vent port
☐ NA	☐	Enclosed flare - Inspect solenoid valves
☐ NA	☐	Enclosed flare - Lubricate purge blower fan and motor and louver doors on flare **Maintenance performed on as-needed and/or manufacturer specs basis*
☐ NA	☐	Extraction blowers - Lubricate blower bearings and motor bearings **Maintenance performed on as-needed and/or manufacturer specs basis*
		Gas Collection - Knockout Pot (if applicable)
☐ NA	☐	Remove top of pot and check for corrosion and grime build up **Maintenance performed on as-needed and/or manufacturer specs basis*
☐ NA	☐	Clean demister pad and inside of knockout pot, if necessary **Maintenance performed on as-needed and/or manufacturer specs basis*

Blower building

☑ ☐ Check compressor for maintenance activities (e.g., oil change)

☑ ☐ Check and lubricate building exhaust fans
**Maintenance performed on as-needed and/or manufacturer specs basis*

☑ ☐ Calibrate explosive gas sensor
**Manufacturer recommends testing not calibration; testing performed as recommended*

(*) Indicates protocol already in place differs from check list. Protocol in place is followed as recommended by manufacturer and/or best management practices.

COMMENTS:

RESPONSE:

QUARTERLY
POST-CLOSURE INSPECTION CHECKLIST FOR
ZION LANDFILL, SITE 1A

Date: 12/9/20 Time: 14:00 Name (Print): Gregory Kompoth

Signature:

Weather Conditions: N/A - Maintenance events performed on different days.

Temp., Wind, etc. 52°F 29.13 in H_2O, winds WNW @ 13 mph 49% humidity

S means satisfactory
U means unsatisfactory

QUARTERLY

S	U	Item
		Leachate Collection System
☑	☐	Leachate headwell levels, total well depth, and pump recordings taken and documented
☑	☐	Leachate collection wells - Inspection for leaks in exposed piping, fittings and valves; vandalism; and settlement of well or surrounding area
☑	☐	Performance of extraction pumps of leachate collection system (poor yield, excess sediment accumulation, poorly operating pump)
		Gas Collection System
☑	☐	Exercise isolation valve on the gas collection header
☑	☐	Exercise manual valve on condensate sumps and pump stations
☑	☐	Leakage on pipe fittings and valves to condensate sumps and pump stations
☐ NA	☐	Enclosed flare - Clean flame scanner viewing window and vent port
☐ NA	☐	Enclosed flare - Inspect solenoid valves
☐ NA	☐	Enclosed flare - Lubricate purge blower fan and motor and louver doors on flare **Maintenance performed on as-needed and/or manufacturer specs basis*
☐ NA	☐	Extraction blowers - Lubricate blower bearings and motor bearings **Maintenance performed on as-needed and/or manufacturer specs basis*
		Gas Collection - Knockout Pot (if applicable)
☑	☐	Remove top of pot and check for corrosion and grime build up **Maintenance performed on as-needed and/or manufacturer specs basis*
☑	☐	Clean demister pad and inside of knockout pot, if necessary **Maintenance performed on as-needed and/or manufacturer specs basis*

Blower building

- [x] ☐ Check compressor for maintenance activities (e.g., oil change)
- [x] ☐ Check and lubricate building exhaust fans
  **Maintenance performed on as-needed and/or manufacturer specs basis*
- [x] ☐ Calibrate explosive gas sensor
  **Manufacturer recommends testing, not calibration; testing performed as recommended*

(*) Indicates protocol already in place differs from check list. Protocol in place is followed as recommended by manufacturer and/or best management practices.

COMMENTS:

RESPONSE:

Reporting Period:January 30, 2020
Inspection Performed By: G.Komperda

Landfill Maintenance Summary

Zion Landfill
Zion, Illinois

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
01/06/20	Yes	P	Pump operation	All electric pumps in vaults inspected for proper operations.
01/08/20	Yes	R	EW15 Air Regulator	Air regulator was replaced at well EW15.
01/08/20	Yes	R	SR1 Air Regulator	Air regulator was replaced at well SR1.
01/08/20	Yes	R	SR2 Air Regulator	Air regulator was replaced at well SR2.
01/08/20	Yes	R	SR6 Air Regulator	Air regulator was replaced at well SR6.
01/21/20	Yes	R	EW64R Kanaflex Leak	Leak in kanaflex hose repaired for well EW64R.
01/21/20	Yes	R	EW18 Air Leak	Leak in air hose repaired for well EW18.
01/28/20	Yes	R	9th Street Manhole	Replaced pump for the 9th Street manhole.
01/28/20	Yes	R	EW28 Regulator	Regulator was replaced at well EW28
01/31/20	Yes	R	EW2 Pump Failed	Replaced a failed pump for well EW2
01/31/20	Yes	P	Header Valve	Replaced a gear for the header valve.

Additional Comments:

R 002357

Reporting Period: February 28, 2020
Inspection Performed By: Gregory Komperda

Landfill Maintenance Summary

Zion, Illinois

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
02/03/20	YES	P	North Vault	Took vault readings on 4 risers. Found liquid in North vault up to door. Bought sump pump and pumped vault down.
02/03/20	YES	P	EW 28	Replaced air line on EW-28.
02/03/20	YES	P	North Vault	Outlet not functional, replaced.
02/07/20	YES	P	Site 1A	Pumps inspected and jumped started.
02/07/20	NO	R	South Vault	Valve in manhole inspected.
02/12/20	YES	P	Site 2	Pumps inspected and jump started.
02/17/20	YES	R	EW 13 and EW 2	Discharge hoses repaired.
02/17/20	YES	R	EW-51	Forcemain leak repaired.
02/25/20	YES	R	CS4	Air line repaired.
02/25/20	YES	R	9th street	Pump inspected and jump started.

Additional Comments:

R 002358

Reporting Period: March 2020
Inspection Performed By: Gregory Komperda

Landfill Maintenance Summary

Zion, Illinois

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
03/03/20	YES	P	EW 13	Dishcarge and Kanaflex replaced
03/03/20	YES	P	EW 2	Dishcarge and Kanaflex replaced
03/10/20	YES	P	SR 6	Discharge line replaced
03/10/20	YES	P	Compressor	Cleaned and inspected
03/10/20	NO	R	All Vaults	Inspected, readings taken and recorded.
03/18/20	YES	P	EW 47	Discharge line repaired.
03/18/20	YES	R	EW 22	Kanaflex replaced
03/24/20	YES	R	EW 22	Air regulator replaced.
03/24/20	YES	R	EW 39R	Air regulator replaced.
03/31/20	YES	R	Compressor	Towers drained and inspected, compressor inspected.

Additional Comments:

R 002359

Reporting Period: April 2020
Inspection Performed By: Gregory Komperda

Landfill Maintenance Summary

Zion, IL

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
04/06/20	YES	P	Compressor	Towers drained and inspected, compressor inspected.
04/06/20	YES	P	All sumps	Monthly sump inspection conducted.
04/16/20	YES	P	EW2	Pump pulled, cleaned and reinstalled
04/16/20	YES	P	Compressor	Air drier failed and reset.
04/16/20	YES	R	All Vaults	Inspected, readings taken and recorded.
04/21/20	YES	P	EW27	Pump pulled, cleaned and reinstalled
04/24/20	YES	R	Site 2	Multiple cycle counters repaired/cleaned/replaced
04/28/20	YES	R	EW 22	Air regulator replaced.
04/28/20	YES	R	EW 16, 20, 24, 28 and 27	Pumps were inspected, back air fed and resumed pumping.
04/28/20	NO	R	EW 03 and 18	Pumps found inoperable and require replacement.

Additional Comments:

R 002360

Reporting Period: May 2020
Inspection Performed By: Gregory Komperda

Landfill Maintenance Summary

Zion, IL

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
05/05/20	YES	P	EW-64	Repaired air line that was broke off at EW-64.
05/05/20	YES	P	EW-44	Dug up around vacuum riser at EW-44 to find air leak. Found 1" plug out of riser in the dirt. Installed new 1" threaded plug below grade and turned on vacuum to make sure riser was not leaking
05/05/20	YES	P	All Vaults	Inspected, readings taken and recorded.
05/05/20	YES	P	Compressor	Compressor radiator cleaned.
05/14/20	YES	R	1B south	Worked on 1B south riser to see if pump was working. Blew air down bubbler tube for an hour and tube finally opened up.
05/18/20	YES	P	Site 2	Multiple cycle counters repaired/cleaned/replaced
05/18/20	YES	R	Site 2	Sumps inspected
05/27/20	YES	R	EW 22	Pump was inspected, removed, cleaned onsite and reinstalled.
05/27/20	YES	R	EW 20	Pump was inspected, removed, cleaned onsite and reinstalled.
05/28/20	YES	R	EW 16	Pump was inspected, removed, cleaned onsite and reinstalled.

Additional Comments:

R 002361

Reporting Period: June 2020
Inspection Performed By: Gregory Komperda

Landfill Maintenance Summary

Zion, IL

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
06/02/20	YES	P	North Vault	Heater was found permanantly on, was disconncted.
06/02/20	YES	P	Site 2	Multiple cycle counters repaired/cleaned/replaced
06/18/20	YES	R	Compressor	Compressor found to be overheating, radiator was cleaned.
06/18/20	YES	P	Site 2	Multiple cycle counters repaired/cleaned/replaced
06/18/20	YES	R	9th street	Pumps manually cycled and inspected.
06/24/20	YES	R	Sumps	All sumps inspected
06/24/20	YES	R	Site 1A	All wells inspected
06/26/20	NO	R	Compressor	Air issue inspected. Site 1A and sumps had no air supply
06/29/20	YES	R	Compressor	Compressor radiator cleaned, Selenoid diaphram replace on compressor.

Additional Comments:

Reporting Period: July 2020
Inspection Performed By: Gregory Komperda

Landfill Maintenance Summary

Zion, IL

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
07/01/20	YES	P	Compressor	Replaced air switch for 1A pumps.
07/01/20	YES	P	9th street	Cleaned and reinstalled cycle counter.
07/09/20	YES	P	Site 1A	Checked entire landfill for problems. Repaired 5 pumps and returned them to functioning condition.
07/09/20	YES	P	Vaults	Readings taken, vaults inspected.
07/16/20	YES	R	CS-6	Blew out air line, inspected sump.
07/16/20	YES	P	Vaults	Readings taken, vaults inspected.
07/27/20	YES	R	EW 49	Air system repaired.
07/27/20	YES	R	Compressor	Towers drained and inspected, compressor inspected.
07/27/20	YES	R	Site 2	All pumps inspected.
03/31/20	YES	R	Leachate Sumps	Leachate sumps inspected.

Additional Comments:

R 002363

Reporting Period: August 2020
Inspection Performed By: Gregory Komperda

Landfill Maintenance Summary

Zion Landfill
Zion, IL

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
08/05/20	YES	P	Vaults	Recorded vault readings. Checked entire wellfield for problems and leaks. Repaired load out sump pump.
08/05/20	YES	P	Site 2	Checked entire wellfield for problems and leaks. Worked on load out sump pump.
08/10/20	YES	P	Site 1A	Checked entire landfill for problems. Repaired 5 pumps and returned them to functioning condition.
08/10/20	YES	P	Vaults	1B South had pumped nonstop with no starts. Trouble shot CU-300 and pump.
08/11/20	YES	R	Vaults	Pulled pump in Riser 1B South. Pump was packed with rust. Cleaned pump and tested by pumping water.
08/12/20	YES	P	Site 1A	Cut damaged 6" flange off of clean out riser, that was hit by mower, and replace with 6" PVC cap.
08/26/20	YES	R	Compressor	Towers drained and inspected, compressor inspected.
08/27/20	YES	R	Site 2	Changed bad regulators and cycle counters. Pumped down 6 wells with high vacuum.
08/31/20	YES	R	EW 72	Forcemain valve replaced.
08/31/20	YES	R	Sumps	Sumps inspected.

Additional Comments: _____

R 002364

Reporting Period: September 20
Inspection Performed By: Gregory Komperda

Landfill Maintenance Summary

Zion Landfill
Zion, IL

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
09/09/20	NO	P	EW72	Forcemain valve shut off due to leak.
09/09/20	YES	P	Compressor	Towers drained and inspected, compressor inspected.
09/17/20	YES	P	Vaults	Installed new grundfos pump, lead, and bubbler tube in 1B South.
09/17/20	YES	P	Vaults	Trouble shot CU-300 and pump.
09/21/20	NO	R	Vaults	1B North requires relay replacement,
09/21/20	YES	P	Site 1A	Flex hose replacement, multiple wells.
09/21/20	YES	R	Compressor	Towers drained and inspected, compressor inspected.
09/21/20	YES	R	EW72	Forcemain repaired.
09/25/20	YES	R	Sumps	Sumps inspected.
09/25/20	YES	P	Site 1A	All wells inspected

Additional Comments:

R 002365

Reporting Period: October 2020
Inspection Performed By: Gregory Komperda

Landfill Maintenance Summary

Zion Landfill

Zion, IL

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
10/09/20	YES	P	Loadout Pad	Sump pump and basin were cleaned.
10/09/20	YES	P	Condensate Sumps	Condensate sump inspections.
10/13/20	YES	P	Vaults	Changes pump settings on 1B south pump.
10/14/20	YES	P	Compressor	Checked oil in compressor.
10/21/20	YES	P	Vaults	All electric pumps inspected and data recorded.
10/23/20	YES	P	Site 1A	Flex hose replacement for multiple wells.
10/23/20	YES	P	Leachate	9th street pumps inspected.
10/23/20	YES	P	Site 1A	Flex hose replacement for multiple wells.
10/28/20	YES	R	EW66	Pump replaced.
10/28/20	YES	P	SR5	Pump replaced.

Additional Comments:

R 002366

Reporting Period: November 20
Inspection Performed By: Gregory Komperda

Landfill Maintenance Summary

Zion Landfill
Zion, IL

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
11/11/20	YES	P	Site 1A	All pumps inspected and liquid levels measured.
11/11/20	YES	P	Leachate	Condensate sump inspected.
11/13/20	YES	P	Site 2	All pumps inspected and liquid levels measured.
11/13/20	NO	P	Condensate tank	Heat trace found to have issues in condensate tanks in 1A.
11/16/20	YES	P	EW3	4" kanaflex hose replaced.
11/16/20	YES	P	EW9	4" kanaflex hose replaced.
11/18/20	YES	P	Compressor	Checked oil in compressor.
11/18/20	YES	P	Vaults	All electric pumps and vaults inspected and data recorded
11/25/20	YES	R	Comnpressor	Oil checked and filter cleaned.
11/30/20	NO	P	Perimeter Probes	Gas migration monitoring performed.

Additional Comments:

R 002367

Reporting Period: Dec, 2020
Inspection Performed By: Gregory Komperda

Landfill Maintenance Summary

Zion Landfill
Zion, IL

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
12/09/20	YES	P	Sumps	Site IA Sumps were inspected.
12/09/20	YES	P	9th street	9th Street Manhole pumps were inspected and cycle counters tested.
12/09/20	YES	P	Leachate	Leachate basin sump was inspected.
12/14/20	YES	P	Vaults	Vault 1B South inspected and all vaults checked.
12/14/20	YES	R	Vaults	Site 1A vault pumps were inspected.
12/17/20	YES	P	Leachate	All leachate sump pumps were inspected.
12/17/20	YES	R	Compressor	Compressor was inspected.
12/23/20	YES	R	Leachate	Installed valve on 9th street manhole sump due to pump blowing out discharge.
12/22/20	YES	R	Gas System	Site 2 pumps were inspected.
12/23/20	YES	R	Gas System	EW17 air line was repaired.

Additional Comments:

R 002368

QUARTERLY
POST-CLOSURE INSPECTION CHECKLIST FOR
ZION LANDFILL, SITE 1A

Date: 3/25/19 **Time:** 12:30pm **Name (Print):** Gregory Kemperly

Signature:

Weather Conditions: N/A - Maintenance events performed on different days.

Temp., Wind, etc. Partly Cloudy 40°F, Winds 20 mph NE 31% Humidity, 29.6 in pressure Hg

S means satisfactory
U means unsatisfactory

QUARTERLY

S	U	Item
		Leachate Collection System
☑	☐	Leachate headwell levels, total well depth, and pump recordings taken and documented
☑	☐	Leachate collection wells - Inspection for leaks in exposed piping, fittings and valves; vandalism; and settlement of well or surrounding area
☑	☐	Performance of extraction pumps of leachate collection system (poor yield, excess sediment accumulation, poorly operating pump)
		Gas Collection System
☑	☐	Exercise isolation valve on the gas collection header
☑	☐	Exercise manual valve on condensate sumps and pump stations
☑	☐	Leakage on pipe fittings and valves to condensate sumps and pump stations
☐ NA	☐	Enclosed flare - Clean flame scanner viewing window and vent port
☐ NA	☐	Enclosed flare - Inspect solenoid valves
☐ NA	☐	Enclosed flare - Lubricate purge blower fan and motor and louver doors on flare **Maintenance performed on as-needed and/or manufacturer specs basis*
☐	☐	Extraction blowers - Lubricate blower bearings and motor bearings **Maintenance performed on as-needed and/or manufacturer specs basis*
		Gas Collection - Knockout Pot (if applicable)
☐ NA	☐	Remove top of pot and check for corrosion and grime build up **Maintenance performed on as-needed and/or manufacturer specs basis*
☐ NA	☐	Clean demister pad and inside of knockout pot, if necessary **Maintenance performed on as-needed and/or manufacturer specs basis*

Blower building

☑ ☐ Check compressor for maintenance activities (e.g., oil change)

☑ ☐ Check and lubricate building exhaust fans

**Maintenance performed on as-needed and/or manufacturer specs basis*

☑ ☐ Calibrate explosive gas sensor

**Manufacturer recommends testing, not calibration; testing performed as recommended*

(*) Indicates protocol already in place differs from check list. Protocol in place is followed as recommended by manufacturer and/or best management practices.

COMMENTS:

RESPONSE:

QUARTERLY
POST-CLOSURE INSPECTION CHECKLIST FOR
ZION LANDFILL, SITE 1A

Date: 6/7/19 **Time:** 12:00 **Name (Print):** Grayson Kamperda

Signature:

Weather Conditions: N/A - Maintenance events performed on different days.

Temp., Wind, etc. 79°F, Humidity 54% clear Winds NE @ 14mph

S means satisfactory
U means unsatisfactory

QUARTERLY

S	U	Item
		Leachate Collection System
☑	☐	Leachate headwell levels, total well depth, and pump recordings taken and documented
☑	☐	Leachate collection wells - Inspection for leaks in exposed piping, fittings and valves; vandalism; and settlement of well or surrounding area
☑	☐	Performance of extraction pumps of leachate collection system (poor yield, excess sediment accumulation, poorly operating pump)
		Gas Collection System
☑	☐	Exercise isolation valve on the gas collection header
☑	☐	Exercise manual valve on condensate sumps and pump stations
☑	☐	Leakage on pipe fittings and valves to condensate sumps and pump stations
☑	☐	Enclosed flare - Clean flame scanner viewing window and vent port
☑	☐	Enclosed flare - Inspect solenoid valves
☐	NA ☐	Enclosed flare - Lubricate purge blower fan and motor and louver doors on flare **Maintenance performed on as-needed and/or manufacturer specs basis*
☐	NA ☐	Extraction blowers - Lubricate blower bearings and motor bearings **Maintenance performed on as-needed and/or manufacturer specs basis*
		Gas Collection - Knockout Pot (if applicable)
☐	NA ☐	Remove top of pot and check for corrosion and grime build up **Maintenance performed on as-needed and/or manufacturer specs basis*
☐	NA ☐	Clean demister pad and inside of knockout pot, if necessary **Maintenance performed on as-needed and/or manufacturer specs basis*

Blower building

☑ ☐ Check compressor for maintenance activities (e.g., oil change)

☑ ☐ Check and lubricate building exhaust fans
**Maintenance performed on as-needed and/or manufacturer specs basis*

☑ ☐ Calibrate explosive gas sensor
**Manufacturer recommends testing, not calibration; testing performed as recommended*

(*) Indicates protocol already in place differs from check list. Protocol in place is followed as recommended by manufacturer and/or best management practices.

COMMENTS:

RESPONSE:

QUARTERLY
POST-CLOSURE INSPECTION CHECKLIST FOR
ZION LANDFILL, SITE 1A

Date: 9-25-17 **Time:** 10:00 **Name (Print):** Joseph Hitzroth

Signature:

Weather Conditions: N/A - Maintenance events performed on different days.

Temp., Wind, etc. 69°F, Winds SW @ 14mph
0-precip Humidity 80%

S means satisfactory
U means unsatisfactory

QUARTERLY

S	U	Item
		Leachate Collection System
☑	☐	Leachate headwell levels, total well depth, and pump recordings taken and documented
☑	☐	Leachate collection wells - Inspection for leaks in exposed piping, fittings and valves; vandalism; and settlement of well or surrounding area
☑	☐	Performance of extraction pumps of leachate collection system (poor yield, excess sediment accumulation, poorly operating pump)
		Gas Collection System
☑	☐	Exercise isolation valve on the gas collection header
☑	☐	Exercise manual valve on condensate sumps and pump stations
☑	☐	Leakage on pipe fittings and valves to condensate sumps and pump stations
☐	N/A ☐	Enclosed flare - Clean flame scanner viewing window and vent port
☐	N/A ☐	Enclosed flare - Inspect solenoid valves
☐	N/A ☐	Enclosed flare - Lubricate purge blower fan and motor and louver doors on flare **Maintenance performed on as-needed and/or manufacturer specs basis*
☐	N/A ☐	Extraction blowers - Lubricate blower bearings and motor bearings **Maintenance performed on as-needed and/or manufacturer specs basis*
		Gas Collection - Knockout Pot (if applicable)
☐	N/A ☐	Remove top of pot and check for corrosion and grime build up **Maintenance performed on as-needed and/or manufacturer specs basis*
☐	N/A ☐	Clean demister pad and inside of knockout pot, if necessary **Maintenance performed on as-needed and/or manufacturer specs basis*

Blower building

☑ ☐ Check compressor for maintenance activities (e.g., oil change)

☑ ☐ Check and lubricate building exhaust fans
**Maintenance performed on as-needed and/or manufacturer specs basis*

☑ ☐ Calibrate explosive gas sensor
**Manufacturer recommends testing, not calibration; testing performed as recommended*

(*) Indicates protocol already in place differs from check list. Protocol in place is followed as recommended by manufacturer and/or best management practices.

COMMENTS:

RESPONSE:

QUARTERLY
POST-CLOSURE INSPECTION CHECKLIST FOR
ZION LANDFILL, SITE 1A

Date: 12/23/19 **Time:** 12:00 pm **Name (Print):** Gregory Komoroski

Signature: [signature]

Weather Conditions: N/A - Maintenance events performed on different days.

Temp., Wind, etc.

S means satisfactory
U means unsatisfactory

QUARTERLY

S	U	Item
		Leachate Collection System
☑	☐	Leachate headwell levels, total well depth, and pump recordings taken and documented
☑	☐	Leachate collection wells - Inspection for leaks in exposed piping, fittings and valves; vandalism; and settlement of well or surrounding area
☑	☐	Performance of extraction pumps of leachate collection system (poor yield, excess sediment accumulation, poorly operating pump)
		Gas Collection System
☑	☐	Exercise isolation valve on the gas collection header
☑	☐	Exercise manual valve on condensate sumps and pump stations
☑	☐	Leakage on pipe fittings and valves to condensate sumps and pump stations
☐	NA ☐	Enclosed flare - Clean flame scanner viewing window and vent port
☐	NA ☐	Enclosed flare - Inspect solenoid valves
☐	NA ☐	Enclosed flare - Lubricate purge blower fan and motor and louver doors on flare **Maintenance performed on as-needed and/or manufacturer specs basis*
☐	NA ☐	Extraction blowers - Lubricate blower bearings and motor bearings **Maintenance performed on as-needed and/or manufacturer specs basis*
		Gas Collection - Knockout Pot (if applicable)
☐	NA ☐	Remove top of pot and check for corrosion and grime build up **Maintenance performed on as-needed and/or manufacturer specs basis*
☐	NA ☐	Clean demister pad and inside of knockout pot, if necessary **Maintenance performed on as-needed and/or manufacturer specs basis*

Blower building

☑ ☐ Check compressor for maintenance activities (e.g., oil change)

☑ ☐ Check and lubricate building exhaust fans

**Maintenance performed on as-needed and/or manufacturer specs basis*

☑ ☐ Calibrate explosive gas sensor

**Manufacturer recommends testing, not calibration; testing performed as recommended*

(*) Indicates protocol already in place differs from check list. Protocol in place is followed as recommended by manufacturer and/or best management practices.

COMMENTS:

RESPONSE:

Reporting Period: January 2019
Inspection Performed By: G. Komperda

Landfill Maintenance Summary

Zion, IL
CEC Project 180-248

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
01/08/19	N	R	EW66 Not Pumping	Pump stuck, could not remove for maintenance.
01/10/19	Y	R	EW8 Regulator	Regulator found to be leaking. Regulator adjusted.
01/10/19	Y	R	EW9 Regulator	Regulator found to be leaking. Regulator repaired.
01/10/19	Y	R	CS 3 Regulator	Regulator and cycle counter were repaired.
01/16/19	Y	R	EW66 Pump	Pump was replaced with new pump.
01/16/19	Y	R	CS3 Pump	Pump jumped and inspected.
01/22/19	Y	P	All Vaults	1BN,1BS, 2N, 2S pumps checked for operation.
01/22/19	Y	P	CS6 and CS7	Pumps inspected and verified function,

Additional Comments:

Reporting Period: February 2019
Inspection Performed By: G. Komperda

Landfill Maintenance Summary

Zion, IL
CEC Project 180-248

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
02/01/19	Y	P	Site 1A	Pumps checked and jumped. Frozen conditions at site.
02/01/19	Y	P	Site 2 Pumps	Pumps checked and jumped. Frozen conditions at site.
02/04/19	Y	P	9th Street Manhole	Sumps inspected and airlines maintained.
02/04/19	Y	P	Site 1A Sumps	Sumps inspected and pumps jumped.
02/07/19	Y	P	Sumps 1 and 2	Heat tracing was checked.
02/07/19	Y	R	North Vault	Vault flooded. Vault was pumped out. Flooding caused by precipitation.
02/08/19	N	R	North Vault	Inspected for possible leaks.
02/12/19	Y	R	Load Out Pad	Drain not working. Load out pad sump was cleaned.
02/12/19	Y	R	9th Street Manhole	Air leak in manhole, airline was repaired.

Additional Comments: _____

Reporting Period: March 2019
Inspection Performed By: G. Komperda

Landfill Maintenance Summary

Zion, IL
CEC Project 180-248

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
03/01/19	Y	R	EW-33, EW-22, and EW-26	Cycle counter failed and was replaced.
03/01/19	Y	R	EW-11, EW-12A, and EW+25	Cycle counters were replaced.
03/07/19	NA	NA	1st Quarter SEM	Surface emission scan conducted.
03/08/19	Y	R	SR6	Leaky discharge hose was replaced.
03/11/19	Y	R	Air Compressor	Leaky compressor drainage line was replaced.
03/11/19	Y	R	South Vault	South vault was inspected. Breaker was tripped and had to be reset.
03/11/19	Y	R	SR8	Leaky discharge hose was replaced.
03/15/19	Y	R	North Vault	Power issue at vault, power supply to terminal was repaired.
03/15/19	Y	R	Air Compressor	Leak was discovered and repaired at the oil/water separator.
03/18/19	Y	P	Site 2 Pumps	Site 2 pumps were inspected and cycled.
03/26/19	Y	P	Condensate Pumps	Condensate pumps were inspected and cycled.

Additional Comments:

Reporting Period: April 2019
Inspection Performed By: J. Hitzeroth

Landfill Maintenance Summary

Zion, IL
CEC Project 180-248

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
04/10/19	YES	P	Site 1B	Kanaflex replaced and wellheads fixed.
04/10/19	YES	P	Site IA	Kanaflex replaced and wellheads fixed.
04/05/19	YES	R	Site IA	Forcemain valve repaired and air regulator replaced.
04/26/19	YES	P	Site IA Load Out Tanks	Replaced stainless steel valves on load out tanks
04/03/19	YES	P	Site IA	Cycle counters and air regulators were replaced
04/16/19	YES	R	EW-2	Pump at EW-2 was pulled for repairs and replaced.
04/30/19	YES	R	EW-2	Leak at EW-2 was repaired and air regulator installed. Cleaned spill from leak.

Additional Comments: _____

Reporting Period: May 2019
Inspection Performed By: J. Hitzeroth

Landfill Maintenance Summary

Zion, IL
CEC Project 180-248

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
05/09/19	YES	P	EW-26	Installed vacuum jumper on well EW-26.
05/09/19	YES	P	EW-26	Installed new cycle counter on well EW-26.
05/09/19	YES	P	EW-20	Replaced pump at well EW-20.
05/09/19	YES	P	Site IA Wells	Inspected all wells in Site IA for leaks.
05/16/19	YES	P	Site IA Wells	Inspected wells on Site IA.
05/16/19	YES	P	Site IA Kanaflex	Fixed kanaflex lines for wells in Site IA.
05/16/19	YES	P	Site IA Airline/slip boots	Repaired airlines and slipboots in Site IA.
05/17/19	YES	P	Site IA Wells	Inspected remaining wells in Site IA.
05/17/19	YES	P	Site IA Wells	Reinstalled 4 inch flexhose.
05/17/19	YES	P	Site IA Wells	Installed 4 inch fernco cap and tightened four inch clamps.

Additional Comments:

R 002381

Reporting Period: June 20, 2019
Inspection Performed By: G. Komperda

Landfill Maintenance Summary

Zion, IL
CEC Project 180-248

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
06/07/19	YES	P	9th Manhole	Cycle counter was inspected and cleaned.
06/07/19	YES	P	CS3	CS3 regulator was adjusted.
06/07/19	YES	P	EW12	EW12 cleaned and adjusted regulator.
06/13/19	YES	R	EW66	EW66 discharge line repaired.
06/13/19	YES	R	EW41	EW41 pump not pumping. Pump was inspected and is now pumping.
06/13/19	YES	R	EW61	EW61 pump not pumping. Pump was inspected and is now pumping.
06/13/19	YES	R	EW12R	Air restored to EW12R.
06/14/19	YES	P	Site A and Site B Tanks	Vegetation around Site A and Site B tanks was cleared.
06/25/19	YES	R	Leachate Pipe	Leachate line hit by mower was repaired.
06/27/19	YES	R	EW46	Pump was replaced.

Additional Comments:

Reporting Period: July 26, 2019
Inspection Performed By: G. Komperda

Landfill Maintenance Summary

Zion, IL
CEC Project 180-248

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
07/10/19	Yes	P	Site 1B Wellheads	Eight wellheads were replaced with new QED brands.
07/10/19	Yes	P	All Sumps	Inspected and tested all sumps for functionality.
07/10/19	Yes	P	9th Street	Manhole pumps were tested and inspected.
07/18/19	No	R	Site IB N Pump	Electrical diagnosis for Site IB N pump failed. Pump was left off.
07/18/19	Yes	P	Site 2S, 2N, 1B South	Remaining vaults inspected and checked for flow.
07/23/19	Yes	R	1B N Pump	Worked with Blue Flame to run new wiring for 1B.
07/29/19	Yes	P	1B NTS Pumps	Both pumps for 1B were inspected.
07/29/19	No	R	EW 37AA	Pump failed to operate. New parts were ordered for the pump repair.
07/30/19	Yes	R	EW 37AA	Pump repaired and back in operation.

Additional Comments:

R 002383

Reporting Period: August 28, 2019
Inspection Performed By: G. Komperda

Landfill Maintenance Summary

Zion, IL
CEC Project 180-248

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
08/08/19	YES	P	Site 1A	Wells EW-1 through EW-20 pumps were inspected and backjacked.
08/08/19	YES	P	9th Street Manhole	Manhole was inspected, no issues noted.
08/08/19	YES	P	Site 1A and 1B Leachate Pad	Sump at loadout pad inspected.
08/15/19	YES	R	EW-38	Pump pulled and repaired.
08/15/19	NO	R	North Vault	Hours are not being registered on vault pump.
08/15/19	YES	P	All Vaults	All vaults were inspected, no issues noted.
08/22/19	NO	R	North Vault	Vault was inspected with a camera, no issues noted.
08/22/19	YES	R	EW-51	Forcemain leak repaired.
08/28/19	YES	R	North Vault	Follow-up inspection, no issues noted.
08/28/19	YES	R	All Vaults	New air pumps installed for Magnahelics.

Additional Comments:

Reporting Period: September 25, 2019
Inspection Performed By: G. Komperda

Landfill Maintenance Summary

Zion, IL
CEC Project 180-248

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
09/06/19	Yes	R	IBS Vault	Vault settings checked and pump recalibrated.
09/06/19	Yes	P	Compressor	Compressor was inspected and field checked for leaks.
09/10/19	Yes	P	9th St. Pump	Pump in manhole was inspected.
09/10/19	No	P	Site 1A Sumps	All sumps inspected.
09/17/19	Yes	P	Site 2 Sumps	All sumps inspected.
09/17/19	Yes	P	Site 2 Wells	All wells inspected and checked.
09/24/19	Yes	R	Well EW-10	Valve for EW-10 was replaced.
09/24/19	No	P	Site 2 N and S Vaults	Vaults were inspected.
09/25/19	Yes	P	Compressor	Compressor was blown out.
09/25/19	Yes	P	Sump 1 and 2	Sumps 1 and 2 were inspected and heat trace was inspected.

Additional Comments:

Reporting Period: October 10, 2019
Inspection Performed By: G. Komperda

Landfill Maintenance Summary

Zion, IL
CEC Project 180-248

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
10/03/19	Yes	R	Site 2 N Vault	Vault at Site 2, North Vault flooded due to heavy rain. Vault was drained and returned to running status.
10/03/19	Yes	R	1B Pump	Pump at 1B malfunctioned. Control box for 1B programming was checked. Pump returned to running status.
10/09/19	No	R	1B Pump	Pump failure at 1B. Pump pulled for maintenance.
10/09/19	No	R	1B Riser	New fitting welded to discharge on riser.
10/10/19	Yes	R	1B Riser	Completed welding on riser. Pump installed and returned to running status.
10/10/19	Yes	R	Site 1B	Pumps were all jumped and restarted during leachate level monitoring.
10/17/19	No	R	1B Pump	Pump failed and pulled. New pump will need to be ordered.
10/17/19	Yes	P	1A Non Haz Tank	Heat trace checked for leachate tank.
10/22/19	No	R	Air Compressor	Compressor shut down. Electrical components checked. Called contractor.
10/29/19	Yes	P	1A Pumps	Pumps were inspected during leachate level monitoring and jump started.
10/30/19	Yes	P	Site 2 Pump	Pump were inspected during leachate level monitoring and jump started.

Additional Comments: _____

Reporting Period: November 27, 2019
Inspection Performed By: G. Komperda

Landfill Maintenance Summary

Zion, IL
CEC Project 180-248

Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
11/05/19	Yes	P	Site 1B leachate tank	Float shutoff system was inspected for operation.
11/06/19	Yes	P	All Sumps	Inspected and tested all sumps for functionality.
11/06/19	Yes	P	9th Street	Manhole pumps were tested and inspected.
11/14/19	Yes	P	Site 2S, 2N, 1B South	Vaults inspected and checked for flow.
11/14/19	Yes	P	Entire Site	Surface Emissions scans were performed. No exceedances
11/18/19	Yes	P	Compressor	Inspected, oil checked and radiator blown out.
11/18/19	Yes	R	Site IB N Pump	New Seal-tight was installed. Wiring was inspected and repaired.
11/20/19	No	R	EW 37AA	Pump failed to operate. New parts were ordered for the pump repair.
11/25/19	Yes	P	All Sumps	Inspected and tested all sumps for functionality.
11/25/19	Yes	R	Site IB N Pump	New pump installed, wire installed, bubbler tube installed
11/27/19	Yes	R	Entire Site	Gas Migration monitoring conducted. No exceedances

Additional Comments:

R 002387

Reporting Period: December 23, 2019
Inspection Performed By: G. Komperda

Landfill Maintenance Summary

Zion, IL
CEC Project 180-248

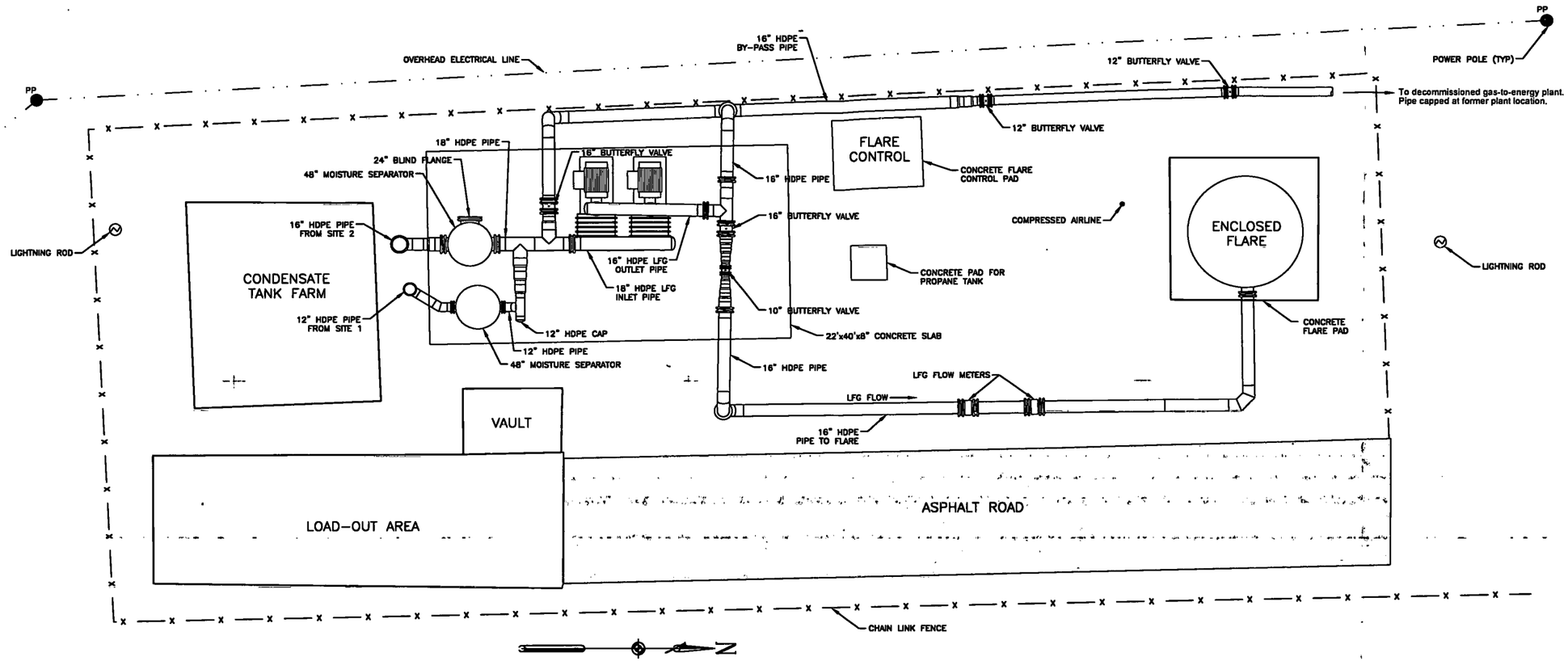
Civil & Environmental Consultants, Inc.

Date	System Repaired	Proactive/ Reactive	Diagnosis of Problem Causing Reactive Action	Corrective Action / Description of Maintenance Performed
12/10/20	Yes	P	9th Street	Manhole pumps were tested and inspected.
12/10/20	Yes	P	Pump 1B North	Heat trace and insulation installed.
12/17/20	Yes	P	Site 1A	Pumps inspected and jumped.
12/17/20	Yes	P	Site 2	Pumps inspected and jumped.
12/23/20	Yes	P	9th Street	Manhole pumps were tested and inspected.
12/23/20	Yes	P	Entire Site	Valves Exercised, site inspections conducted.
12/30/20	Yes	R	Compressor	Inspected, oil checked and radiator blown out.
12/30/20	No	R	Site 2S, 2N, 1B South	Vaults inspected and checked for flow.

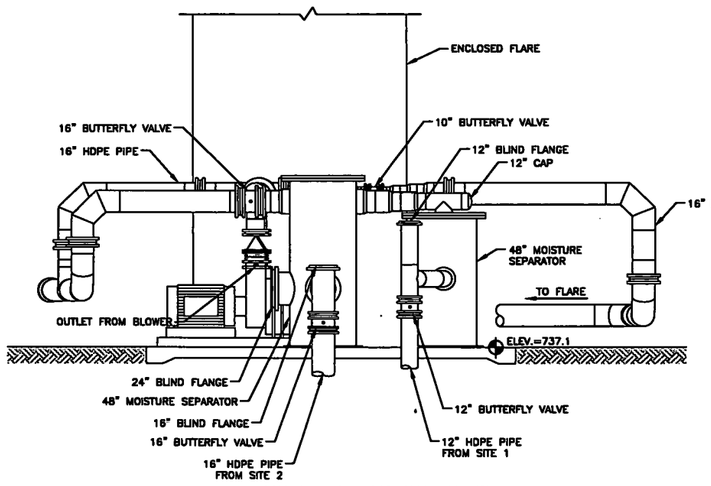
Additional Comments:

Appendix E-19

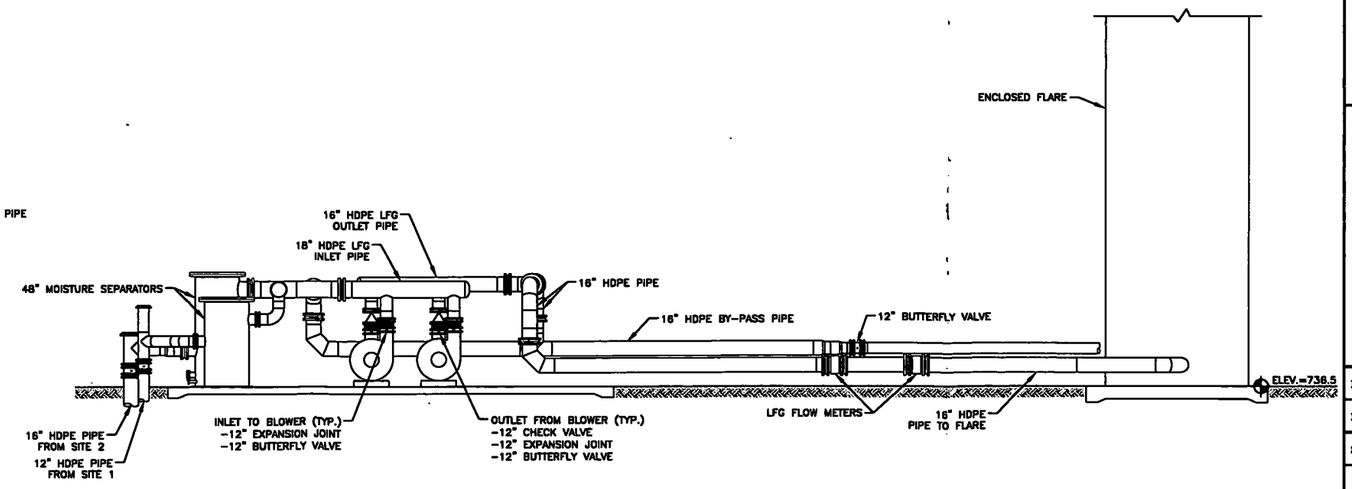
Blower Building and Flare Drawing



PLAN VIEW
SCALE: 1"=6'



SOUTH ELEVATION VIEW
SCALE: N.T.S.



EAST ELEVATION VIEW
SCALE: N.T.S.

R 002390

RELEASE	DATE:	BY:
Project Review		
5		
4		
3		
2		
1		
NO.	DATE:	BY:
DESCRIPTION		
REVISIONS		

VEOLIA ENVIRONMENTAL SERVICES

CQM, Inc.
Construction Quality Management
2778 Manitowoc Road, Suite A
Green Bay, WI 54311

Blower Building and Flare As-Built

Construction Documentation Drawings
2007 Composite Cover & LFG System
Veolia ES Zion Landfill
Zion, Illinois

DRAWN BY: WBE
DATE: March 2008
SCALE: As Shown
DRAWING NO.
A-14

Appendix E-20

Gas Monitoring Plan

File 0120-37-01
March 2021

GAS MONITORING PLAN
ZION LANDFILL
SITE 1, PHASE A

RCRA ID Number: ILD 980700728

RCRA Permit No. B-23R

GAS MONITORING PLAN
ZION LANDFILL, SITE 1A

TABLE OF CONTENTS

LIST OF ATTACHMENTS

1.0 INTRODUCTION

The Zion Landfill is located at 9th Street and Green Bay Road in Zion, Lake County, Illinois. The portion of the facility regulated under a RCRA Part B Post-Closure Permit is known as "Site 1, Phase A" (Site 1A). The most recent version of the Post-Closure Permit Application submitted to the Illinois Environmental Protection Agency (EPA) for review is dated May 2021.

Although a Gas Monitoring Plan is not required by the applicable regulations contained in 35 IAC Parts 702, 703, 705 and 720 through 729, because a sufficient volume of municipal solid waste is believed to have been disposed within Site 1A, perimeter gas monitoring has been occurring under the Effective Permit, originally issued by Illinois EPA in 2011.

The following Gas Monitoring Plan is intended to be implemented as part of post-closure activities at Site 1A. It has been prepared in general accordance with Section 3.3.A the Illinois Environmental Protection Agency (EPA) guidance document, "Informational Requirements for Leachate and Gas Control Systems at Certain Landfills at RCRA Facilities". This Plan is designed to monitor the buildup and composition of landfill gas.

2.0 GAS MONITORING SYSTEM

2.1 Likely Gas Migration Paths

The uppermost soil units at the facility are comprised of various glacial morainal deposits and interglacial deposits of lacustrine and fluvial depositional environments. The moraine deposits consist of clayey brown to gray till. The higher energy lacustrine and fluvial depositional environments resulted in deposition of coarser grained sand and gravel units within the finer grained till matrix.

Boring logs from the gas probes and groundwater monitoring wells historically installed at the facility indicate that the majority of the soils within approximately 100 feet of the ground surface are comprised of clay and silty clay. The laterally continuous uppermost aquifer for purposes of post-closure groundwater monitoring at the facility is located within the unconsolidated glacial deposits and is known as the "shallow drift aquifer". It is located at approximately 100 feet below ground surface. While not laterally continuous, other coarser sand and gravel units are sporadically located above the shallow drift aquifer, beginning at a depth of approximately 20 feet below ground surface. At depths below approximately 20 feet below ground surface, these sand and gravel units tend to be saturated. These saturated shallower units are also monitored as part of the post-closure groundwater monitoring program at the facility. At depths shallower than approximately 20 feet below ground surface, these sand and gravel units tend to be unsaturated.

The report documenting the completion of the installation of the final cover system at the facility was submitted to Illinois EPA in February 1998. The existing final cover layer at the facility is comprised of clay, geomembrane, geocomposite, protective soil, and top soil. The final cover is designed to limit direct exposure with the waste materials, minimize liquid infiltration, and minimize vertical gas migration from the underlying waste materials. Consequently, subsurface landfill gas is expected to migrate laterally to the more porous coarser grained unsaturated soil units intersecting with the landfill. It is these unsaturated coarser grained units that are believed to represent the most likely gas migration pathways from the facility. Landfill gas produced within the upper layers of the waste may be more inclined to migrate vertically and therefore the following Plan also includes surface monitoring within the waste footprint.

2.2 Physical Components of Gas Monitoring System

2.2.1 Devices Within Waste Unit

The gas monitoring within the waste unit performed in accordance with this Plan will be limited to surface scanning along a pre-determined grid. Consequently, no physical components are associated with gas monitoring within the waste unit. The scope of the gas monitoring within the waste unit is presented below in Section 3.1.

2.2.2 Below Ground Devices Around The Unit

A series of gas monitoring probes have been installed around the perimeter of Site 1A. The location of the gas monitoring probes is show on **Figure 1**. The gas monitoring devices are placed at intervals and elevations around the perimeter of the waste to provide a representative sampling of the composition and buildup of gases in the area adjacent to Site 1A. Construction diagrams providing the as-built details for these gas monitoring devices are presented in **Attachment 1**, along with boring logs providing a description of the subsurface soil materials encountered during the installation of the gas monitoring devices. The gas monitoring points are screened in the most likely subsurface gas migration pathway, comprised of the unconsolidated sand and gravel unit located at approximately 20 feet below ground surface.

The devices are constructed from polyvinyl chloride (PVC) and will allow for the collection of a representative sample of gas. The gas monitoring points are designed and constructed to measure pressure and to minimize gas leakage. The gas monitoring system does not interfere with the operation of the liner, leachate collection system, or have an impact on the schedule for installation of the final cover system. The final cover system has already been installed and the documentation report was submitted to the Illinois EPA in February 1998.

2.2.3 Ambient Air Monitoring

Ambient air monitoring will be conducted during the post-closure care period, as described below in Section 3.2, however there are no physical components associated with ambient air monitoring. The monitoring will be performed with instrumentation needed to obtain the gas measurements referenced below in Section 3.2.

2.2.4 Air Devices Within Buildings

Presently, the on-site building located closest to the waste boundary is the Blower Building located approximately 650 feet west of the facility waste boundary. This building is only occasionally occupied, when maintenance and/or monitoring activities need to be performed on

the blower equipment. Given the distance from the waste boundary and occasional human occupancy, methane monitoring within this building will only be initiated in the event of a confirmed exceedance at the perimeter gas monitoring probe located nearest the building (i.e., GP-10) and monitoring will only be required when the building is occupied. Monitoring may take the form of personal gas monitoring devices.

3.0 SCOPE OF GAS MONITORING ACTIVITIES

Gas monitoring activities at Zion Landfill Site 1A will be comprised of the following components:

1. Monitoring within the waste unit;
2. Monitoring from existing below ground devices around the perimeter of the unit; and
3. Ambient air monitoring around the perimeter of the unit.

The following provides additional details pertaining to each of the above monitoring programs.

3.1 Monitoring Within Waste Unit

Air within the waste unit will be monitored in accordance with the Title V Clean Air Act Permit Program (CAAPP) Permit No. 097200AAV.

3.2 Gas Probe Monitoring

The existing gas monitoring probes outside the waste boundary will be monitored on an annual basis for the following parameters:

- Pressure;
- Temperature;
- Methane;
- Oxygen; and
- Carbon Dioxide.

Procedures for responding to a gas exceedance are presented below in Section 4.2.

The gas probe monitoring results will be reported within an Annual Report submitted to the Illinois EPA by March 1 the following year.

3.3 Ambient Air Monitoring

Ambient air monitoring for methane will also take place at the Zion Site 1A facility on an annual basis. The ambient air monitoring will be comprised of the following:

1. Monitoring three locations downwind of Site 1A; and

2. Monitoring for at least one location upwind of Site 1A.

Ambient air monitoring will not be performed if the maximum sustained wind speed in proximity of the facility is greater than 10 miles per hour. The downwind locations must be at least 100 feet downwind of the edge of the refuse or at the property line, whichever is closer. The upwind monitoring point(s) will be utilized to evaluate whether a potential source(s) upwind of Site 1A are impacting the monitoring results. These points may be particularly important at this facility, given the fact that other waste disposal facilities are located near Site 1A. The monitoring locations should be clearly documented on a site map and be consistent, depending upon wind direction. The Ambient Gas Monitoring form included in **Attachment 2** should be completed each time ambient air monitoring is conducted.

The ambient air monitoring results will be submitted to Illinois EPA with the above referenced Annual Report by March 1 the following year.

4.0 RESPONSE TO GAS MONITORING EXCEEDANCE

4.1 Monitoring Within Waste Unit

A measurement of 500 parts per million or more above background at any location will be recorded as a monitored exceedance. Corrective action(s) will be taken by adjusting the vacuum of the adjacent wells to increase gas collection in the vicinity of the exceedance and re-monitoring within 10 calendar days. If there is a second exceedance, then additional adjustments will have to be made and re-monitoring conducted within 10 days. If there is a third exceedance at the same location, then permittee must re-monitor within 1-month from initial exceedance. If the exceedance continues to be present, then a new well(s) or other collection device must be installed within 120 days of initial exceedance or an alternative remedy, such as upgrading the blower, header pipes or control device must be installed within a specified timeframe.

The above procedures are in accordance with the Title V CAAPP Permit for the facility referenced above.

4.2 Perimeter Probes and Ambient Monitoring

For purposes of the perimeter probes and ambient monitoring discussed above in Sections 3.2 and 3.3, any of the of the following will be considered a preliminary gas monitoring exceedance:

1. A methane concentration greater than 50% of the lower explosive limit (LEL) in air attributable to Site 1A detected in any of the below ground monitoring devices outside the waste boundary;
2. A methane concentration greater than 50% of the LEL in air at a downwind ambient location attributable to Site 1A detected during ambient air monitoring; or
3. Malodor attributable to Site 1A is detected beyond the property boundary.

If any of the above occurrences are observed, permittee has the option of conducting additional gas monitoring to verify the initial result. The additional monitoring will be comprised of monthly sampling for a period of at least 6 months following the initial occurrence. If the initial concentrations are consistently observed during the verification period, then within 90 days of the date of verification, a permit modification shall be submitted with a proposal to address the condition(s).

The monthly gas monitoring would not need to be performed if permittee submits a proposal to address the condition(s) within 90 days of the identification of the initial exceedance.

If malodor attributed to Site 1A is detected beyond the property boundary, then the condition must be documented for an extended time period before additional action will be undertaken.

FIGURES

out takes from "original" copy 23rd Zion 10/11/24 revisions B-23C-M-8

GP-4

GP-3

GP-2

GP-10

GP-9

SITE 1
PHASE A
(RCRA FACILITY)

LEGEND

GP-2 APPROXIMATE GAS PROBE LOCATION

PROPERTY BOUNDARY

WASTE MANAGEMENT BOUNDARY

POINT OF COMPLIANCE

SOURCE: LAND CONTOURS BASED UPON AERIAL SURVEY PERFORMED APRIL 2020, BY TETRA TECH.

APPROXIMATE GRAPHIC SCALE

400 0 200 400 800

1 inch = 400 ft.

N

PREPARED FOR:

ZION LANDFILL

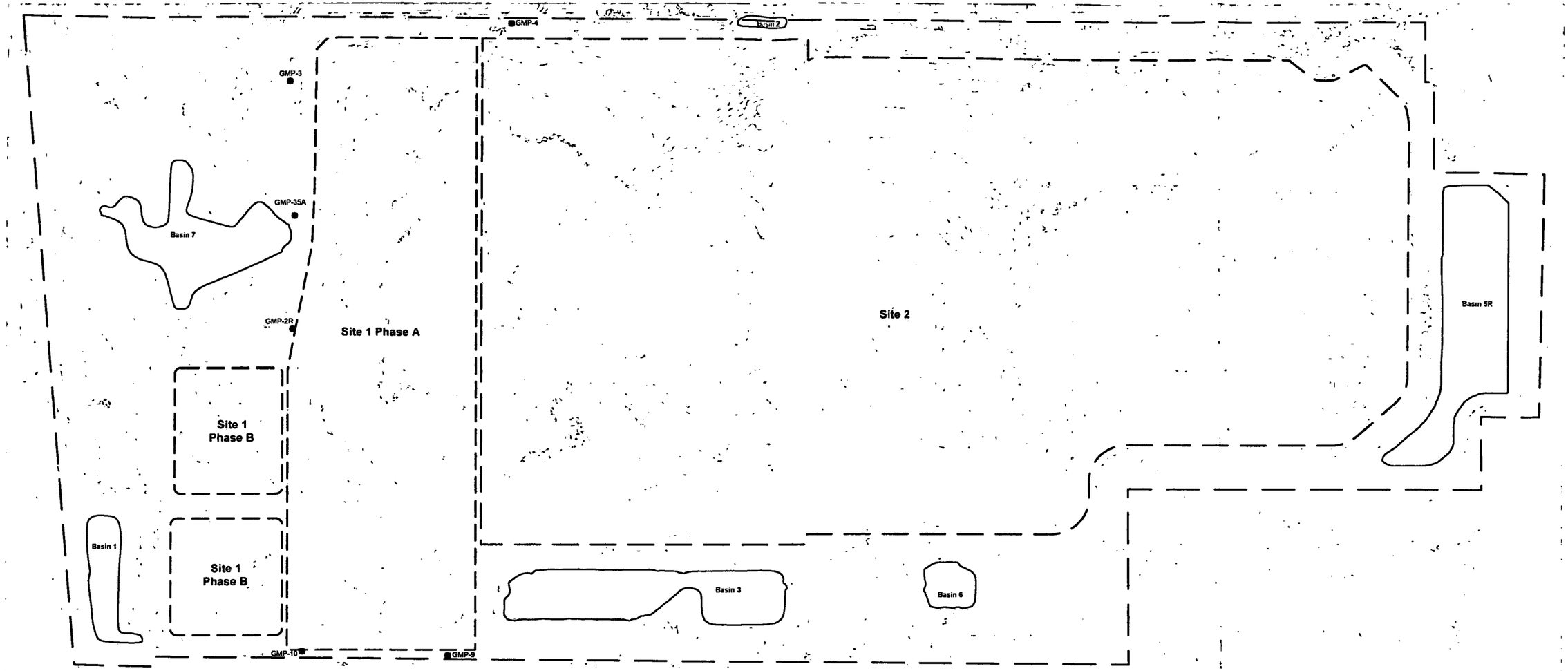
GAS PROBE LOCATION MAP

SITE 1 - PHASE A
POST-CLOSURE PERMIT APPLICATION
LAKE COUNTY, ZION, IL

Weaver Consultants Group
CHICAGO, ILLINOIS
(312) 922-1030 www.wcgrp.com

DRAWN BY:	RMD
REVIEWED BY:	MM
DATE:	2/22/2021
FILE:	0120-037-10
CAD:	GASPROBE.dwg

FIGURE 1



Legend:

GMP-3 — Landfill Gas Perimeter Probe - Zion Site 1 Phase A Landfill

GMP-10 — Landfill Gas Perimeter Probe - Zion Sites 1 Phases A and B Landfills

GMP-9 — Landfill Gas Perimeter Probe - Zion Sites 1 Phase A and Zion Landfills

Facility Boundary

Waste Boundary

IEPA - DIVISION OF RECORDS MANAGEMENT
RELEASABLE

JUN 27 2025

REVIEWER: MCD

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N

0 200 400
SCALE: 1" = 400'

PREPARED BY
EIL ENVIRONMENTAL INFORMATION LOGISTICS, LLC

PREPARED FOR
BFI Waste Systems of North America, LLC

Drawing 1

Perimeter Landfill Gas Monitoring Probe Locations

Zion Landfill
Zion, Illinois

990403

2024-10-04

ATTACHMENT 1

Boring Logs and Gas Probe Construction

LOG OF BORING

R 002406

PROJECT: BFI - Gas Probes, Winthrop Harbor Landfill

BORING NO.: GP-2

DRILLER: Patrick Engineering START: 2/28/89 COMPLETE: 2/28/89

SHEET: 1 OF 2

RIG: CME-75 LOCATION: N 11362.05, E 8657.34

GROUND EL.: 758.9 W.L. & TIME:

LOG	ELEV.	DEPTH (ft.)	SOIL DESCRIPTION	SAMPLE TYPE & NO. / DEPTH (ft.) / RECOV. (in.)	SPT	WC %	q_u (tsf)	NOTES & TEST RESULTS
	758.9	0.0						Advanced borehole using 4-1/4" I.D. HSA.
			Brown gray black and red mixed silty clay, trace to and coarse to fine sand, trace to some coarse to fine gravel, very stiff to hard, low plasticity, dry to moist, fill CL	SS-1 1.0-2.5 8"R	3 5 7		Frozen	
				SS-2 2.5-4.0 14"R	4 13 12		4.5+*	
				SS-3 4.0-5.5 18"R	8 12 14		4.0*	
				SS-4 5.5-7.0 18"R	8 13 22		4.5+*	
				SS-5 7.0-8.5 18"R	11 16 27		4.5+*	
				SS-6 8.5-10.0 18"R	12 18 20		4.5+* 4.5+*	
				SS-7 10.0-11.5 18"R	6 16 23		4.5+*	
				SS-8 11.5-13.0 18"R	8 9 13		4.5+*	
				SS-9 13.0-14.5 18"R	7 9 12		3.3+*	
				SS-10 14.5-16.0 18"R	4 8 11		2.6*	
	742.9	16.0	A) Gray silty clay, little to some coarse to fine sand, little coarse to fine gravel, stiff to very stiff, low plasticity, moist CL B) Interbedded with gray clayey silt, trace medium to fine sand, well graded, medium dense, saturated ML	SS-11A,B 16.0-17.5 18"R	3 5 8		2.2*	
				SS-12 17.5-19.0 18"R	4 6 9		1.8*	
				SS-13 19.0-20.5 18"R	4 6 8		1.5*	

PATRICK ENGINEERING INC LOGGED BY: GGS JOB NO.: D178 (b154/D178)

LOG OF BORING

R 002407

PROJECT: BFI - Gas Probes, Winthrop Harbor Landfill

BORING NO.: GP-2

DRILLER: Patrick Engineering START: 2/28/89 COMPLETE: 2/28/89

SHEET: 2 OF 2

RIG: CME-75 LOCATION: N 11362.05, E 8657.34

GROUND EL.: 758.9 W.L. & TIME:

LOG	ELEV.	DEPTH (ft.)	SOIL DESCRIPTION	SAMPLE TYPE & NO. / DEPTH (ft.) / RECOV. (in.)	SPT	WC %	q_u (tsf)	NOTES & TEST RESULTS
	738.9	20.0						
				SS-14	4			
				20.5-22.0	6		1.7*	
				18"R	11			
	736.9	22.0	End of Boring at 22.0'					

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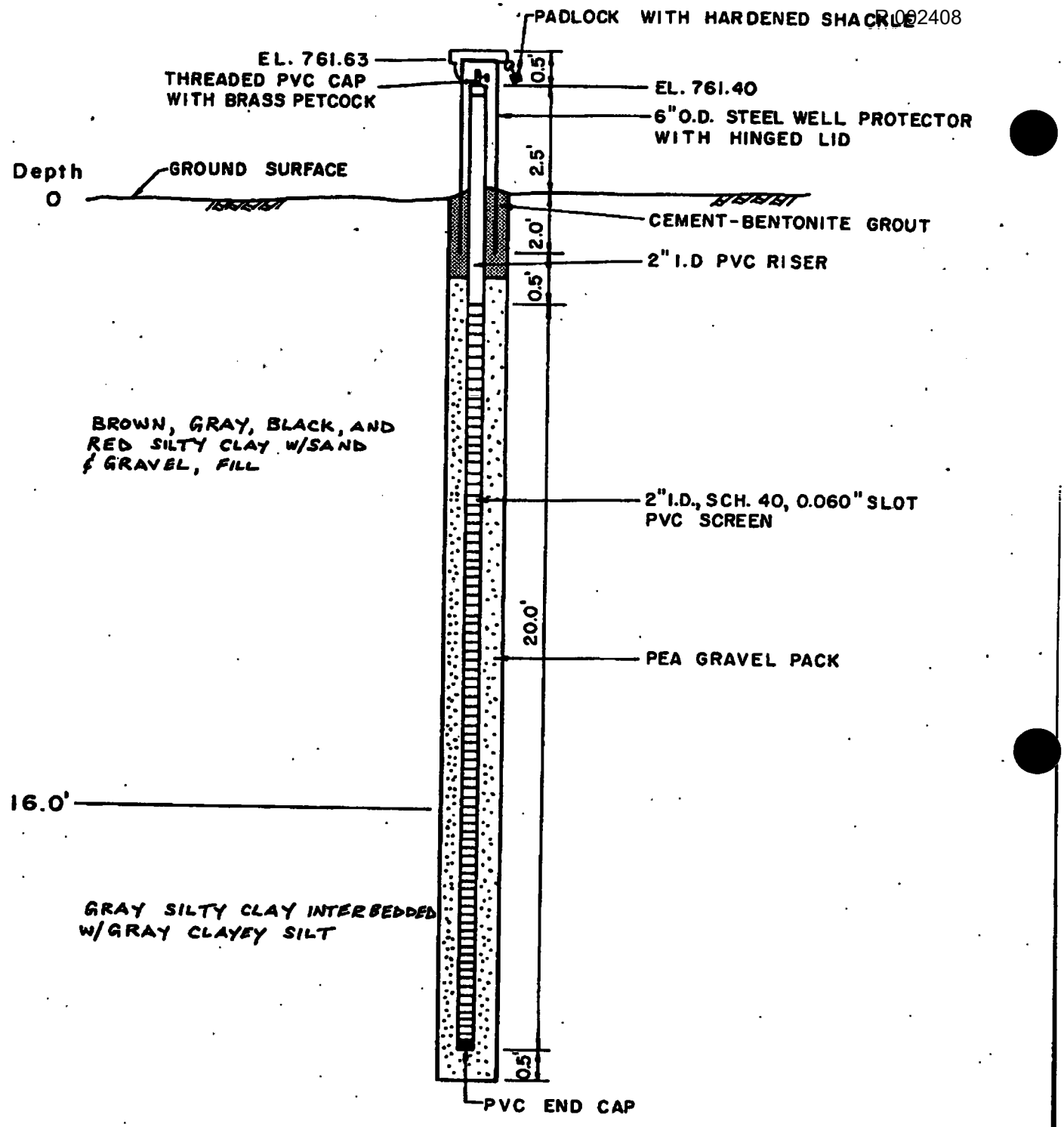

NOT TO SCALE

BFI WINTHROP HARBOR LANDFILL

DATE: FEB. 28, 1989 | JOB NUMBER D178

METHANE PROBE NO.
GP-2

PATRICK ENGINEERING INC.
Engineers • Architects • Hydrologists
Geologists • Surveyors
Glen Ellyn, Illinois

Civil & Environmental Consultants, Inc.
1230 E. Diehl Road, Suite 200
Naperville, Illinois 60563
Telephone: 630-963-6026

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RING NUMBER GP-02R

CLIENT Republic Services, Inc.
PROJECT NUMBER 170-226.2403
DATE STARTED 9/24/24 COMPLETED 9/24/24
DRILLING CONTRACTOR TSC
DRILLING METHOD HSA with Auto Hammer
CEC REP VM CHECKED BY MCM
NOTES

s Probe Installation
lay Road, Zion, Illinois
BACKFILL
WHILE DRILLING NE
AT END OF DRILLING NE
AFTERDRILLING ---

Elevation (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
		Brown and gray silty CLAY, trace sand, moist, hard	0	SS 1	80	3-5-7-10 (12)	4
760				SS 2	75	7-9-9-10 (18)	4.5
		Gray and tan CLAY, moist, stiff	5	SS 3	90	4-6-7-9 (13)	2
				SS 4	95	3-5-7-7 (12)	1.5
755		Gray silty CLAY, trace sand, trace gravel, moist, soft		SS 5	38	4-7-7-10 (14)	0.5
		Brown to gray silty CLAY, trace sand, moist, hard	10	SS 6	95	4-6-11-14 (17)	4.5
750				SS 7	100	4-6-13-17 (19)	
			15	SS 8	90	7-13-13-12 (26)	3
				SS 9	95	4-7-13-16 (20)	4
745		Gray silty CLAY, moist, soft		SS 10	80	2-5-5-7 (10)	3
			20				

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ UCS (tsf) ☐
1 2 3 4

(Continued Next Page)

GEOTECH - MDJ 170-226.GPJ GEOTECHDATA.GDT 9/27/24

Civil & Environmental Consultants, Inc.
1230 E. Diehl Road, Suite 200
Naperville, Illinois 60563
Telephone: 630-963-6026

BORING NUMBER GP-02R

CLIENT Republic Services, Inc. **PROJECT NAME** Zion LF O&M Gas Probe Installation

PROJECT NUMBER 170-226.2403 **PROJECT LOCATION** 701 Green Bay Road, Zion, Illinois

Elevation (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
		Gray silty CLAY, moist, very stiff	20				
				SS 11	100	3-5-7-8 (12)	2.5
740				SS 12	80	3-5-7-5 (12)	3.5
			25	SS 13	89	3-5-5-6 (10)	2
		End of boring at 26.1 feet.					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ UCS (tsf) ☐
1 2 3 4

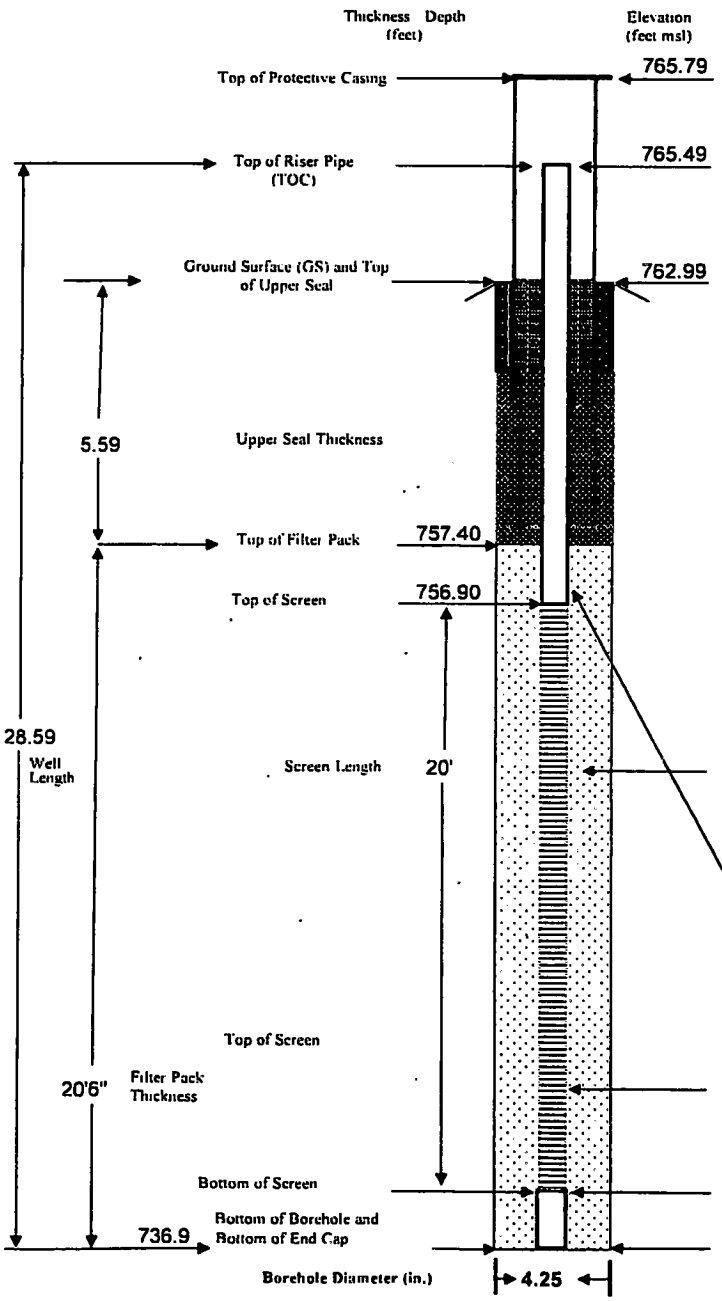
GEOTECH - MDJ 170-226.GPJ GEOTECHDATA.GDT 9/27/24

GAS PROBE CONSTRUCTION DIAGRAM

Site Name:	Zion Landfill	**Project Number:**	170-226-2403	**Probe ID:**	GP-02R
Northing:	2118882.873 (feet)	**Drilling Contractor:**	TSC	**Ref. Boring ID:**	
Easting:	1106185.97 (feet)	**Driller's Name:**	Jim Wilson	**Drilling Dates:**	9/24/2024
GS Elevation:	762.99 (feet msl)	**CEC Inspector:**	Vincent Morales	**Probe Completion Dat**	9/24/2024

Drilling Method: Hollow Stem Auger 4 1/4"

Drilling Fluids: N/A



Protective Casing

Material Type	Anodized Aluminium	Vented (Y/N)	N
Diameter (in)	4"	Locked (Y/N)	Y
Length (ft)	6'	Key No	N/A
Cap Type:	Aluminium	Vented (Y/N)	N

Surface Seal Type: Cement at surface

Material Volume: 1 bag

Sonotube® Used for Forming (Y / N): N/A Diameter (in)

Upper Seal Type: Bentonite

Material Volume: 2 bags (40 lbs ea)

Hydration Water Vol: 5 gal Hydr Time: 10 min

Grout Type: N/A

Material Volumes: lbs of

lbs of

Gallons of Water

= Total Gallons of Grout

Manufacturer / Supplier

Lower Seal Type: N/A

Material Volume

Hydration Water Vol. Hydr Time

FILTER PACK

Secondary Fine Sand Filter Pack (Y / N): N

Fine Sand Type

Fine Sand Volume(lbs)

Manufacturer / Supplier

Primary Filter Pack

Filter Sand Type: Pea Gravel

Filter Sand Volume(lbs): 20 bags

Manufacturer / Supplier

Probe Riser Pipe	Pipe ID (in)	2.049	Pipe OD (in)	2 3/8
Pipe Material Type	PVC		Pipe Schedule	40
Pipe Joint Type	Flush Threaded with O-Rings			
Length / Section (ft)	10.0		No. of Sects	1

Length of any "Partial" Section (ft): 8.59

Total Riser Pipe Length (ft): 8.59

Manufacturer / Supplier: Johnson Screens

Probe Screen	Scrn ID (in)	2.049	Scrn OD (in)	2 3/8
Material Type	PVC		Scrn Schedule	40
Scrn Slot Size (in.)	0.010		No Slots/ft	
Length per Screen Section (ft):	10.0		No of Sects	2

Total Slotted Length of Screen (ft): 20.00

Manufacturer / Supplier: Monoflex

Bottom Cap Type: PVC Length (ft.)

Total Gas Probe Length (feet) : 28.59

Drilling/Const. Water Source: N/A

Static Water Level in Probe (Below TOC ft.): N/A (feet msl) = N/A

Notes:

LOG OF BORING

R 002412

PROJECT: BFI Gas Probes, Winthrop Harbor Landfill
DRILLER Patrick Engineering START: 11/09/88 COMPLETE: 11/10/88
RIG: CME-55/TRUCK LOCATION: N 12362.20, E 8666.82
GROUND EL.: 762.1 W.L. & TIME:

BORING NO.: GP-3
SHEET: 1 OF 2

LOG	ELEV.	DEPTH (ft.)	SOIL DESCRIPTION	SAMPLE TYPE & NO. / DEPTH (ft.) / RECOV. (in.)	SPT	WC %	q_u (tsf)	NOTES & TEST RESULTS
	762.1	0.0	Brown and gray mixed silty clay, little to some coarse to fine sand, trace to little coarse to fine gravel, stiff to hard, low plasticity, moist, fill CL					Advanced borehole using 4-1/4" I.D. HSA.
				SS-1 1.0-2.5 18"R	19 14 11		Frozen	
				SS-2 2.5-4.0 12"R	7 6 7		1.3*	
				SS-3 4.0-5.5 14"R	5 11 17		4.5+*	
				SS-4 5.5-7.0 18"R	10 17 25		4.5+*	
				SS-5 7.0-8.5 18"R	11 19 27		4.5+*	
				SS-6 8.5-10.0 18"R	9 17 24		4.5+*	
				SS-7 10.0-11.5 18"R	7 15 23		4.5+*	
				SS-8 11.5-13.0 18"R	10 14 24		4.5+*	
				SS-9 13.0-14.5 18"R	11 18 27		4.5+*	
	747.6	14.5	Brown silty clay, little coarse to fine sand, little coarse to fine gravel, hard, low plasticity, moist CL	SS-10 14.5-16.0 18"R	12 24 29		4.5+*	
				SS-11 16.0-17.5 18"R	11 22 29		4.5+*	
				SS-12 17.5-19.0 18"R	10 18 20		4.5+*	
	742.6	19.5	Gray silty clay, little coarse to fine sand, little coarse to fine gravel, very stiff, low plasticity, moist CL	SS-13A,B 19.0-20.5 18"R	6 8 12		3.7*	

PATRICK ENGINEERING INC

LOG OF BORING

R 002413

PROJECT: BFI Gas Probes, Winthrop Harbor Landfill — BORING NO.: GP-3

DRILLER Patrick Engineering — START: 2/28/89 — COMPLETE: 2/28/88 — SHEET: 2 OF 2

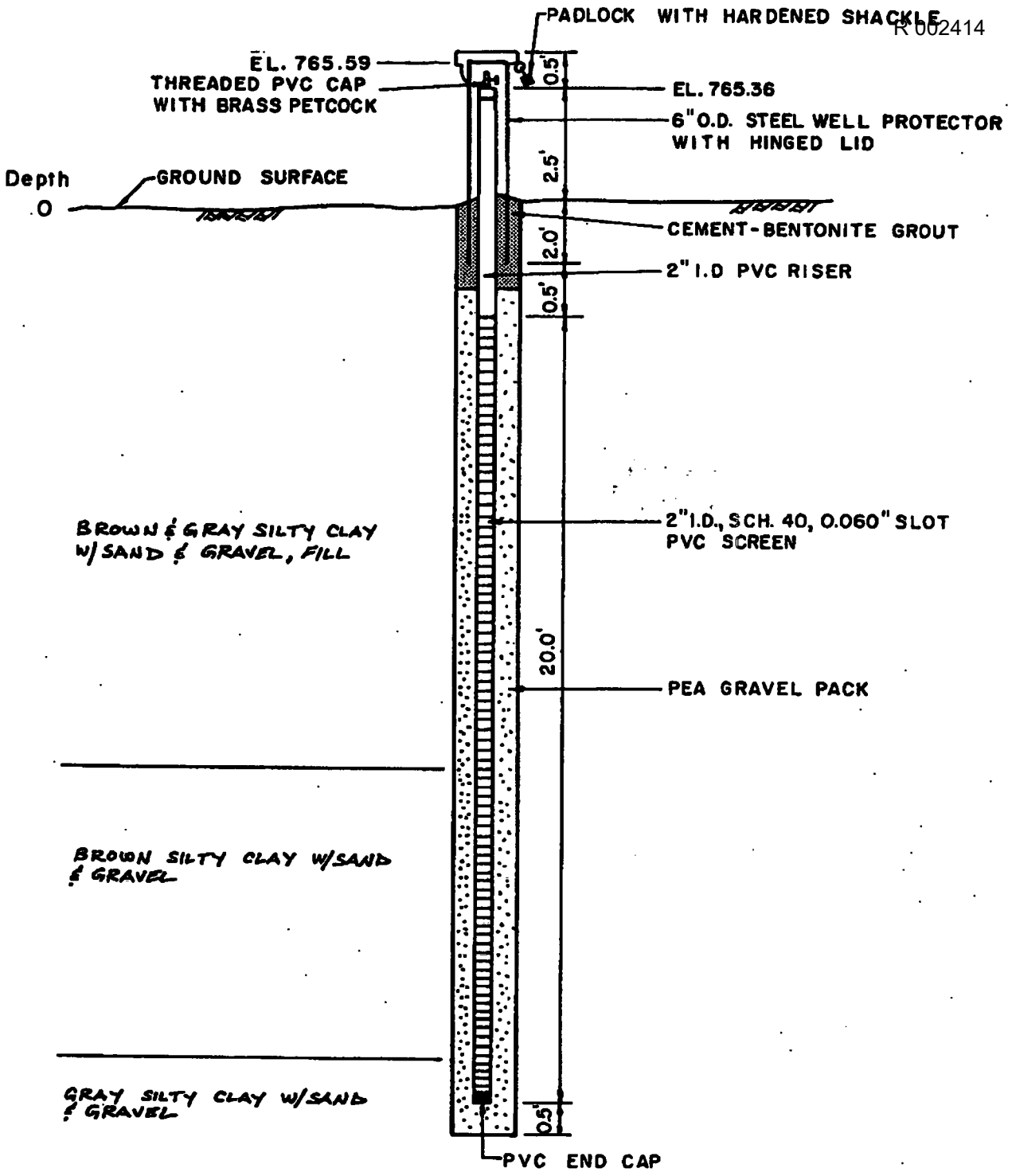
RIG: CME-55/TRUCK — LOCATION: N 12362.20, E 8666.82

GROUND EL.: 762.1 — W.L. & TIME:

LOG	ELEV.	DEPTH (ft.)	SOIL DESCRIPTION	SAMPLE TYPE & NO. / DEPTH (ft.) / RECOV. (in.)	SPT	WC %	q_u (tsf)	NOTES & TEST RESULTS
	742.1	0.0						
				SS-14 20.5-22.0 18"R	5 8 12		3.5*	
	740.1	22.0	End of Boring at 22.0'					

PATRICK ENGINEERING INC

LOGGED BY: CDS JOB NO. : D178 (w6:b149/D178-GP-3)



NOT TO SCALE

BFI WINTHROP HARBOR LANDFILL

DATE: FEB. 28, 1989 | JOB NUMBER D178

METHANE PROBE NO.
GP-3

PATRICK ENGINEERING INC
Engineers • Architects • Hydrologists
Geologists • Surveyors
Glen Ellyn, Illinois

LOG OF BORING

R-002415

PROJECT: BFI Gas Probes, Winthrop Harbor Landfill — BORING NO.: GP-4

DRILLER: Patrick Engineering — START: 2/27/89 — COMPLETE: 2/27/89 — SHEET: 1 OF 2

RIG: CME-75 — LOCATION: N 12601.51, E 9457.30

GROUND EL.: 750.6 — W.L. & TIME:

LOG	ELEV.	DEPTH (ft.)	SOIL DESCRIPTION	SAMPLE TYPE & NO. / DEPTH (ft.) / RECOV. (in.)	SPT	WC %	q_u (tsf)	NOTES & TEST RESULTS
	750.6	0.0						Advanced borehole using 4-1/4" I.D. HSA.
			Brown gray black and red mixed silty clay, trace to some coarse to fine sand, trace to little coarse to fine gravel, medium stiff to stiff, low plasticity, moist, fill CL	SS-1 1.0-2.5 10"R	9 7 5		Frozen	
				SS-2 2.5-4.0 6"R	3 4 5		1.1*	
				SS-3 4.0-5.5 6"R	2 3 4		1.0*	
				SS-4 5.5-7.0 6"R	1 2 2		0.7*	
	743.1	7.5						
			Brown and gray mottled silty clay, some coarse to fine sand, little coarse to fine gravel, hard, low plasticity, moist CL	SS-5 8.0-10.0 18"R	7 10 15 22		4.1*	
				SS-6 10.0-11.5 18"R	5 11 17		3.0*	
				SS-7 11.5-13.0 18"R	10 11 16		3.7*	
				SS-8 13.0-14.5 18"R	7 11 13		3.7*	
				SS-9 14.5-16.0 18"R	7 10 12		3.3*	
	734.6	16.0	Gradational Contact					
			Gray silty and clayey coarse to fine sand, little to some coarse to fine gravel, well graded, medium dense to dense, wet SW	SS-10 16.0-17.5 18"R	6 8 10			
			Gradational Contact	SS-11 17.5-19.0 18"R	4 6 34			
			Gray silty clay and coarse to fine sand, little coarse to fine gravel, well graded, low plasticity, very stiff, wet SW/CL	SS-12 19.0-20.5 18"R	8 14 17		2.9*	
	731.1	19.5						

LOG OF BORING

PROJECT: BFI - Gas Probes, Winthrop Harbor Landfill

BORING NO.: GP-4

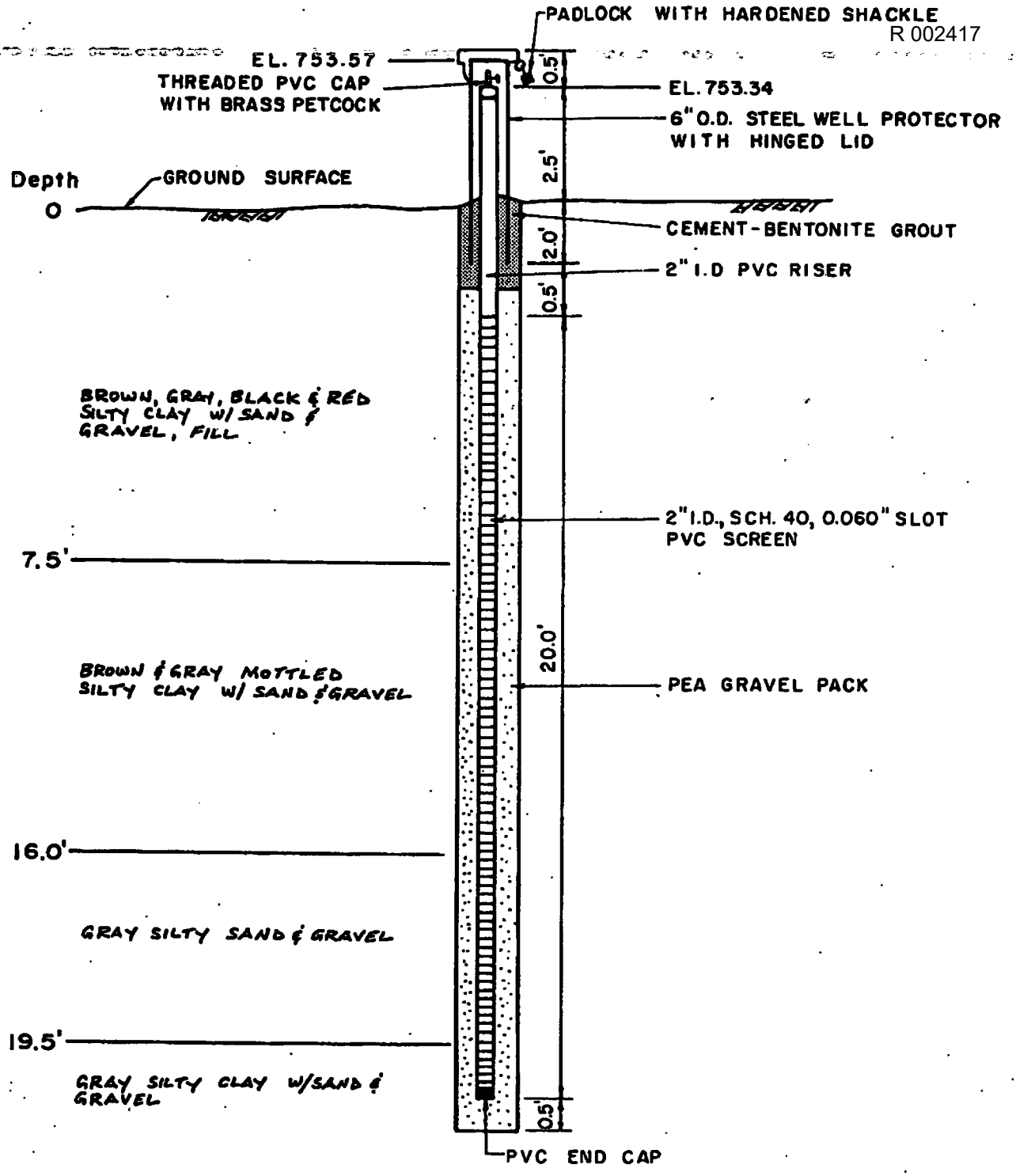
DRILLER: Patrick Engineering START: 2/27/89 COMPLETE: 2/27/89

SHEET: 2 OF 2

RIG: CME-75 LOCATION: N 12601.51, E 9457.30

GROUND EL.: 750.6 W.L. & TIME:

LOG	ELEV.	DEPTH (ft.)	SOIL DESCRIPTION	SAMPLE TYPE & NO. / DEPTH (ft.) / RECOV. (in.)	SPT	WC %	q_u (tsf)	NOTES & TEST RESULTS
	730.6	20.0						
	729.6	21.0	Gray silty clay, little coarse to fine sand, trace coarse to fine gravel, very stiff, low plasticity, moist CL	SS-13 20.5-22.0 18"R	8 12 14		2.7*	
	728.6	22.0	End of Boring at 22.0'.					



NOT TO SCALE

BFI WINTHROP HARBOR LANDFILL

DATE: FEB. 27, 1989 | JOB NUMBER D178

METHANE PROBE NO. GP-4

PATRICK ENGINEERING INC.
Engineers • Architects • Hydrologists
Geologists • Surveyors
Glen Ellyn, Illinois

LOG OF BORING

R 002418

PROJECT: BFI - Gas Probes, Winthrop Harbor Landfill
DRILLER: Patrick Engineering START: 2/23/89 COMPLETE: 2/23/89
RIG: CME-75/TRUCK LOCATION: N 10031.32, E 9259.76
GROUND EL.: 742.0 W.L. & TIME:

BORING NO.: GP-9
SHEET: 1 OF 2

LOG	ELEV.	DEPTH (ft.)	SOIL DESCRIPTION	SAMPLE TYPE & NO. / DEPTH (ft.) / RECOV. (in.)	SPT	WC %	q_u (tsf)	NOTES & TEST RESULTS
	742.0	0.0						
			Brown, gray and red silty clay, little to and coarse to fine sand, trace to some coarse to fine gravel, stiff to very stiff, low plasticity, moist to dry, fill CL					Advanced borehole using 4-1/4" I.D. HSA.
				SS-1 1.0-2.5 3"R	9 5 5		Frozen	
				SS-2 2.5-4.0 12"R	4 5 5		1.1*	
				SS-3 4.0-5.5 18"R	7 7 8			
	736.0	6.0						
			Gray clayey silt interbedded with red medium to fine silty sand, medium dense, moist ML/SP	SS-4 5.5-7.0 18"R	7 7 9			
				SS-5 7.0-8.5 18"R	5 6 12			
	733.0	9.0						
			Gray organic silty clay, trace coarse to fine sand, trace coarse to fine gravel, roots, stiff, high plasticity, moist CF	SS-6 8.5-10.0 18"R	4 6 7		1.3*	
				SS-7 10.0-11.5 18"R	2 4 8		1.6*	
	730.5	11.5						
			Gray silty clay, some coarse to fine sand, little coarse to fine gravel, very stiff, low plasticity, moist CL	SS-8 11.5-13.0 18"R	7 7 8		3.4*	
				SS-9 13.0-14.5 18"R	5 5 7		3.2*	
				SS-10 14.5-16.0 18"R	4 6 11		3.4*	
				SS-11 16.0-17.5 18"R	8 11 15		4.0*	
				SS-12 17.5-19.0 18"R	6 10 11		4.1*	
				SS-13 19.0-20.5 18"R	4 6 7		1.7*	

PATRICK ENGINEERING INC.

LOGGED BY: CGS JOB NO.: D178 (ref:b149/d178)

LOG OF BORING

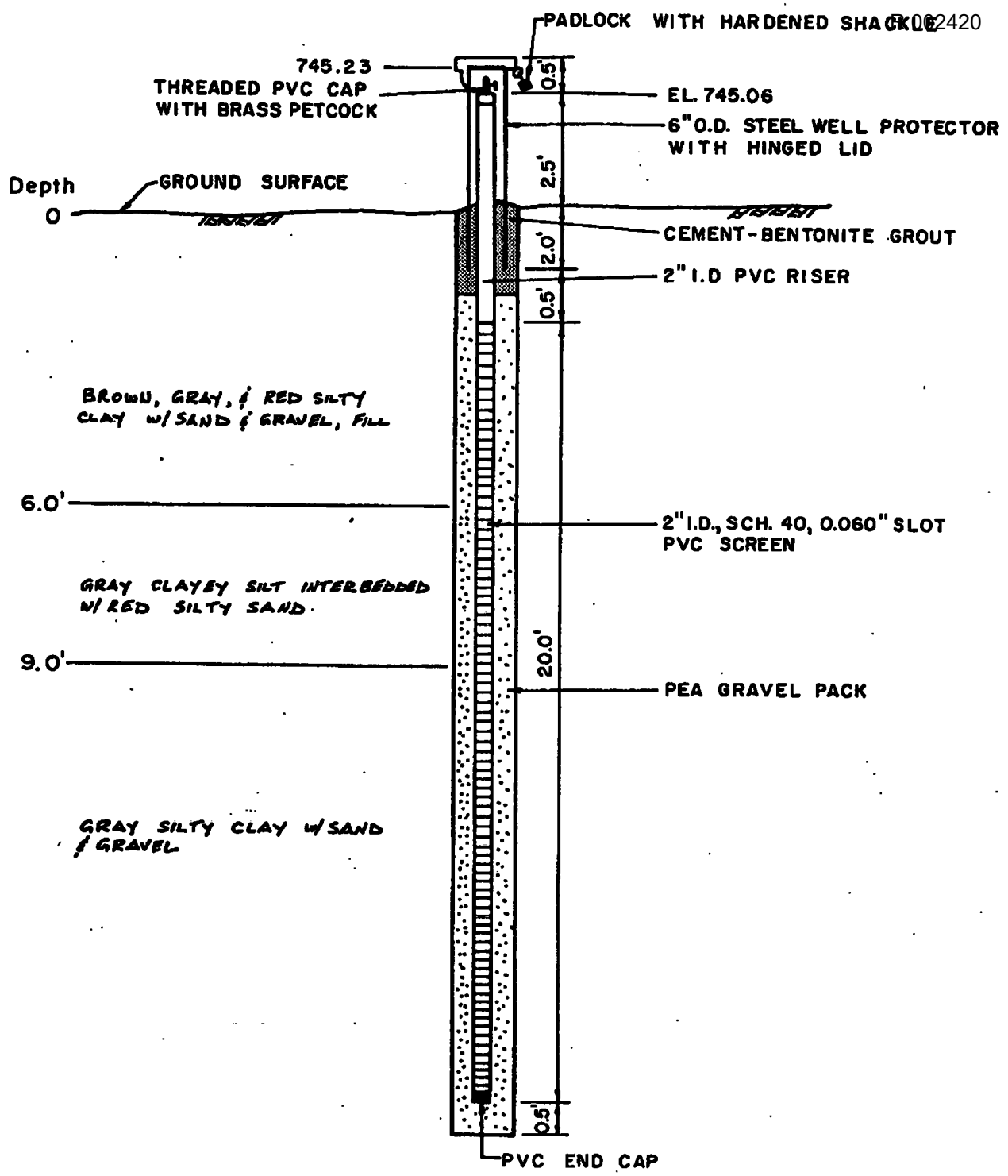
R 002419

PROJECT: BFI - Gas Probes, Winthrop Harbor Landfill
BORING NO.: GP-9
DRILLER: Patrick Engineering START: 2/23/89 COMPLETE: 2/23/89
SHEET: 2 OF 2
RIG: CME-75/TRUCK LOCATION: N 10031.32, E 9259.76
GROUND EL.: 742.0 W.L. & TIME:

LOG	ELEV.	DEPTH (ft.)	SOIL DESCRIPTION	SAMPLE TYPE & NO. / DEPTH (ft.) / RECOV. (in.)	SPT	WC %	q_u (tsf)	NOTES & TEST RESULTS
	722.0	20.0						
				SS-14	3			
				20.5-22.0	4		1.3*	
				18"R	5			
	720.0	22.0	End of Boring at 22.0'					

PATRICK ENGINEERING INC.

LOGGED BY: CGS JOB NO.: D178 (ref:h149/d178)



NOT TO SCALE

BFI WINTHROP HARBOR LANDFILL

DATE: FEB. 23, 1989 | JOB NUMBER D178

METHANE PROBE NO.
GP-9

PATRICK ENGINEERING INC
Engineers • Architects • Hydrologists
Geologists • Surveyors
Glen Ellyn, Illinois

LOG OF BORING

R 002421

PROJECT: BFI - Gas Probes, Winthrop Harbor Landfill
DRILLER: Patrick Engineering START: 2/23/89 COMPLETE: 2/23/89
RIG: CME-75/TRUCK LOCATION: N 10047.44, E 8690.55
GROUND EL.: 735.1 W.L. & TIME:

BORING NO.: GP-10
SHEET: 1 OF 2

LOG	ELEV.	DEPTH (ft.)	SOIL DESCRIPTION	SAMPLE TYPE & NO. / DEPTH (ft.) / RECOV. (in.)	SPT	WC %	q_u (tsf)	NOTES & TEST RESULTS
	735.1	0.0						Advanced borehole using 4-1/4" I.D. HSA
			Brown, gray and black silty clay, little to some coarse to fine sand, trace to little coarse to fine gravel, stiff to hard, low plasticity, dry to moist, fill CL	SS-1 1.0-2.5 8"R	6 8 8		Frozen	
				SS-2 2.5-4.0 8"R	3 4 4		0.7*	
				SS-3 4.0-5.5 14"R	9 11 9		2.4*	
				SS-4 5.5-7.0 14"R	4 5 7		1.8*	
	727.8	7.3		SS-5 7.0-8.5 18"R	7 8 10		2.7*	
			Brown silty clay, little to some coarse to fine sand, little to some coarse to fine gravel, very stiff, low plasticity, moist CL	SS-6 8.5-10.0 18"R	4 9 11		3.4*	
				SS-7 10.0-11.5 14"R	6 11 14		3.3*	
	723.8	11.3		SS-8 11.5-13.0 18"R	9 11 15			
			Brown clayey silt, trace coarse to fine sand, trace coarse to fine gravel, well graded, medium dense, low plasticity, wet ML					
	721.9	13.2		SS-9 13.0-14.5 18"R	7 10 11			
			Gray clayey silt, trace coarse to fine sand, trace coarse to fine gravel, well graded, medium dense, low plasticity, wet ML	SS-10 14.5-16.0 18"R	10 30 15			
	719.1	16.0	Gradational contact					
			Gray silty clay, trace coarse to fine sand, trace coarse to fine gravel, very stiff, low plasticity, moist SW/GW	SS-11 16.0-17.5 18"R	10 12 22		3.3*	
	717.8	17.3		SS-12 17.5-19.0 18"R	15 20 24			
			Gray silty and clayey coarse to fine sand and coarse to fine gravel, well graded, dense, saturated SW/GW	SS-13A,B 19.0-20.5 18"R	9 11 12			

PATRICK ENGINEERING INC

LOGGED BY: CGS JOB NO.: D178 (ref:h149/d178)

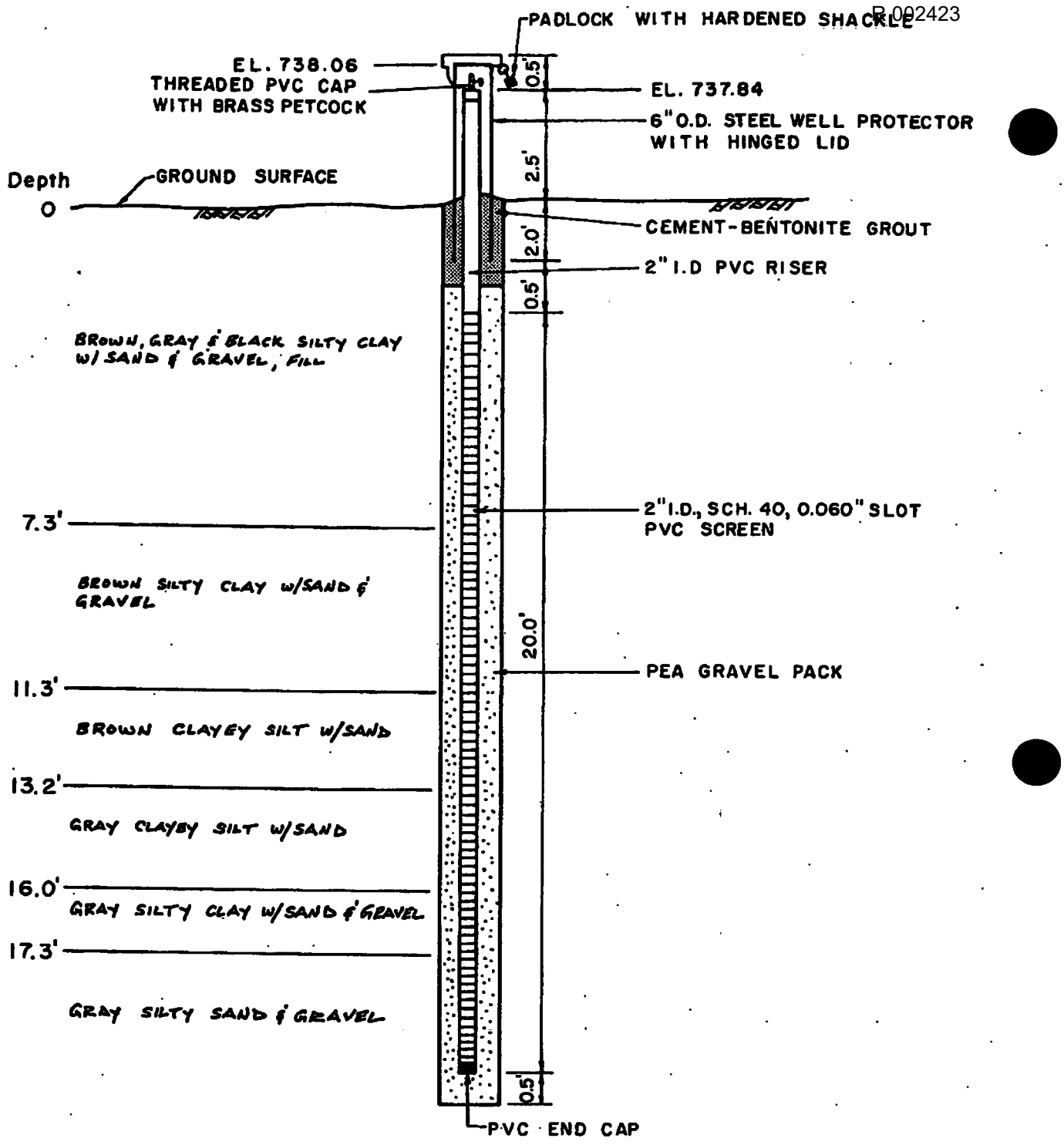
LOG OF BORING

R 002422

PROJECT: BFI - Gas Probes, Winthrop Harbor Landfill
DRILLER: Patrick Engineering START: 2/23/89 COMPLETE: 2/23/89
RIG: CME-75/TRUCK LOCATION: N 10047.44, E 8690.55
GROUND EL.: 735.1 W.L. & TIME:

BORING NO.: GP-10
SHEET: 2 OF 2

LOG	ELEV.	DEPTH (ft.)	SOIL DESCRIPTION	SAMPLE TYPE & NO. / DEPTH (ft.) / RECOV. (in.)	SPT	WC %	q_u (tsf)	NOTES & TEST RESULTS
	725.1	20.0						
				SS-14 20.5-22.0 6"R	11 13 13			
	713.1	22.0	End of Boring at 22.0'.					



NOT TO SCALE

BFI WINTHROP HARBOR LANDFILL

DATE: FEB. 23, 1989 | JOB NUMBER D178

METHANE PROBE NO. GP-10

PATRICK ENGINEERING INC.
Engineers • Architects • Hydrologists
Geologists • Surveyors
Glen Ellyn, Illinois

ATTACHMENT 2

Gas Monitoring Forms

Ambient Gas Monitoring

Zion Landfill, Site 1A

Task	Monitoring Protocol
1.	Date: _____ Time:_____
2.	Name of Sampler: _____
3.	Direction of Wind: _____
4.	Is wind speed less than 5 miles per hour? Yes _____ No _____
5.	Location of Three Ambient Sampling Points – **Downgradient of Wind:**
	Point 1: _____
	Point 2:_____
	Point 3:_____
6.	Monitoring Results:
	1st Location: _____
	2nd Location: _____
	3rd Location: _____
7.	Location of Ambient Background Sampling Point(s) – **Upgradient of Wind:**
	Point 1: _____
	Point 2 (if needed): _____
	Point 3 (if needed):_____
8.	Monitoring Results (Background):
	1st Location: _____
	2nd Location (if apl.):_____
	3rd Location (if apl.)_____

Note: Attach map documenting location of each ambient monitoring location.

Appendix E-21

Operation & Maintenance Manual, Landfill Gas Extraction System

BFI ZION LANDFILL
LANDFILL GAS EXTRACTION SYSTEM
OPERATIONS AND MAINTENANCE MANUAL

AUGUST 1998

R 002427

CQM, INC.

TRANSMITTAL

TO:	**Mr. James A. Lewis, P.E.**	**FROM:**	**Mr. Paul J. Wintheiser**
	Onyx Zion Landfill		***CQM, INC.***
			2679 Continental Drive
	Mr. Randy Frank, P.E.		**Green Bay, WI 54311-6627**
	Superior Services	**PHONE:**	**(920) 465-3911**
		DATE:	**August 1, 2002**
RE:	**Zion LFG System**	**PROJECT:**	

WE ARE SENDING YOU:

☒ **ATTACHED**	☐ **UNDER SEPARATE COVER VIA**	
☒ DRAWINGS	☐ SPECIFICATIONS	☐
☐ DOCUMENTS	☐ COPY OF LETTER	☐

QUANTITY	DESCRIPTION
1 Set Each	**"DRAFT" Zion LFG System Plan Modification Drawings**
	Jim and Randy,
	Please note the red, handwritten LFG pipe elevations on Drawing No. 2. I added them to your
	copies to explain how the tie-in to the Site 2 system works. If you have questions, please call me
	at (920) 465-3911. Thanks.

IF MATERIAL RECEIVED IS NOT AS LISTED, PLEASE NOTIFY US AT ONCE.

REMARKS

COPY TO

Lamson

1 - Gardner Denver

Multistage centrifugal
50 - Hp 3600 RPM
~~Serial~~ Model # 863-0000-3-3600GB

Serial 970685

SO Number 66256

ph. 1-800-543-7736

Transmittal Letter

RMT, Inc.
744 Heartland Trail (53717-1934)
PO Box 8923 (53708-8923)
Madison, WI
Tel. (608) 831-4444 • Fax (608) 831-3334

To: Steven P. Delfs
701 Greenbay Road
Zion, Illinois 60099

Date: August 11, 1998
Project No.: 3828.07
Subject: BFI Zion O &M Manual

We are sending you:

☒ Report

COPIES	DATE	NO.	DESCRIPTION
2	8/98		Operations And Maintenance Manual, Landfill Gas Extraction System, BFI-Zion Landfill

These items are transmitted as checked below:

☒ For your use

Remarks: Enclosed are two copies of the above-mentioned report. Please call me with any questions.

Signed: Mark J. Torresani

Mark Torresani
Project Manager

xc: File

OPERATIONS AND MAINTENANCE MANUAL

LANDFILL GAS EXTRACTION SYSTEM

BFI-ZION LANDFILL

Zion, Illinois

August 1998

Prepared For

BFI WASTE SYSTEMS OF NORTH AMERICA, INC. (BFI)
P. O. Box 3151
Houston, TX 77253
(281) 870-8100

RMT, INC.
744 HEARTLAND TRAIL = 53717-1934
P.O. BOX 8923 = 53708-8923
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608/831-4444 = 608/831-3334 FAX

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List of Drawings

SYSTEM DRAWINGS

Chapter 1

INTRODUCTION AND SYSTEM OVERVIEW

1.1 GUIDE TO USE OF THIS MANUAL

This manual describes the operation and maintenance procedures for the Landfill Gas Extraction System. The primary purposes of the manual are: (1) to acquaint landfill personnel with the overall capabilities of the system; (2) to outline the responsibilities of the operation and maintenance personnel; and (3) to provide personnel with the necessary instructions for proper operation and maintenance of the system.

The purpose of this manual is to provide guidelines for operation and maintenance of the system. It is not intended to be a substitute for proper training and experience. On-site training and experience with the system will be required to complement the information in this manual. Modifications can be incorporated in the manual to accommodate changes in system operation.

The manual is organized into the following seven chapters and five appendices.

- Chapter 1 Introduction and System Overview
- Chapter 2 System Startup and Operation
  - Contains a detailed description of the operation of the system components, and overall system operation including startup, routine operation, and shutdown procedures.
- Chapter 3 System and Equipment Maintenance
  - Describes and summarizes the basic maintenance procedures for each major system component.
- Chapter 4 Monitoring and Process Control
  - Provides monitoring requirements and process control procedures for maintaining efficient system operation.
- Chapter 5 Contingency Measures
  - Describes contingency measures including precautions for safety, procedures for emergency conditions, and troubleshooting procedures for equipment.
- Chapter 6 Records and Reports
  - Includes personnel, records, and reporting requirements.
- Chapter 7 Safety
  - Contains safety information for site personnel.
- Appendix A Permits and Regulations
  - Contains relevant permits and regulations.
- Appendix B Equipment Manufacturers Operation and Maintenance Manuals
  - Contains the relevant equipment manufacturers manuals.
- Appendix D Monitoring and Record Forms
  - Contains forms for recording all relevant information about the system during operation.

- Appendix D Monitoring and Record Forms
  - Contains site monitoring forms for various components of the system.
- Appendix E OSHA Regulations for Confined Space Entry
  - Contains OSHA regulations for Permit Required Confined Space Entry

It will be a requirement for effective operation of the system that landfill gas extraction system operation and maintenance personnel become familiar with this manual and the Operating Permit contained in Appendix A. This manual is supplemented by operation, maintenance, repair instructions, and other information prepared by manufacturers of equipment incorporated in the system. Associated equipment manufacturers manuals are included in Appendix B.

1.2 PURPOSE OF THE LANDFILL GAS EXTRACTION SYSTEM

The Landfill Gas Extraction System is designed to control, remove and dispose of the gas generated within the landfill in a safe and environmentally sound manner. Landfill gas is composed primarily of approximately equal portions of carbon dioxide (CO_2) and methane (CH_4) along with small quantities of many other compounds. It is a product formed by the anaerobic decomposition of organic portions of the refuse.

The rate and volume of landfill gas production depends on many factors. The most significant factors are:

1. Composition of refuse,
2. Age of refuse,
3. pH of refuse,
4. Moisture content of refuse, and
5. Temperature conditions in the landfill.

The rate of landfill gas production is not constant. Because so many variables affect the production of landfill gas, the total quantity and the length of time landfill gas will be produced is difficult to quantify. It is anticipated that peak production will be achieved within 5 years of closure and that after this peak, the landfill gas production rate will slowly decline.

Installation and operation of the landfill gas extraction system is necessary to mitigate concerns arising from landfill gas generation. Primary concerns regarding landfill gas generation include fire, explosion, health hazards, odor, and environmental hazards.

1.2.1 Fire and Explosion Hazards

Methane gas is the primary component of natural gas and is combustible when the methane concentration in air is between 5 and 15 percent by volume. The 5 percent level is called the Lower Explosive Limit (LEL). Below 5 percent, there is insufficient methane for combustion. Above 15 percent, called the upper explosive limit (UEL), there is insufficient oxygen for combustion. However, it is important to note that a concentration of methane above 15 percent is considered at least as dangerous as a

concentration between 5 and 15 percent because as the methane dilutes with air, it will pass through the explosive range. When gas concentrations are low, it is common to express methane concentration as a percentage of the LEL. For example, 100 percent LEL is 5 percent methane in air, and 50 percent LEL is 2.5 percent methane in air.

Because the decomposition of buried refuse typically produces methane at concentrations ranging from 40 to 60 percent, landfill gas will always pass through the combustible range as it vents to the atmosphere and is diluted with air. Methane is lighter than air and will rise in the absence of a physical barrier. Landfill gas, being a mixture of methane and carbon dioxide, may be heavier than air or lighter than air depending on the specific mixture.

As the waste within the landfill decomposes and gas is generated, the gas becomes trapped within the pore space of the landfill and begins to build pressure. This pressure gradient is the primary moving force of landfill gas although, to a much smaller degree, gas concentration gradients also contribute to gas movement. As pressure within the landfill continues to build, the gas will eventually expand along the paths of least resistance. Generally, this forces the gas through the surrounding soils, the landfill cap, or through vents and other high permeability pathways. If LFG is allowed to migrate through the surrounding soils, the potential for the gas to collect in explosive quantities in nearby structures exists. There have been many documented cased of explosions in buildings due to the migration of LFG.

Generally, the potential for landfill gas migration is not constant and any activity that renders the soil cover less permeable will increase the tendency for lateral migration. For example, the potential for subsurface lateral migration can increase when precipitation or freezing temperatures reduces the permeability of surface soil. The placement of pavement, liners, compacted soils, or other types of cover on the landfill surface can have the same effect.

1.2.2 Health Hazards

Analysis of gas samples collected from previously-installed landfill gas extraction systems at other landfills have shown the presence of at least 80 volatile organic compounds (VOCs) with the following being the most common: benzene, methyl chloride (chloromethane), methylene chloride, trichlorofluoromethane, and vinyl chloride. These and other VOC compounds are known health threats, and some are suspected or known carcinogens.

Landfill gas may be either heavier or lighter than air depending on its carbon dioxide content and may therefore accumulate in the tops or bottoms of sumps, manholes, trenches, drainlines, etc. Methane, carbon dioxide, or the landfill gas mixture may displace oxygen and pose a suffocation hazard as well as a fire or explosion hazard. It is mandatory to check these areas for gas concentration and oxygen content prior to entry.

1.2.3 Odor

Although methane gas itself is colorless and odorless, the landfill gas mixture generated during the decomposition of organic matter is usually odorous. Odorous components of landfill gas can include mercaptans, VOCs, and occasionally hydrogen sulfide. A properly designed and operated active gas extraction system will eliminate most of these odors associated with the landfill.

1.2.4 Environmental Hazards

Migration of LFG through the landfill cap or surrounding soils can result in environmental hazards caused by destruction of the cap, vegetation stress, and groundwater contamination.

1.3 SITE AND SYSTEM DESCRIPTION

1.3.1 Site Description

The BFI-Zion Landfill is located in Zion, Illinois. Waste depths range from 30 feet to 70 feet. Waste disposal has taken place at the site for an extended period of time and has been deposited into three distinct areas. The areas are designated as Site 1A, Site 1B, and Site 2.

1.3.2 System Description

The landfill gas extraction system consists of the following major components:

1. Landfill gas extraction wells,
2. Collection header and piping network,
3. Condensate pump stations,
4. Leachate extraction system
5. Extraction blowers and ancillary equipment,
6. Enclosed flare system,
7. Aboveground condensate collection tanks, and
8. Gas monitoring probes

This section describes each system component. An overall site plan for the system is presented on Plan Sheet A-1. Refer to this drawing for the location and configuration of each system component. Design criteria for the system components are summarized in Table 1-1 at the end of this chapter.

1.3.2.1 Landfill Gas Extraction Wells

The landfill gas extraction wells function to remove landfill gas from within the refuse by creating an area of negative pressure, thus providing a path of least resistance for flow of the landfill gas. Therefore, this action minimizes the vertical and lateral migration of the landfill gas. In order to extract the majority of the gas, each well was constructed within approximately 5 to 10 feet of the bottom of waste. A typical well

construction drawing is shown on Plan Sheet 21. Drillers logs for each extraction well are also included in Appendix C of this manual.

1.3.2.2 Collection Header and Piping Network

The landfill gas system piping network functions to transfer the landfill gas from the extraction wells to the blower and flare as well as transport the condensate generated throughout the system to the condensate sumps. Each extraction well is connected to a lateral pipe or main collection header.

1.3.2.3 Condensate Pump Stations

Landfill gas collection systems create areas of differential pressures and temperatures within the landfill, thereby providing conditions for condensate formation. Normally, condensate forms when saturated gases, extracted from the warm landfill interior, enters the vacuum of the extraction system piping network and begins to cool. The condensate collects throughout the gas extraction system at the bottom of the laterals and headers. Condensate forming in the lateral piping and collection header network then flows by gravity to the condensate pump stations located at the low points in the main header system.

Five condensate sumps were installed adjacent to the gas header line. A reducer tee was fused into the low point of the header line adjacent to the condensate pump station location. This tee allows the condensate to gravity-drain from the header line into the condensate pumping station through a 4-inch-diameter (SDR 11) HDPE pipe.

The condensate pump stations were constructed two different ways, depending on the location. CS-1 and CS-2, which are outside the limits of waste, are double contained as shown in detail on Plan Sheet 23. Pump stations outside the limits of waste (CS-1 and CS-2) consist of an 8-inch diameter (SDR 11) HDPE pipe encased in a 12-inch diameter (SDR 17) HDPE pipe with a 12-inch diameter (SDR 17) HDPE flat cap welded on the bottom. Condensate sumps located within the limits of waste consist of an 8-inch pipe connected by a reducer to a 12-inch pipe with an HDPE cap fused to the bottom. A submersible pneumatic pump was placed inside condensate sumps to pump condensate to the condensate storage tanks.

The discharge pipes from the condensate sumps transport the condensate to the condensate storage tanks for removal. In all locations where the condensate storage pipe is outside the limits of waste, a secondary HDPE containment pipe is provided. The second containment pipe can be monitored for liquid with a riser pipe as shown in detail on Plan Sheet 23. Refer to Details on Plan Sheet 23 for additional information regarding the condensate system.

The condensate may contain variable concentrations of chemicals including VOCs, semi-volatile organic compounds (SVOCs), other organic compounds, and metals. Condensate quantities and qualities are also highly variable and unique to each landfill and gas collection system design. However, as long as saturated landfill gas is

produced and its temperature and pressure is lowered, the landfill gas extraction system will produce condensate.

1.3.2.4 Extraction Blowers and Ancillary Equipment

The vacuum produced by the blowers functions to produce a negative pressure (vacuum) within the landfill. This vacuum removes the gas from the landfill and transports it to the flare system for combustion. The extraction system blowers and ancillary equipment are housed in the blower building located next to the enclosed flare system.

1.3.2.5 Enclosed Flare System

The enclosed flare system functions to destroy VOCs, odors, and toxic components in LFG via combustion. The enclosed flare system consists of several burner tips which release the gas for combustion within an enclosed area. Containment of the flame serves to increase combustion efficiency and provide a means of collecting exhaust gas samples. The flare is located adjacent to the blower building.

1.3.2.6 Condensate Storage Tank

The condensate sumps pump condensate to the collection tanks located near the blower building. A separate 8,000-gallon tank for Site I, Phase A is provided to allow for the collection and testing of condensate generated from landfill gas produced in Site I, Phase A. The other 8,000-gallon tank will serve the remainder of the gas system (Site I, Phase B and Site II). The condensate storage tanks were constructed by Modern Welding Company, Inc., of Newark, Ohio. The tanks are aboveground skid mounted and include the following features:

- 8,000-gallon capacity each
- Above ground skid mounted for ease of installation
- 12 inch thick compacted granular base material
- Secondary containment (a double-walled tank) with an insulated annular space with leak monitoring capability
- Visual and audible alarms to signal high levels of condensate
- Corrosion protective coating (interior and exterior surfaces)

Condensate transfer pipes from condensate collection sumps CS-1 and CS-2 are insulated and heat traced aboveground to prevent freezing within the pipes.

1.3.2.7 Gas Monitoring Probes

The gas monitoring probes are located around the perimeter of the landfill. Each probe functions to detect LFG migration and therefore insure that the gas extraction system is operating properly and is effective in preventing the subsurface migration of landfill gas.

1.4 RELEVANT LAWS AND REGULATIONS

Appendix A contains the permits and regulations relevant to the operation of the landfill gas extraction system. These permits and regulations should be read and understood by the gas system operator.

TABLE 1-1
SYSTEM DESIGN CRITERIA

ITEM	UNITS	QUANTITY
General		
Methane content of landfill gas	Volume percent	50%
Carbon dioxide, air, and inerts	Volume percent	50%
Extraction Wells and Collection System		
Well Construction: HDPE, SDR-17	Each	72
Number of wells	Feet	18 to 74
Well Depths	Acres	120
Approximate gas collection area		
Collection System Constr.: HDPE, SDR-17	Inches	6 to 12
Collection System Pipe Sizes		
Gas Blowers		
Type: Centrifugal		
Manufacturer: Lamson Corporation		
Model No: 513-GB		
Number of blowers	each	2
Blower horsepower	HP (each)	60
Design flow rate per blower (max.)	SCFM	380 to 1,000
Design inlet vacuum	Inches wc	-30
Design outlet pressure	Inches wc	+18
Flare		
Type: Enclosed		
Manufacturer: Callidus Technologies, Inc.		
Size: 11' Diameter x 40' Height		
Number	Each	1
Design flow (max.)	SCFM	3,200 CFM
Normal flow	SCFM	2,600 CFM
Operating (combustion) temperature	Degrees F	1,400 (minimum)
	Degrees F	2,100 (maximum)
	Degrees F	1,600 (normal)

TABLE 1-1
SYSTEM DESIGN CRITERIA

ITEM	UNITS	QUANTITY
Condensate Pump Stations		
Pump Station Construction: 8-inch-diameter (SDR 11) x 12-inch-diameter (SDR 17) HDPE		
Number		
Pump Type: Pneumatic, Controllerless	Each	5
Pump Manufacturer: QED		
Model No: Solo II		
Fittings Model No: NA		
Air Header Construction: HDPE, SDR-11		
Air Header Size		
Condensate Force Main Construction: HDPE (SDR 17)	Inches	2
Condensate Force Main Size	Inches	2" and 4"
Condensate Storage Tank		
Type:		
Construction: VL-142 SA-36		
Manufacturer: Modern Welding		
Internal Coating: Corrocote II Urethane		
External Coating: Primer Ameron-Amerlock 400 (5-8 mils DFT)		
Heater Type: Pipe insert heater tubular type		
Heater Manufacturer: Indeeco		
Heater Size:	Kw	5
Tank Size:	Gallons	8,000
Air Compressor		
Type: Recip.		
Manufacturer: Ingersoll-Rand		
Model No.: Unit #1 - 2540 E10; Unit #2 - 2545X10		
Classification: Electric two-stage industrial air compressor		
Air Dehydrator		
Type: Desiccant Air Dryer		
Manufacturer: Ingersoll-Rand		
Air Dryer Core Kit (4 desiccant cores/2 for each tower & gasket kit)		
Model IR40CD Coalescing Air Filter Element		
Model 1R60PD IR60PD Particulate Air Filter Element		

Chapter 2

SYSTEM STARTUP AND OPERATION

2.1 GENERAL

This chapter provides guidelines for startup, routine, and shutdown operations for each major system component. The procedures outlined herein cannot possibly cover every possible operating situation and do not provide a substitute for proper training and experience.

Proper operation and maintenance of the landfill gas extraction system is essential to insure that the system functions safely and effectively. The primary operational procedure for the system entails regulating and adjusting the applied vacuum and therefore the gas flow rate at each extraction well. This procedure is referred to as "balancing" or "tuning" the gas system. A balanced system requires that each well be adjusted to extract the maximum amount of landfill gas possible while maintaining control of migration and without causing an excessive amount of air intrusion through the landfill cover. Drawing excessive amounts of air into the refuse must be avoided because the presence of oxygen in the refuse can cause spontaneous combustion, resulting in a subsurface refuse fire. *Monitoring and adjusting of flow rate, vacuum, methane content, and temperature must be performed to achieve and maintain system "balance".* Monitoring and process controls are described in Chapter 4 of this manual.

Detailed operating and maintenance procedures may be found in the equipment manufacturers' operation and maintenance manuals located in Appendix B. All manufacturer's instructions must be read and understood before operating the equipment. BFI should be contacted if additional assistance is needed.

2.2 LANDFILL GAS EXTRACTION WELLS

Landfill gas extraction wells have been installed within the landfill. As-built construction details for each well are shown on the well logs located in Appendix C.

The sample ports located on the side of each well are to be used to monitor the methane concentration, vacuum, and temperature at each well weekly. In addition to these tests, flowrate is to be monitored monthly.

The objective is to extract the maximum amount of landfill gas possible from each well while maintaining migration control and without causing excessive amounts of air intrusion through the landfill cover. The following measurements determine the performance of each well:

- Vacuum readings insure that the well is open and vacuum is available to cause gas flow.
- Methane concentration measurements determine if the well is producing landfill gas or drawing air into the system.

- Flow measurements quantify the amount of gas production and assist in positioning the valve at each well.
- Temperature and oxygen measurements identify air intrusion and potential underground fire problems.

Refer to Chapter 4 for detailed monitoring and adjustment procedures.

2.3 LANDFILL GAS COLLECTION HEADER AND LATERAL PIPING NETWORK

The landfill gas piping network transfers gas to the blower and flare. All underground pipe is constructed of (SDR 17) High Density Polyethylene. Prior to system operation, isolation valves on the main header and subheaders should be fully opened. In the event that the gas extraction system becomes damaged, portions of the main gas header or subheaders may be isolated for repair by closing the required isolation valves.

2.4 CONDENSATE PUMP STATIONS

Condensate pump stations are placed at the low points of the main header to allow for the removal of condensate from the system. The design of the pump stations allows for the operation of the pumps under the vacuum conditions of the extraction system while venting all air from the pumps outside of the pump stations. This allows for the condensate to be removed from the header while preventing any air from being allowed into the extraction system.

Prior to placing the condensate pump stations into operation and after any new pipe work on the air headers, purge the air header of water and foreign debris. This can be accomplished by removing the air line from the air header at the pump station(s) that is (are) the furthest from the blower building and then opening the isolation valve on the air header. Allow the header to vent for several minutes or until all water and foreign material has been removed. USE CAUTION TO KEEP FACE AND BODY AWAY FROM THE OUTLET OF THE PIPE WHILE THE PIPE IS VENTING. DO NOT PERFORM THIS TASK WITHOUT THE USE OF SAFETY GLASSES AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT.

To prevent chance of freezing problems, minimize the length of the condensate hose between the pump station and the condensate force main. Insulate the hose and exposed force main with closed-cell foam insulation and nylon ties prior to placing the system into operation.

Under normal circumstances, the operation of the pump station(s) is completely automatic. Each pump station should be checked weekly for air or condensate leaks and for proper operation. The best way to check for proper operation of the pump is to isolate the pump station from the vacuum in the header system. This is accomplished by closing the 4" ball valve using the remote handle located in the pump station encasement and then opening the 1" ball valve located on the top of the pump station. The removal of the applied vacuum should cause the pump to cycle at a rate

of approximately 3-4 times per minute. If this occurs, the pump is operating properly and the system can be returned to normal operation.

If the pumps should require repairs or maintenance, isolate the pump station from the vacuum in the header system as described above. The 8" blind flange can then be removed from the top of the pump station and the pump lifted to the surface. Refer to the pump manufacturers Operations and Maintenance Manual for troubleshooting information.

The air pressure applied to each pump can be changed by adjusting the regulator located at the top of each pump station. Generally, the pressure should be as low as possible while still providing enough pressure for removal of the condensate or a minimum of 40 PSI. A pressure of 50 to 60 PSI should be adequate.

Pump stations located outside the limits of waste placement are generally double contained as are the force mains connected to them. These double contained systems must be checked weekly for leaks. This is done by quickly opening and closing the valve located on the containment pipe section inside the pump station encasement. Place a small bucket below the valve prior to opening to catch any liquid that may be within the containment annulus. The presence of any liquid is indicative of a leak. If a leak is detected, it must be located and repaired immediately. If necessary, contact BFI for assistance.

All condensate pump stations must be checked quarterly for leaks. This is done by isolating the pump station from the vacuum of the extraction system and removing the pump assembly as described above. Completely fill the pump station with clean water for a period of at least eight (8) hours. There should be no detectable decrease in water level over this period. A decrease in water level is indicative of a leak. If a leak is detected, the pump station must be repaired prior to placing the pump station back into normal service. Contact BFI for assistance if necessary. Record and maintain the dates and results of each test.

2.5 CONDENSATE STORAGE TANK

Condensate will be pumped directly to the condensate storage tanks. Because the potential for gas to be liberated from the condensate while it is stored in the tank exists, the following safeguards must be installed prior to the tank being placed into service.

1. The explosion-proof liquid level switch must be installed and set to turn the tank heater off if the condensate level in the tank falls to a level less than approximately 16" above the bottom of the tank. This is to insure that the heater element is never energized without it and the thermostats being fully submerged in the condensate.

2. The tank should only be emptied using the designated outlet point on the tank. This outlet point is equipped with an internal outlet pipe that will only allow the tank to be drained to a level that will leave the tank heater submerged. This outlet pipe is also equipped with a basin to catch any spills that may occur while

connecting and disconnecting the transfer hoses. After transferring the condensate to a tanker truck, drain any remaining condensate from the outlet pipe into the catch basin and then drain the contents of the catch basin into a bucket. The condensate collected in this bucket must be disposed of properly. Probably the easiest way to do this is to return the condensate to one of the condensate pump stations by pouring it through a funnel into the 1" ball valve located on the top of the pump station.

3. The secondary containment pipe leading into the tank should be checked weekly for leaks. This is done by quickly opening and closing the valve located on the containment pipe. Place a small bucket below the valve prior to opening to catch any liquid that may be within containment annulus. The presence of any liquid is indicative of a leak. If a leak is detected, it must be located and repaired immediately. If necessary, contact BFGSI for assistance.

4. The primary heater thermostat (the one closest to the heater element) should be set to 40°F. The secondary thermostat (the one furthest from the heater element should be set to 50°F.

5. Set the force main heat tracing thermostat to 40°F.

6. Make sure that all items have been wired and grounded per the National Electric Code as well as local electric codes.

7. **DO NOT TURN ON THE TANK HEATER UNTIL THE CONDENSATE LEVEL IN THE TANK IS ABOVE 18" IF THE INITIAL STARTUP IS IN FREEZING WEATHER, FILL THE BOTTOM 18" OF THE TANK WITH CLEAN WATER PRIOR TO TURNING THE TANK HEATER ON.**

Prior to disposal of any condensate and periodically thereafter, the condensate must be sampled to determine its regulatory status (hazardous or non-hazardous). The tests that are performed to determine this status are the TCLP and RCI tests. Contact your Environmental Compliance Manager or the Corporate Environmental Compliance Department to obtain exact sampling procedures, BFI approved laboratories, and resampling schedules.

2.6 KNOCKOUT POT

The knockout pot (sometimes referred to as a scrubber) is simply an expansion chamber located just upstream of the blowers. As gas flows through the pot, the decrease in velocity allows any remaining liquids or small particles to drop out of the gas stream. A site glass, located on the pot, indicates the liquid level inside and when it must be drained. Two 4 foot diameter knockout pots are located in the blower building immediately upstream of the blowers.

Routine Operation

Drain the knockout pots weekly or as required while the gas extraction system is shutdown. An excellent time to do this is during the weekly switching of the blowers. This is accomplished by simply opening the 2" ball valve located at the bottom of the knockout pot. Close the drain valve after the condensate has been drained. The knockout pot should not be operated if more than one-fourth of the site glass is filled.

Check the differential pressure gauge located on the side of the knockout pot weekly. This gauge measures the pressure drop across the internal stainless steel demister pad. A pressure drop of greater than 2" of water column indicates that the pad is dirty and needs to be cleaned.

2.7 EXTRACTION SYSTEM BLOWERS

Two centrifugal blowers are installed in parallel in the blower building to allow for alternate operation and to provide a backup should one blower fail. Operation of the blowers should be performed in conjunction with the operation of the flare system.

2.7.1 Startup Procedures

1. On the blower that is to be placed into operation, fully open the outlet valve located directly on the blower. Open the inlet valve located on the blower the appropriate amount to adequately throttle the blower.

2. Close the inlet and outlet valves on the blower that will not be in operation.

3. Select the appropriate blower on the flare control panel using the "Waste Gas Blower Select" switch.

4. Blower will start automatically at the appropriate time when the flare is placed in the automatic mode. Refer to the flare startup procedures in Section 2.8 and the Enclosed Flare Operation and Maintenance Manual for more information.

2.7.2 Routine Operation

1. Operation is automatic after the flare "Control Power" switch is activated and the "Start-Up Mode" switch is in the "AUTO" position.

2. Blowers are to be alternated weekly. Follow shutdown procedures below to deactivate a blower.

WARNING: DO NOT OPERATE BLOWERS IN MANUAL MODE UNLESS AN OPERATOR IS PRESENT AT ALL TIMES. OPERATION IN THE MANUAL MODE WILL DISABLE THE SAFETY DEVICES ON THE FLARE AND BLOWERS.

2.7.3 Shutdown Procedures

1. Switch "Control Power" switch to "OFF" on the flare control panel.

2. Close the inlet and outlet valves on the shutdown blower.

2.8 BLOWER BUILDING ANCILLARY EQUIPMENT

In addition to the knockout pot and blowers, the blower building is equipped with a ventilation fan, heater, and gas detection devices.

2.8.1 Initial Startup Procedures

Prior to placing the blower building into service, the following tasks must be performed. Refer to the specific equipment manufacturers manuals for detailed instructions on performing these tasks.

1. Set Building Heater Thermostat to 50°F.

2. Set Building Exhaust Fan Thermostat to 80°F.

3. Calibrate the Building LEL Sensors.

4. Calibrate the Building H_2S Sensor.

5. Calibrate the Building O_2 Sensor.

6. On the MSA gas monitoring system located on the flare control rack, set the caution, warning, and alarm points for each LEL sensor at 5, 8, and 10 percent of the LEL respectively.

7. On the MSA gas monitoring system located on the flare control rack, set the caution, warning, and alarm points for the H_2S sensor at 10, 25, and 50 PPM respectively.

8. On the MSA gas monitoring system located on the flare control rack, set the caution, warning, and alarm points for the O_2 sensor at 20.5, 20, and 19.5 percent respectively.

2.8.2 Routine Operation

The blower building exhaust fan will operate under the following three conditions.

1. If the internal building temperature exceeds 80°F.

2. If a methane concentration above 10% of the LEL is detected, an oxygen concentration less than 19.5% is detected, or an H_2S concentration in excess of 50 PPM is detected.

3. If the "Blower Building Exhaust" switch located on the flare control panel is turned to the "ON" position.

Prior to entering the blower building, the "Blower Building Exhaust" switch located on the flare control panel must be turned to the "ON" position and the building must be allowed to purge until the "Blower Building Purged" light illuminates (a minimum of 5 minutes). Additionally, the gas monitoring system located on the flare control rack must be checked to assure that the atmosphere is the building is safe and the exhaust fan must remain on whenever the building is entered. The atmosphere is considered safe if and only if no caution, warning, or alarm lights are lit on the gas monitoring system and the LEL level is below 5%, the H_2S concentration is below 10 PPM, and the oxygen concentration is greater than 20.5%. If all of these conditions are not met, this indicates a pipe leak or break is present inside the building.

If a pipe leak or break is indicated, do not enter the building. Shut the system down and allow the building to continue to purge until the gas monitoring system indicates that it is safe to enter the building. Find and repair the pipe leak(s) or break(s) prior to restarting the system.

2.9 AIR COMPRESSOR AND DEHYDRATOR SYSTEM

The building is equipped with an explosion-proof air compressor that provides the compressed air to drive the condensate pumps and operate the fail-closed valve. Perform the following checks and adjustments prior to starting the compressor. Refer to the air compressor Operations and Maintenance Manual for exact instructions for performing these tasks.

1. Set the compressor to run in the constant speed mode. In this mode, the compressor motor will run continuously but the compressor will only operate when more compressed air is needed. This mode is to be used because frequent starting and stopping will greatly reduce the life of the air compressor motor.

2. Make sure that the compressor is filled with oil and that the low level oil switch is working correctly. Use only an oil recommended by the compressor manufacturer.

3. Make sure that the air compressor is turning in the correct direction.

4. Prime the automatic drain trap on the compressor receiver tank.

5. Check all pressure relief valves to make sure that they release and reseat properly.

6. Set the compressor to turn on at approximately 110 PSI and to turn off at approximately 125 PSI.

7. Read and perform any other checks required by the compressor manufacturers Operations and Maintenance Manual. If you have any questions concerning

how to perform any of the checks, contact the local compressor distributor for assistance.

In order to insure that only clean dry air is sent to the condensate pumps, an explosion-proof heaterless desiccant type air dryer has been installed next to the air compressor. Additionally, an oil-coalescing filter is installed between the compressor and the dryer and a particulate filter is installed on the outlet side of the air dryer. Perform the following checks and adjustments prior to placing the air compressor/dryer system into normal operation. Refer to the dryer Operations and Maintenance Manual for detailed instructions on performing these tasks.

1. Set the timer to the 10-minute cycle.

2. Set purge economizer switches to 25% of maximum flow.

3. Adjust the purge rate pressure setting to 40 PSI.

4. Adjust the outlet regulator for the air header to 100 PSI.

5. Read and perform and other checks required by the dryer manufacturers Operations and Maintenance Manual.

Condensation will form in the air compressor tank as well as the oil coalescing and particulate filters. Because this condensate will be slightly contaminated with the lubrication oil in the compressor, it must be collected and disposed of properly. To facilitate this process, all of the drain points are piped to a single location at the edge of the compressor skid. Place a small plastic collection tray under the outlet and empty as necessary. The oil-phase should be disposed of in a manner similar to other waste oils. The water phase is to be disposed of with the landfill gas condensate. If you need additional information concerning the proper disposal of the condensate wastes, contact your environmental compliance manager.

2.10 FLARE SYSTEM

REFER TO THE ENCLOSED FLARE OPERATION AND MAINTENANCE MANUAL FOR MORE DETAILED INFORMATION CONCERNING THE OPERATION OF THE FLARE SYSTEM. THE FOLLOWING IS ONLY BASIC FLARE OPERATION INFORMATION.

The flare system is located approximately fifty (50) feet from the blower building. The outer shell of the flares have sample ports near the top of the stack for testing as required by the regulatory agencies and are constructed with a carbon steel shell painted with an inorganic zinc primer for corrosion protection. The interior of the shell is covered with two layers of ceramic refractory to protect the flare stack from the heat of combustion. The flare is equipped with thermocouples mounted at various levels along the stack to monitor the combustion temperature and provide safety shutdowns. Additionally, a self-checking U.V. flame scanner is located at the flare base to insure that combustion is occurring. Two air dampers are positioned along the

base of the flare to control the combustion temperature. A flame arrestor is located at the inlet to the flare to prevent the propagation of the flame into the pipeline in the event that a combustible mixture is present in the pipeline. The system also includes a pneumatically actuated fail-closed valve located on the knockout pot that closes when the blowers shut off or when the flame scanner does not detect a flame in the flare.

Other components of the flare system include:

1. Temperature monitor and recorder.
2. Flowrate monitor and recorder.
3. High temperature shutdown.
4. Low temperature shutdown.
5. Automatic temperature control.
6. Automatic restart.

All blower building and flare components are located within a 6-foot high chain-link security fence. This fence should remain closed and locked at all times when the system is unattended.

2.10.1 Initial Startup Procedures

Before initiating operation of the flare, system operation personnel should familiarize themselves with the recommended safety precautions and detailed operation procedures detailed in the Enclosed Flare Operations and Maintenance Manual provided by the Flare Manufacturer. Furthermore, a competent technical consultant must be present at the initial startup and operation of the flare system. Thereafter, only qualified personnel are allowed to work on or around the flare. Perform the checks (flowsheet, mechanical, electrical, and equipment) described in the Enclosed Flare Operations and Maintenance Manual.

2.10.2 Manual Operation (For Troubleshooting Only)

1. Turn the flare "Control Power" switch to the "ON" position.

2. Place "Start-Up Mode" switch in manual mode.

3. Press "Purge Cycle Start" button to begin the purge cycle. This step must be performed prior to unit firing.

4. Verify that the "Purging" light is on. This light indicates that the purge air blower is purging the flare with clean air.

5. After the "Purging Cycle Completed" light illuminates, press the "Ignition Start" button.

6. After the pilot is lit, the "Flame Proved" light will illuminate. With the "Waste Gas Valve" and "Waste Gas Blowers" switches in the "Auto" position, the valve will open and the blower will start to operate. If these switches are placed in the

"OPEN" and "MANUAL" positions, the valve and the blower will both be placed in operation. Typically, this mode is selected only for maintenance purposes.

CAUTION: MANUAL OPERATION OF THESE COMPONENTS BYPASSES SOME SAFETY FEATURES. DO NOT LEAVE SYSTEM UNATTENDED IN THIS MODE.

2.10.3 Automatic Operation (Routine Operation)

1. Position "Start-Up Mode" switch to "AUTO".
2. Turn "Waste Gas Valve" and "Waste Gas Blowers" switches to the "AUTO" position.
3. Turn the "Control Power" switch to the "ON" position.
4. Observe the system operation sequence on the control panel, as follows:
   a. Purging,
   b. Purge Completed,
   c. Pilot gas valve opened,
   d. Flame proved,
   e. Waste gas valve open,
   f. Waste gas blower running.

2.10.4 Shutdown Procedures

1. Turn the "Waste Gas Blowers" switch to the "OFF" position at the flare control panel.
2. Turn the "Waste Gas Valve" switch to the "CLOSE" position at the flare control panel.
3. Turn the "Control Power" switch to the "OFF" position.

2.10.5 Emergency Shutdown

1. Press "SYSTEM EMERGENCY SHUTDOWN" button on flare control panel.
2. If necessary, lock control panel in the "OFF" position using the panel lock-out key.
3. Flare will not restart until "SYSTEM EMERGENCY SHUTDOWN" button has been reset and control power has been restored.

Chapter 3

SYSTEM AND EQUIPMENT MAINTENANCE

3.1 GENERAL

A well-operated landfill gas extraction system depends, to a large extent, on the implementation of a good preventative maintenance program. Preventative maintenance is important to the long life of the gas extraction system equipment and is necessary to qualify for manufacturers' warranty protection. Because the Landfill Gas Extraction System must be operational 24 hours a day, every day of the year, it is vital that a regular preventative maintenance program be incorporated in the routine work schedule at the landfill.

The tasks outlined in this chapter serve as a minimum recommended list of maintenance tasks from which a detailed checklist may be developed. All equipment manufacturer's maintenance requirements, as listed in their operation and maintenance manuals, must be incorporated into the work schedule. **NO MAINTENANCE TASK IS TO BE PERFORMED WITHOUT FIRST CONSULTING THIS MANUAL, AND THE RESPECTIVE EQUIPMENT MANUFACTURER'S OPERATION AND MAINTENANCE MANUAL.**

Maintenance records must be kept for each piece of equipment and each task performed. Chapter 6 describes the use of these records and provides examples of forms that may be used for recording maintenance information.

Before any maintenance is performed, safety precautions, such as shutting off and locking-out power supplies, must be followed. Refer to Chapter 7.

3.2 LANDFILL GAS EXTRACTION WELLS

The following maintenance tasks are to be performed weekly or as needed.

1. Remove all weeds and debris from around wells or encasements.

2. Check for significant soil settlement around wells. The wells have a flexible hose connection with the lateral pipe to accommodate settling. However, if significant settling occurs along with a loss of available vacuum, a break in the pipe or condensate blockage may be responsible.

3. Inspect exposed piping, valves, and fittings for leaks.

4. All well encasements are to be locked at all times when unattended.

3.3 LANDFILL GAS HEADER AND LATERAL PIPING NETWORK

Monitoring of vacuum, methane concentration, temperature, and flow rate at the wells will indicate problems in the piping system. Two problems that may be encountered are surging and pipe breaks. Surging is a cycle of restricted and unrestricted gas flow caused by condensate trapped in low points of the header.

1. Normal maintenance of the piping consists only of operating the header isolation valves quarterly.

2. If normal monitoring and operation of the system indicates the presence of surging or a pipe break, the following procedure should be followed:

   a. Close the isolation valves on the problem length of pipe to isolate it from the system. Close all wellhead valves on the isolated portion of the header.

   b. Excavate the pipe in the area where the settlement or break is most likely to have occurred. Repair the damaged pipe.

   c. Replace and re-compact cover material over the pipe.

   d. Open isolation and wellhead valves.

3. All valve boxes are to be locked at all times when unattended.

3.4 CONDENSATE PUMP STATIONS

The following maintenance tasks are to be performed weekly.

1. Remove all weeds and debris from around the pump stations.

2. Open pump station encasement lids to check for leaks in the system and check to see that the pumps are functioning properly. The best way to check for proper operation of the pump is to isolate the pump station from the vacuum in the header system by closing the 4" ball valve using the remote handle located in the pump station encasement and then opening the 1" ball valve located on the top of the pump station. The removal of the applied vacuum should cause the pump to cycle at a rate of approximately 3-4 times per minute. If this occurs, the pump is operating properly and the system can be returned to normal operation.

3. If the pumps should require repairs or maintenance, isolate the pump station from the vacuum in the header system as described above. The 8" blind flange can then be removed from the top of the pump station and the pump lifted to the surface. Refer to the pump manufacturers Operations and Maintenance Manual for troubleshooting information.

4. All condensate pump station encasements are to be locked at all times when unattended.

The following maintenance tasks are to be performed quarterly.

1. Test the condensate pump stations for leaks using the method described in Section 2.4.

3.5 CONDENSATE STORAGE TANK

The following maintenance tasks are to be performed weekly.

1. Remove all weeds and debris from around the tank.

2. Check and record the level of condensate/leachate in the tank. Begin making preparations for the disposal of the condensate when the tank becomes approximately two thirds full. **DO NOT OPERATE THE GAS SYSTEM IF THE TANK IS NEARING FULL CAPACITY AND THERE IS A CHANCE THAT THE TANK WILL OVERFLOW.**

3. Check the tank for leaks, visible damage, or corrosion.

The following maintenance tasks are to be performed monthly.

1. Test the tank leak detection system for proper operation.

The following maintenance tasks are to be performed quarterly.

1. Check the tank heater system, level switches, heat tracing, etc., for proper operation.

2. Repair and paint any corroded areas on the tank.

3.6 KNOCKOUT POT

Maintenance to be performed every 6 months:

1. Remove the top of the pot and check inside for corrosion and dirt buildup. Clean demister pad and inside of pot, if necessary. ***System must be completely shut down with main header valves closed to remove knockout pot cover.***

Weekly maintenance:

1. Inspect pipe fittings and connections for signs of leakage. Make necessary repairs immediately.

2. Drain completely during blower change-over, or more often if necessary.

3.7 EXTRACTION SYSTEM BLOWERS

Weekly maintenance to be performed when blowers are alternated (refer to manufacturer's manual for detailed procedures):

1. Check for leaks in piping and valve connections.
2. Check the condition of the drive belts. Adjust or replace as necessary according to manufacturer's instructions.
3. Check for vibrations and loose connections.
4. Open the valves located at the bottom of each stage of each blower to drain any trapped condensate. Close valves.

Every 1,500 hours (under normal operating conditions), or every 3 months.

1. Lubricate blower bearings according to manufacturers recommendations. Use only a grease recommended by the blower manufacturer.

   WARNING: DO NOT OVER GREASE OR PERMIT CONTAMINANTS TO ENTER THE GREASE CHAMBER. DO NOT USE STANDARD CUP GREASE.

2. Lubricate motor bearings quarterly according to manufacturers recommendations. Use only lubricants specified (type and quantity) by the manufacturer.

   WARNING: DO NOT OVER GREASE. MOTOR WINDINGS MAY BE PERMANENTLY DAMAGED.

3. Clean grease inlet area of the motor to prevent grease contamination. Lubricate only with manufacturer's recommended grease that is fresh, and free from contamination.

Every 6 months:

1. Check motor/blower alignment.
2. Check motor insulation resistance at approximately the same temperature and humidity conditions to determine possible deterioration of the insulation. Refer to manufacturer's manual.
3. Check/tighten connections on motor control panel and at motor.

Annually:

1. Clean and repack grease reservoir in each blower following manufacturer's instructions.

3.8 BLOWER BUILDING ANCILLARY EQUIPMENT

The following maintenance tasks are to be performed weekly.

1. Check the operation of the fail-closed valve.
2. Inspect all piping, fittings, valves, etc. for leaks or breakage.
3. Inspect and repair any visible damage to the blower building weekly.
4. Check the building heater for proper operation during the winter months.
5. Check the building exhaust fan for proper operation.

The following maintenance tasks are to be performed quarterly.

1. Lubricate the blower building exhaust fan and ventilation louvers.
2. Inspect the fire extinguishers.
3. Calibrate the gas detection sensors located inside the blower building.

3.9 AIR COMPRESSOR AND DEHYDRATOR SYSTEM

Refer to the equipment manufacturers Operations and Maintenance Manual for detailed instructions on how to perform the all maintenance tasks.

The following maintenance tasks are to be performed weekly.

1. Check the frame oil level in the compressor.
2. Check the automatic condensate drain on the compressor for proper operation.
3. Check the oil coalescing and particulate filters. Replace when the indicator needle moves into the red area.
4. Check condensate collection tray and dispose of liquid properly if necessary.

The following maintenance tasks are to be performed monthly.

1. Inspect and clean the inlet air filter on the compressor.
2. Inspect compressor oil for contamination - change if necessary.

3. Change oil in the compressor if using petroleum based oil. Change oil every two months if using synthetic based oil.

4. Clean exterior of the compressor intercooler.

5. Check operation of compressor low level oil switch.

6. Manually operate all safety valves on compressor and dehydrator.

7. Clean cylinder cooling fins on compressor.

8. Check belt tension on compressor. Adjust if necessary.

9. Clean motor bearings on compressor.

10. Clean exterior of compressor aftercooler.

11. Tighten or check all bolts on compressor.

12. Inspect for air leaks on compressor, dehydrator, and all piping.

The following maintenance tasks are to be performed quarterly.

1. Lubricate compressor unloader piston O-ring with lubricant capable of 200°F.

2. Inspect, clean, or replace compressor valves.

3. Check and lubricate compressor motor bearings.

4. Clean the interior of the compressor aftercooler.

5. Inspect the desiccant in the air dehydrator and replace as necessary.

3.10 ENCLOSED FLARE SYSTEM

Maintenance requirements for the flare system are summarized below. Refer to the manufacturers instructions for detailed maintenance procedures.

1. Check the propane pilot fuel supply level weekly to insure that an adequate supply is available.

2. Check for proper operation of the fail-closed valve weekly.

3. Quarterly inspection of gas solenoid valves.

4. Weekly removal, replacement, and filing of flare temperature and flow recorder charts.

5. Quarterly cleaning of the flame scanner viewing window and vent port.

6. Quarterly lubrication of the purge blower fan and motor.

7. Monthly inspection and cleaning of the flame arrestor.

8. Monthly lubrication of the air louvers on the flare.

9. Visually inspect the flare refractory quarterly.

10. Refer to the Enclosed Flare Operations and Maintenance Manual for detailed maintenance procedures for each flare control system component.

3.11 SITE MAINTENANCE

Maintenance activities to be conducted at the landfill site on a periodic basis include:

1. Weed control around wells, drains, blower/flare facility, and gas monitoring probes. (Inspect weekly.)

2. Quarterly lubrication of all locks with dry graphite.

3. Site cleanup as needed.

4. Fence repair as needed. (Inspect quarterly.)

3.12 MAINTENANCE SCHEDULE SUMMARY

Table 3-1 summarizes the major maintenance tasks outlined in this chapter. The information in the table is not a comprehensive list of maintenance responsibilities, but is intended to serve as a minimum guide in establishing a routine maintenance schedule. It is recommended that landfill gas extraction system operations personnel develop a more detailed maintenance schedule based on the information in this manual, the equipment manufacturer's manuals, and experience with the gas extraction system.

TABLE 3-1
MAINTENANCE SCHEDULE SUMMARY

Equipment/Action	Wk	Mo	Qtr	6 Mo	Yr
Wells/Probes					
1. Inspect for settling, weeds, leaks, water.	X				
Extraction System Piping					
1. Inspect for settling, weeds, leaks, water.	X				
2. Operate header isolation valves.			X		
Condensate Pump Stations					
1. Inspect and remove weeds and debris from around pump station.	X				
2. Check for leaks and proper functioning of pumps.	X				
3. Test pump stations for leaks.			X		
Condensate Storage Tank					
1. Inspect and remove weeds and debris from around the tank.	X				
2. Check and record condensate level in tank. Arrange for disposal if necessary.					
3. Check heater pipe insert for leaks	X				
4. Check for leaks, visible damage, or corrosion.	X				
5. Test the tank leak detection system.	X				
6. Check heater for proper operation.		X			
7. Repair and paint corroded areas on tank.			X		
			X		
Blower Facility					
1. Inspect piping, fittings, valves, and seals for leaks or breakage.	X				
2. Drain knock-out pot during blower changeover.	X				
3. Check for belt condition, loose connections, vibration at blower.	X				
4. Drain blower stages after changeover.	X				
5. Check operation of the fail-closed valve.	X				
6. Check building heater.	X				
7. Check building exhaust fan.	X				
8. Inspect fire extinguishers.			X		
9. Lubricate blower motor bearings.			X		
10. Lubricate blower bearings.			X		
11. Lubricate building exhaust fan.			X		
12. Calibrate building gas detection sensors.			X		
13. Clean knock-out pot and demister pad.				X	
14. Check motor/blower alignment.				X	
15. Check motor insulation resistance.				X	
16. Tighten electrical connections on motor control panel and at motor.				X	
					X
17. Clean and re-pack blower bearings (or every 1,500 hours)			X		

TABLE 3-1
MAINTENANCE SCHEDULE SUMMARY
(Continued)

Equipment/Action	Wk	Mo	Qtr	6 Mo	Yr
Air Compressor and Dehydrator System					
1. Check compressor oil level.	X				
2. Check automatic condensate drain on compressor tank.	X				
3. Check dryer filters.	X				
4. Check/drain air compressor condensate collection tray.	X				
5. Inspect and clean compressor inlet filter.		X			
6. Inspect compressor oil for contamination.		X			
7. Change compressor oil if necessary.		X			
8. Clean exterior of compressor intercooler.		X			
9. Check compressor low oil level switch.		X			
10. Operate all safety valves.		X			
11. Clean compressor cylinder cooling fins.		X			
12. Check compressor belt tension.		X			
13. Clean compressor motor bearings.		X			
14. Clean exterior of compressor aftercooler.		X			
15. Check all bolts on compressor.		X			
16. Inspect compressor, dehydrator, and piping for air leaks.		X			
17. Lubricate compressor unloader piston O-ring.			X		
18. Inspect, clean or replace compressor valves.			X		
19. Check and lubricate compressor motor bearings.			X		
20. Clean interior of compressor aftercooler.			X		
21. Inspect desiccant in dehydrator.				X	
Flare					
1. Drain flame arrestor.	X				
2. Inspect control panel for water damage.	X				
3. Check propane level.	X				
4. Replace charts.	X				
5. Weed, debris removal.		X			
6. Clean flame arrestor.		X			
7. Visually inspect ignitor.		X			
8. Lubricate air louvers.		X			
9. Visually inspect refractory.			X		
10. Inspect gas solenoids.			X		
11. Clean/inspect flame scanner view and vent.			X		
12. Purge blower motor lubrication.			X		
Other					
1. Inspect security fencing.			X		
2. Lubricate locks.			X		
3. MSA explosimeter factory service.				X	
4. MSA oxygen meter factory calibration and service.					X
5. Airdata multimeter factory calibration and service.					X

Chapter 4

WELLFIELD MONITORING AND PROCESS CONTROL

4.1 GENERAL

Monitoring is required to insure that all relevant laws, regulations, and permit conditions are being complied with and to evaluate the landfill gas extraction system operation and performance. Routine monitoring of operating parameters is also necessary to insure the effectiveness and continued safe operation of the gas extraction system.

Operation of the landfill gas extraction system consists mainly of regulating and adjusting the amount of vacuum applied to each extraction well through the use of valves. This adjustment of vacuum, and therefore flowrate, is referred to as "balancing" the gas system. A balanced system is one in which each well is adjusted to extract the maximum amount of gas possible while controlling migration and without causing excess amounts of air to be drawn into the landfill. The tests performed to balance and insure the efficient operation of the gas system are:

1. Flowrate into the Flare
2. Methane Concentration into the Flare
3. Gas Temperature at the Knockout Pot
4. Methane Concentration at Each Well
5. Oxygen Concentration at Each Well
6. Vacuum at Each Well
7. Gas Temperature at Each Well
8. Gas Concentration at Each Probe

Monitoring of the above parameters is to be conducted on a weekly basis. The above parameters should be monitored three to four times a week during the first three weeks of operation of newly constructed portions of the system. Monitoring forms are included in Appendix D.

4.2 OPERATIONS MONITORING - TESTING PROCEDURES

In order to achieve and maintain a well balanced system, vacuum, methane concentration, oxygen concentration and gas temperature are to be measured weekly at each well. In addition to these weekly tests, flowrates are to be measured monthly to help establish the correlation between vacuum and flowrate at each individual well.

4.2.1 Methane Concentration

Landfill gas is typically generated at a mixture of approximately 50 percent methane and 50 percent carbon dioxide. High methane concentrations usually indicates that more gas is being generated than is being extracted by the well. Low methane concentrations usually indicate air intrusion. Therefore, methane concentration is the primary test for determining if the applied vacuum should be changed. Methane

concentration is also to be measured at the inlet to the flare to insure that the flare is operating within its design limits. The suggested instrument for monitoring methane concentration is the Model 62-S explosimeter manufactured by Mine Safety Appliances, Inc. The meter is designed for measuring both LEL (lower explosive limit) and percentage of gas by volume.

The methane concentration data obtained from the landfill gas extraction wells are to be recorded on the Weekly LFG Extraction System Report located in Appendix D. These reports are to be kept in a binder and should only be sent to the Corporate office if requested.

The weekly measurements taken at each of the methane monitoring probes should be recorded on the Weekly Gas Monitoring Report. The monthly maximum reading per probe should be recorded on the Monthly Gas Monitoring Summary. The original completed forms are to be filed in the Methane Monitoring Logbook and copies of the Monthly Gas Monitoring Summary sent to the Landfill Manager and to the BFI gas system project manager. Both forms are located in Appendix D. If a Methane Monitoring Logbook is not available, please contact BFI.

Testing Procedure

1. Make sure the meter is calibrated prior to each use. Calibration is normally done with bottled calibration gas, which can be obtained from MSA. The meter must be calibrated on 2 or 2½% methane for the LEL scale and 100% methane for the percentage by volume scale. Record the data on the Instrument Calibration Record located in Appendix D and keep a copy of the report in the Methane Gas Monitoring Logbook. This record will be necessary to substantiate any data used in legal proceedings. Refer to the MSA owners manual for detailed calibration instructions.

2. Clear the meter and make sure each scale is set to zero. This is done by pumping the aspirator with the probe in fresh air. After clearing the meter, zero adjustment may be required. Start each measurement with the instrument set to percentage of gas to avoid over-ranging the meter and damaging the elements.

3. To test methane monitoring probes, place a cork or rubber stopper around the meter probe. Remove the probe cap and quickly insert the tube into the monitoring probe. Pump the aspirator bulb 5 times to obtain a representative sample. Record the peak reading of the meter. If the methane concentration is less than 5% by volume, switch the meter to the LEL scale and repeat the above steps.

4. To test the extraction wells, place a cork or rubber stopper tightly around the probe. Insert the probe in the sample port on the wellhead and pump the aspirator bulb at least 5 times. Record the peak reading. There is no need to monitor extraction wells using the LEL scale.

5. Take readings at all monitoring probes, extraction wells and inlet to the flare.

6. If the methane concentration is greater than 5 percent, do not measure the LEL percentage as it may damage the instrument. If the methane concentration is less than 5 percent, measure and record the LEL percentage for gas monitoring probes only.

4.2.2 Vacuum

In order to operate the gas extraction system effectively, the system must be balanced. Balancing is the process of adjusting the vacuum applied each extraction well in order to extract the gas stored within the landfill initially and then to extract the gas that is being generated.

The measurement of vacuum is conducted to establish its relationship to methane concentration and flow rate at each extraction well. Once a relationship is determined, an optimal flow rate and vacuum that maximizes gas extraction and minimizes air intrusion can be established for each well.

Because methane production in the landfill is dependent upon many factors, the amount of vacuum required to extract the gas will vary at each well and also with time. Generally, a vacuum of only 1-2 inches of water column is applied to the extraction wells along the systems' perimeter. Experience has shown that this will usually be adequate to control gas migration and that greater vacuums usually result in excessive air intrusion due to the large area of exposed landfill cap within the radius of influence of these wells. Interior wells however, due to the relatively small area of exposed cap, will usually have a vacuum in the range of 2-3 inches of water column applied.

One problem that is indicated by vacuum tests is water blockage. A large drop in available vacuum or surging between two wells is a sign of water filling a low spot in the header. This is normally caused by the settlement of the landfill. Such problem areas should be isolated from the rest of the system until repairs to the pipe can be made. Repairs should be performed as soon as possible.

It is recommended that a Model ADM-870 airdata multimeter manufactured by Shortridge Instruments of Scottsdale, Arizona be used to perform vacuum tests.

Testing Procedure

1. Place a rubber stopper around the meter hose so that a positive seal can be made to the wellhead sample port.

2. Open the sample port located on the wellhead.

3. Insert the meter hose and read the applied vacuum at the wellhead. Refer to the ADM-870 manual for detailed operating instructions.

4. Record the initial vacuum data on the Weekly LFG Extraction System Report located in Appendix D.

5. Make any adjustments to the wellhead valve that may be required.

6. Record the final vacuum data on the Weekly LFG Extraction System Report located in Appendix D.

7. Close the sample port.

4.2.3 Landfill Gas Temperature

Although the simplest of the tests performed, temperature is one of the most important as accurate temperature data can indicate the onset of problems that may lead to a fire within the landfill. Fires within the landfill can result from the presence of oxygen. This is usually caused by too much vacuum being applied to a well which results in excessive amounts of air being drawn through the landfill cap. There are two signs of excessive air intrusion. The first is a high gas temperature at the wellhead. The second is a sudden decrease in the methane concentration of the flow stream. As temperatures may vary somewhat between wells, it is important to quickly establish a normal temperature for each well.

If excessive air intrusion occurs, both effected and surrounding wells should be closed for at least two weeks. After this time, the wells should then be slowly brought back into service and monitored daily for a week. If the excessive temperatures do not return and gas concentrations remain normal, the wells can be placed back into normal service. If the high temperatures return, the wells should again be taken out of service for another two weeks.

Testing Procedure

1. Open the sample port located on the wellhead.

2. Place a rubber stopper around the temperature probe of the airdata multimeter.

3. Insert the probe into the wellhead and record the stabilized temperature on the Weekly LFG Extraction System Report located in Appendix D. Refer to the ADM-870 manual for detailed operating instructions.

4. Close sample port.

4.2.4 Gas Flow Measurement

The results of flowrate tests show the performance of each well and how much gas is being extracted from each area of the landfill. When a decrease in flowrate from a well is observed, it is normally due to water occupying a greater portion of the well string perforations. However, decreased wellhead flowrates can also indicate well failures due to landfill settlement or other forces. A significant decrease in flowrate at the flare can indicate a broken or blocked main header line.

A flow sensor is permanently installed in the 12" line between the blower building and the flare. This sensor continuously measures, in standard cubic feet per minute, the total flowrate of landfill gas going into the flare. The flowrate can be read on the L.E.D. display of the chart recorder located in the flare control panel cabinet. Record this reading on the Weekly LFG Extraction System Report located in Appendix D.

Testing Procedure (Wellheads)

1. Open sample port on the wellhead.

2. Measure the gas velocity at the wellhead using the ADM-870 airdata multimeter. Refer to the owners manual for detailed instruction on the procedure.

3. Multiply the gas velocity (ft/min) by the inside cross-sectional area of the pipe (ft^2).

4. Record the flowrate (CFM) on the Weekly LFG Extraction System Report located in Appendix D.

5. Close the sample port.

4.2.5 Oxygen Concentration

Landfill gas is a result of the anaerobic decomposition of waste within the landfill. The presence of oxygen is toxic to the methane producing bacteria. Therefore, oxygen concentrations of more than a few percent is indicative of excessive air intrusion into the landfill and can indicate the potential for future problems such as underground landfill fires and low methane production. Therefore, oxygen concentration is to be measured weekly at the wellheads so that these potential problems can be avoided. The suggested instrument for monitoring oxygen concentration is a Model 245 oxygen meter manufactured by Mine Safety Appliances, Inc. that is equipped with an adaptor and tube assembly for remote sampling.

The oxygen concentration data obtained from the landfill gas extraction wells are to be recorded on the Weekly LFG Extraction System Report located in Appendix D. These reports are to be kept in a binder and should only be sent to the Corporate office if requested.

Testing Procedure

1. Make sure the meter is calibrated prior to each use. Calibration is normally performed using uncontaminated fresh air. Refer to the Operations and Maintenance Manual for the meter for detailed calibration instructions.

2. Clear the meter and make sure the scale is set to 20.8 percent. This is done by pumping the aspirator with the probe in fresh air.

3. To test the extraction wells, place a cork or rubber stopper tightly around the probe. Insert the probe in the sample port on the wellhead and pump the aspirator bulb at least 5 times. Record the stabilized reading of the meter. This will usually take between 30 seconds and three minutes depending on the temperature. The colder the weather, the longer it will take to obtain an accurate reading.

4. Take readings at all extraction wells.

4.2.6 Flare Temperature

The flare system is equipped with thermocouples located at various points on the flare stack to monitor and control combustion temperature. In addition to this process, the thermocouples also act to prevent the flare from operating at temperatures that will result in problems.

Temperatures above 2100°F will damage the ceramic refractory inside the flare. Therefore, if the flare exceeds this temperature, it will automatically shut down and will not restart until the system is reset by turning the control panel power off and then back on. Do not restart the flare after a high-temperature shutdown until the problem has been determined and corrected.

By permit conditions, this landfill gas flare cannot be operated at temperatures below 1,400°F. The low temperature shutdown on the flare should be set no lower than this temperature. This safety feature will prevent continued operation of the flare in the event that the stack temperature falls below this minimum temperature. Do not restart the flare after a low-temperature shutdown until the problem has been determined and corrected.

The set point temperature of the flare is the temperature that the flare system will try to maintain. Typically, the flare will maintain a temperature within 20°F of the set point temperature. Therefore, the set point temperature should be set approximately 100°F above the low temperature shutdown.

An L.E.D. display of both the set point temperature and actual combustion temperature is provided on the flare control panel. Record the actual combustion temperature on the Weekly LFG Extraction System Report located in Appendix D.

4.3 PROCESS CONTROL

Proper operation of the gas extraction system requires appropriate response to the monitoring data. Actions to be taken when particular conditions in the system are discovered are summarized on Tables 4-1 through 4-5.

TABLE 4-1
LFG WELL SYSTEM ADJUSTMENT SCHEDULE

OXYGEN (% V)	METHANE (% V)	BALANCE GAS OR NITROGEN (% V)	ACTION	STATUS
<1.0	>50	<4	Increase vacuum	Below optimum extraction
<1.0	<50 but >40	<4	Maintain same vacuum	Well most likely prime production
>1.0 but <4.0	>50	>4 but <8	Open or maintain vacuum, watching for oxygen rise, check cover integrity	Below optimum extraction, possible air intrusion
>1.0 but <4.0	<50 but >40	>4 but <8	Maintain vacuum, watching for oxygen rise, check cover integrity, watch for sharp temperature increases	Optimum production, possible air intrusion which may lead to damage to microbe and decrease in methane
>1.0 but <4.0	<40	>4 but <8	Decrease vacuum, watch for oxygen rise, check cover integrity, watch for sharp temperature increases	Well over drawn, air intrusion and possible damage to microbes occurring
>4.0	>40	>8	Maintain vacuum, check, repair cover, watch for oxygen rise, shut well if oxygen is greater than 10 percent, watch for sharp temperature increases	Air intrusion and damage to microbes occurring
>4.0	<40	>8	Throttle back or close well, watch for oxygen rise, shut well if greater than 10 percent, check cover integrity, watch for sharp temperature increases	Air intrusion and damage to microbes occurring

Note:
The vacuum should be greatest at the blower inlet and lowest at the farthest monitoring point of the LFG collection system. In accordance with the NSPS regulations, pressures at individual wells should be maintained as negative (vacuum).

TABLE 4-2
LFG COLLECTION SYSTEM TROUBLESHOOTING CHECKLIST

SYMPTOM	POSSIBLE CAUSE	DETERMINATION OF CAUSE	TEMPORARY SOLUTION	LONG-TERM SOLUTION
Vertical extraction well high oxygen/ nitrogen concentration	1. Loose or leaky test port connection	1. If the plastic tube fits loosely on the quick connect coupling or does not effect a positive seal	1. Use Teflon tape liberally to effect a better seal	1. Plug and redrill test port
	2. Bad or loose hose connection with meter	2. Check hose connection	2. Fix hose connection	2. Fix hose connection
	3. Bad/leaky gasket at wellhead or valve	3. Check gasket and flange	3. Try to use duck tape around the flange	3. Replace gasket
	4. Bad well seal	4. None of the above causes were found—historically a good well	4. Adjust valve setting lower or shut-off	4. Repack or rehydrate wellhead seal with bentonite
	5. Overdrawing on the well	5. None of the above causes were found	5. Adjust valve setting lower or shut-off	5. None, well may be past maximum production
Low methane concentration (<40%)	1. Air leak	1. See high oxygen/nitrogen concentration troubleshooting		
	2. Over pulling on the well	2. Check well's past history typical vacuums	2. Adjust valve setting lower	2. Check well reading in next monitoring event
High nitrogen/ balance gas (>10%)	1. Air leak	1. See high oxygen/nitrogen concentration troubleshooting		
	2. Over pulling on the well	2. Check well's past history typical vacuums	2. Adjust valve setting lower	2. Check well reading in next monitoring event
Fluctuating static/delta pressure readings "Surging"	1. Partial condensate blockage in lateral	1. Listen to well lateral for surging of LFG or gargling of condensate	1. If significant, shut off well and drain condensate	1. May need to regrade lateral
	2. Main header pipe partially blocked by condensate	2. Listen for surging or gargling of condensate, check for differential settlement between header and sump	2. Check operation of nearest condensate sump, or repair drain line from header to sump	2. May need to regrade header, or inspect condensate sump
Low flow from well	1. Significant leachate in well restricts LFG flow	1. Check liquid level	1. Pump liquid out once	1. Install dedicated pumps and leachate drain lines
	2. Waste is decomposed	2. Check waste placement records	2. None	2. None
	3. Well screen is clogged	3. Televise well screen	3. None	3. Abandon well and replace with a new well

TABLE 4-3
LIQUID MANAGEMENT SYSTEM TROUBLESHOOTING CHECKLIST

SYMPTOM	POSSIBLE CAUSE	DETERMINATION OF CAUSE	TEMPORARY SOLUTION	LONG-TERM SOLUTION
Sump not operational	1. Insufficient air pressure.	1. Verified by confirming water level in sump above pump start level or lack of vacuum at sump. Verify pump is working by actuating pump manually (place thumb over pump brain exhaust outlet, pump should cycle approx. 1 time every 15 seconds). Air pressure regulator setting too low.	1. Increase air pressure. Air pressure should be set between 40 and 100 psi.	1. Look for leaks to determine why air pressure was too low. Repair pump.
	2. Unable to discharge.	2. Discharge valve or isolation valve on force main closed. Verify pump is operational. Refer to pump manual for more information on troubleshooting the pump.	2. Check valve position at sump and at isolation valve locations. Valves should be open. Check discharge hose for correct set-up and discharge. Check force main for blockage or damage.	2. Check valve positions as part of regular weekly maintenance. Replace exhaust hoses. Remove pump and inspect/ clean, check valve, clean pump brain by flushing with clean water, and reconnect pump. Replace pump brain if pump does not function after all described steps have been followed. Repair pump.
Knockout pot not operational	1. Incorrect valve setting.	1. Verify drain valve is closed during operation.	1. Close valve drain.	1. Standardize operation to have valve drained during shutdown.
	2. High pressure loss. Loss of gas flow.	2. Inspect knockout pot demister pad for cleanliness.	2. Clean demister pad by flushing with manufacturer's recommended cleaning solution.	2. Clean demister pad when pressure loss across knockout pot exceeds 1-inch water column.

TABLE 4-4
FLARE STATION TROUBLESHOOTING CHECKLIST

SYMPTOM*	POSSIBLE CAUSE	DETERMINATION OF CAUSE	TEMPORARY SOLUTION	LONG-TERM SOLUTION
Loss of ignition	1. Blower malfunction.	1. See Table 4-5.	1. See Table 4-5.	1. See Table 4-5.
	2. Methane concentrations less than 30%, oxygen >10%	2. Check access port between blower and flare. Check flowrate and gas concentration to confirm that they are within the design parameters of the flare.	2. Verify readings. Obtain a complete set of extraction well monitoring data.	2. Adjust wellfield in accordance with Section 6.0.
	3. Thermocouple failure	3. Check recorder chart for temperature data at failure. Visually inspect thermocouple and wiring. Check to see if all thermocouples are reading approximately the same. Discontinuity of a thermocouple will cause a high temperature shutdown.	3. Select alternate thermocouple.	3. Repair thermocouple or wiring.
	4. Flame scanner failure	4. Check flame scanner.	4. Verify clear line of sight to flame.	4. Service flame arrestor.
	5. Flare louver failure	5. Check louver throw by adjusting manual louver and watching auto louver adjustment.	5. Reset manual louvers.	5. Check louver operation if flame temperature not steady.

TABLE 4-4 (CONTINUED)
FLARE STATION TROUBLESHOOTING CHECKLIST

SYMPTOM*	POSSIBLE CAUSE	DETERMINATION OF CAUSE	TEMPORARY SOLUTION	LONG-TERM SOLUTION
	6. Pilot failure.	6. Check level of propane tank. Check condition of spark plug. If ignition system is in good condition, test transformer for performance. If transformer is okay, check to see if ignition wire is broken. If the pilot lights briefly before going out, check flame relay and scanners for proper operation. Dirt and residue may limit flame scanner visibility. If a spark is present, check inspirator on gas pilot lines. Orifices may become clogged with dirt and oil. Check to see if spark system is grounded (i.e., cracked insulators).	6. Replace propane tank. Clean spark plug. Clean ignitor.	6. Repair replace system components.
	7. High temperature shutdown.	7. Check operation of actuated louvers to insure proper operation. Check manual louver to see if it is positioned correctly for the flow conditions. The manual louver should be placed in approximately the same position as the automated louver. Check the temperature controller for proper setting and operation.	7. See items 2, 3, and 5.	7. Repair replace system components.
Flare systems not operational	1. Loss of power.	1. Check circuit breakers, power supply, check for electrical short circuits	1. Reset circuit breakers, check electric service, eliminate electrical shorts.	1. Replace circuit breakers and repair wiring.

Note:
* Symptoms and causes can often be determined by failure lights on control panel.

TABLE 4-5
ADDITIONAL BLOWER TROUBLESHOOTING SUMMARY

BLOWER/SYMPTOM	ACTION
1. Insufficient pressure or vacuum.	■ Check rotation and speed. ■ Inspect piping for blockage and leaks. Check all inlet and outlet valves. ■ Check motor load. Motor should not be operating beyond rating. ■ If rubber sleeve on inlet is used: check for collapse. ■ Clean demister pad on knock-out pot. ■ Clean flame arrestor.
2. Vibration and noise.	■ Check alignment between blower and motor. ■ Proper alignment must be restored immediately to prevent damage to bearings or drive. ■ Inspect bearings for wear or damage. ■ Replace if necessary. ■ Blowers will surge when operating under very light or no load. Increase air flow in this case. ■ Never run blowers continuously with the valves closed or if in a surge condition. ■ Check for blockage in piping and blower.
3. Blower overheated.	■ Check inlet demister pad for clogging. ■ Check for surge or inadequate air flow.
4. Bearing housing overheated.	■ Inspect for damaged bearings. ■ Check for high ambient temperature.
5. Motor overheated.	■ Check for overload or bearing failure. ■ Be sure that voltage is correct and balanced. ■ Look for shorted stator windings. ■ Check for high ambient temperature.
6. Surge ("unstable" flow of air through machine).	■ Check for restricted air piping. ■ Inspect outlet piping for blockage. ■ Check for high liquid level in knockout pot.

Chapter 5

CONTINGENCY MEASURES

5.1 GENERAL

Emergency situations may occasionally arise at the site. To insure continued effective operation of the landfill gas extraction system and to protect public health during such emergencies, an emergency response plan must be in place. General response to most emergency situations may include the following procedures:

1. Assess the condition and its impact upon human lives, public health, and operation of the facility. This may mean weighing general environmental damage against limited property damage.

2. Determine the required response with particular attention to human lives, public health, and potential environmental damage. Take a system out of operation if necessary.

3. Notify the appropriate personnel, utilities, and regulatory agencies as soon as possible.

4. Do not assign personnel to take action unless they are properly trained and have the necessary protective equipment.

5. Take corrective action to restore the facility to normal operation. Keep down-time to a minimum.

6. Maintain an adequate spare parts inventory.

7. Critique the response plan.

This chapter is to be updated as often as necessary to insure a timely response to all reasonably expected situations.

5.2 EMERGENCY PERSONNEL

In the event of an emergency, the following persons should be contacted as needed as soon as possible.

Gas System Operator:

Steven P. Delfs
701 Greenbay Road
Zion, Illinois
Office: 847-731-5110; ext. 233
Emergency: 414-942-9579

Landfill Manager:	Jim Lewis 701 Greenbay Road Zion, Illinois Office: 847-731-5110; ext. 224 Emergency: 630-417-6052
District Safety Manager:	Cliff Jacobson 701 Greenbay Road Zion, Illinois Office: 847-731-5110; ext. 26 Mobile Phone: 847-344-2019
BFI:	Jeune Franklin 757 North Eldridge Houston, Texas 77079 Office: 281-870-7857

5.3 SAFETY PRECAUTIONS

Many emergency situations arise from poor maintenance practices and accidents. Diligent performance of preventative maintenance, careful operation and balancing practices, and implementation of a comprehensive safety program should prevent the occurrence of these types of emergency conditions. Safety procedures are discussed in Chapter 7.

5.4 POWER FAILURE

A general power failure will cause an overall system shutdown. All electrically actuated valves will close when power to them is terminated. Consult the Enclosed Flare Operation and Maintenance Manual for possible effects on the flare control sequence.

5.5 FIRE AND EXPLOSIONS

Landfill personnel must be trained in the use of fire extinguishers and be familiar with their locations onsite. In the event of a major fire, all personnel must leave the area of the fire and notify the fire department. Do not attempt to use a fire extinguisher on a major landfill gas fire.

If an explosion occurs, further explosions must be prevented by isolating the source of ignition, if possible. Keep people a safe distance from the site of the explosion. For both fires and explosions, the gates to the facility or to the blower/flare area must be kept closed to all but emergency vehicles.

5.6 MUTUAL AID AGREEMENTS

There are many agencies and businesses within a community which can be very helpful during emergencies. Mutual aid agreements may be made with such agencies and businesses. After agreements are obtained, an information fact sheet should be made listing the agreements.

Mutual aid agreements may be made with the fire and police department. For instance, the fire department would then routinely check the LFG extraction system for potential fire hazards and provide first aid instruction to LFG system operations personnel.

5.7 EQUIPMENT TROUBLESHOOTING

This section outlines the troubleshooting procedures to follow when problems with major system equipment are encountered. Always first consult the manufacturer's operation and maintenance manual before working on any piece of equipment.

5.7.1 Blowers

Trouble Shooting Guide

Problem	Action
1. Insufficient pressure or vacuum.	a. Check rotation and speed. b. Inspect piping for blockage and leaks. Check all inlet and outlet valves. c. Check motor load. Motor should not be operating beyond rating. d. If rubber sleeve on inlet is used: check for collapse. e. Clean demister pad on knock-out pot. f. Clean flame arrestor.
2. Vibration and noise.	a. Check alignment between blower and motor. Proper alignment must be restored immediately to prevent damage to bearings or drive. b. Inspect bearings for wear or damage. Replace if necessary. c. Blowers will surge when operating under very light or no load. Increase air flow in this case. Never run blowers continuously with the valves closed or if in a surge condition. d. Check for blockage in piping and blower.
3. Blower overheated.	a. Check inlet demister pad for clogging. b. Check for surge or inadequate air flow.
4. Bearing housing overheated.	a. Inspect for damaged bearings. b. Check for high ambient temperature.

Problem	Action
5. Motor overheated.	a. Check for overload or bearing failure. b. Be sure that voltage is correct and balanced. c. Look for shorted stator windings. d. Check for high ambient temperature.
6. Surge ("unstable" flow of air through machine).	a. Check for restricted air piping. b. Inspect outlet piping for blockage. c. Check for high liquid level in knockout pot.

5.7.2 Flare

The Enclosed Flare Operation and Maintenance Manual must be consulted for detailed troubleshooting information. Proper safety precautions must be followed as described in Chapter 7 of this manual and in the manufacturer's operation and maintenance manuals.

Trouble Shooting Guide

Problem	Action
1. Pilot failure.	a. Check level of propane tank. b. Check condition of spark plug. c. If spark plug is in good condition, test transformer for performance. d. If transformer is okay, check to see if ignition wire is broken. e. If the pilot lights briefly before going out, check flame relay and scanners for proper operation. Dirt and residue may limit flame scanner visibility. If a spark is present, check inspirator on gas pilot lines. Orifices may become clogged with dirt and oil. f. Check to see if spark system is grounded. (i.e. cracked insulators.) g. If the pilot lights briefly before going out, check flame relay and scanners for proper operation. Dirt and residue may limit flame scanner visibility.

Problem	Action
2. High temperature shutdown.	a. Check operation of actuated louvers to insure proper operation. b. Check manual louver to see if it is positioned correctly for the flow conditions. The manual louver should be placed in approximately the same position as the automated louver. c. Check the temperature controller for proper setting and operation. d. Check flowrate and gas concentration to confirm that they are within the design parameters of the flare. e. Check to see if all thermocouples are reading approximately the same. Discontinuity of a thermocouple will cause a high temperature shutdown.

5.8 SYSTEM TROUBLESHOOTING

Actions to be taken under various operating conditions are described in Chapter 4 in the Process Control Section.

Chapter 6

RECORDS AND REPORTS

6.1 GENERAL

Records and reports of the landfill gas extraction system operation, maintenance, and monitoring efforts serve a number of purposes. They are useful to landfill gas extraction system operating personnel, regulatory agencies, and others with similar systems or related problems. Because system operation will continue for years, proper "archiving" of information is necessary to monitor the status, and document the history of the system.

Records may be used to serve the following purposes:

1. Evaluation of system performance - Review of operating and monitoring records can indicate system efficiency and help pinpoint present and potential problems in the system.

2. Assessing maintenance frequency of system components - Maintenance records are also necessary qualifications for warranties issued by manufacturers.

3. Supporting budget requests for personnel or equipment to assist in the operation of the system.

4. Providing a foundation for defense against legal action, especially after emergencies.

5. Providing information for use in reports to regulatory agencies.

6. Submitting information for use by public and administrative officials.

7. Compliance with relevant permits, laws, and regulations.

8. Providing information for potential revenue generating ventures.

Records are not to be maintained for their own sake, but for their expected usefulness and value at a later date.

The following types of records are required in operating the gas extraction system:

- Monitoring records
- Maintenance records
- Safety records
- Emergency condition records

6.2 MONITORING RECORDS

Records of landfill gas extraction system monitoring results must be kept to document the history of system operation and performance. This data will be used to modify operating procedures, if necessary, and to optimize system performance. Forms for the maintaining of these records are located in Appendix D.

6.3 MAINTENANCE RECORDS

Comprehensive maintenance records are to be kept to document maintenance progress and to validate warranties. Records of service, maintenance, and repairs must also be maintained in order to develop the historical data vital for planning purposes. Standardization of records and procedures will reduce confusion as well as ease in the determination of major or recurring problem areas where improved maintenance or other appropriate action may be required. Maintenance records are to be kept on each piece of equipment and system component. A Maintenance and Repair Log is to be kept up-to-date and available on-site for review.

6.4 SAFETY RECORDS

Every accident, injury or illness occurring on the job must be immediately reported and recorded. Follow BFI policy for accident reporting.

6.5 EMERGENCY CONDITION RECORDS

All emergency conditions and responsive actions must be documented. Chapter 5 discusses the general procedures to be followed when emergency situations arise.

Emergency condition records should include, at a minimum, the following information:

1. Emergency facility and auxiliary personnel: names, addresses, telephone numbers, disaster responsibilities, skills, and availability of transportation.

2. Amounts, types, and locations of emergency equipment, materials, supplies, and chemicals (including repair items) that are available in the area.

3. Vehicles and equipment for hauling emergency supplies.

Chapter 7

SAFETY

7.1 GENERAL

Personnel operating and maintaining the system should be thoroughly familiar with safety practices. The telephone numbers of local emergency response services are to be readily accessible.

Personnel are to be aware that the information in this manual is not intended to be comprehensive. The safety precautions stated here are not to be considered the only precautions necessary, and are no substitute for an alert, informed, and responsible person. Employees are to be familiar with safety requirements of federal, state, and local agencies as well as the Occupational Safety and Health Administration (OSHA) rules and regulations.

7.2 LANDFILL HAZARDS

In addition to general safety hazards that may be present in any work situation, hazards specific to landfill sites may also be present. Employees may expect to encounter, at a minimum, the following hazards when operating and maintaining the landfill gas extraction system:

1. Fires and explosions may occur from the presence of methane gas.
2. Landfill gases may cause an oxygen-deficient atmosphere in underground vaults, trenches, structures, and conduits.
3. Hydrogen sulfide, a highly toxic and flammable gas, may be present.
4. Fires may start spontaneously from exposed and/or decomposing refuse.
5. Caving of trenches and excavations may occur when working over or in refuse areas.
6. Lateral gas migration to adjacent areas in addition to venting to the atmosphere through the cover soil may occur.
7. Direct contact with LFG condensate should be avoided.

7.3 FIRE AND EXPLOSION SAFETY

Employees are to be informed of the danger of smoking, dropping lighted matches or burning tobacco, and the use of open flames in and around the landfill or gas extraction facilities. Monitoring personnel should use explosion-proof flashlights or mirrors to assist in any visual inspection. The National Bureau of Mines cautions that when

investigating explosive gas conditions with an explosimeter, the following should be observed:

1. Due regard must be made for the time of year, the velocity and direction of the wind, and barometric conditions. Explosion of such vapors is generally extensive.

2. Landfill gas can be located at the top or bottom of enclosed structures.

7.4 ELECTRICAL SAFETY

1. Lock out and tag main switch of electrical equipment before working on it.

2. Do not remove the tag without first checking with the person who initiated the tag.

3. Notify supervisor in the event a motor circuit breaker trips out.

4. Do not open motor control panels unless you are trained and authorized to perform the work.

5. Report and log any unusual motor noise or vibration.

7.5 CONFINED SPACE SAFETY

Poor ventilation within certain structures in the landfill gas extraction system may result in one or more of the following hazards; toxic gas accumulation, flammable or explosive atmosphere, or oxygen deficiency. These structures include:

- Flare
- Condensate Pump Station Encasements
- Well encasements
- Knockout pot
- Trenches
- Valve boxes
- Blower building

Depending on the situation, these structures may be defined as either confined spaces or permit required confined spaces and each requires special safety precautions to be taken. OSHA regulations for permit-required confined spaces are located in Appendix F. Refer to the "BFI Confined Space Entry Program" manual to classify the areas and define the safety precautions that must be taken. If you do not have a "BFI Confined Space Entry Program" manual, contact your district safety manager or the Corporate Safety Department at (281)870-8100.

7.6 SITE SAFETY RULES

All employees shall observe and obey every rule, regulation, and order necessary for the safe conduct of the work, and shall take such action as is necessary to obtain compliance. Employees shall report all unsafe conditions or practices to the appropriate person or agency.

7.7 FIRST AID AND INFECTION

Prompt attention to injuries is important. A physician should be called for all but minor injuries. Fire department personnel are trained and equipped to handle cases of resuscitation and landfill gas mishaps and should be contacted immediately if either of these occur.

If there is a possibility that workers will come into contact with condensate formed on the inside of the piping system, rubber gloves should be worn. This will prevent exposure to potentially hazardous compounds, especially if the hands are chapped, burned, or the skin broken in any other manner.

Keep fingers away from the nose, mouth, and eyes to prevent exposure.

Wash hands thoroughly after work and before eating. The use of antiseptic solutions will help prevent infection. Keep the nails short and remove foreign material with a nail file or stiff soapy brush. When the hands are soiled, smoking pipes or contaminated ends of cigarettes or cigars may introduce potentially hazardous compounds into the body.

Note: No smoking is to be allowed near any areas of the gas system.

APPENDI

APPENDIX A - PERMITS AND REGULATIONS

- RCRA Permit Log No. B-23-TA-2
- 1992-328-LFM Modification No. 3 (Log No. 1996-117)
- 1980-24-DE and 1980-24-OP Supplemental Permit No. 1996-118-SP (Log No. 1996-118)
- Operational Permit - IEPA Letter Dated April 29, 1998
- IEPA Regulation Sections 811.310, 811.311, 811.312

RCRA Permit Log. No. B-23-TA-2

1/66

— Site 14 Response —

14L

State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

2200 Churchill Road, Springfield, IL 62794-9276

Mary A. Gade, Director

217/524-3300

March 6, 1997

CERTIFIED MAIL
Z 363 621 195

Browning-Ferris Industries
Attn.: Michael W Williams
701 Green Bay Road
Zion, Illinois 60099

Re: 0978020001 -- Lake County
Browning-Ferris Industries #1
ILD980700728
RCRA Permit Log No. B-23-TA-2

Dear Mr Williams:

This letter is in response to your request for a Temporary Authorization ("TA") to construct a modified final cover system and to install a landfill gas extraction system. The proposal to make these modifications is identified in the following correspondence:

- Class III modification request (addition of a gas extraction system), Log No. B-23-M-15, dated October, 2, 1992 and received October 2, 1992;
- TA request (addition of a gas extraction system), Log No. B-23-TA-1, dated May 6, 1996, and received May 8, 1996;
- Class III modification request (modification of the final cover system), Log No. B-23-M-19 dated July 1996 and received August 2, 1996;
- TA request (modification of the final cover system), Log No. B-23-TA-2, dated August 5, 1996 and received August 5, 1996;
- Additional information, Response to Condition 10 dated August 16, 1996 and received August 19, 1996;
- Additional information for TA (Log No. B-23-TA-2), dated February 19, 1997 and received February 20, 1997; and
- The plan sheet entitled, Anchor Trench Detail, dated February 21, 1997.

Pursuant to 35 Ill Adm. Code 703.280(e)(3)(B)(v), the Illinois EPA has approved your request.

This approval supersedes the Illinois EPA's Temporary Authorization approval letter (Log # B-23-TA-1), dated July 16, 1996, and subsequent re-issuance, dated February 19, 1997. This approval is subject to the attached special conditions and shall terminate 180 days from the date of this letter

Should you have any questions regarding this maner, please contact Kevin D. Lesko at 217/524-3271

Sincerely,

Edwin C. Bakowski, P.E.
Manager, Permit Section
Permit Section, Bureau of Land

ECB:KL:mls\973021.WPD

Attachment Special Conditions for the Temporary Authorization to Construct (Log No. B-23-TA-2)

cc: Ries Environmental, Inc. -- Rebecca Ries, CHMM
BFI Waste Systems -- James A. Lewis
Hak Cho -- USEPA - Region V

bcc: Bureau File -- RCRA Permit
Maywood Region
Jerry Kuhn
Kevin Lesko

ATTACHMENT

SPECIAL CONDITIONS FOR THE TEMPORARY AUTHORIZATION TO CONSTRUCT Log No. B-23-TA-2

0978020001 -- Lake County
Browning-Ferris Industries #1
ILD980700728
RCRA Log No. B-23-TA-2

---

1. This temporary authorization (TA) only allows for construction of the landfill gas extraction system and modified final cover system identified in the following applications and correspondences:

   - Class III modification request (addition of a gas extraction system), Log No. B-23-M-16, dated October, 2, 1992 and received October 2, 1992;
   - TA request (addition of a gas extraction system), Log No. B-23-TA-1, dated May 6, 1996 and received May 8, 1996;
   - Class III modification request (modification of the final cover system), Log No. B-23-M-19, dated July 1996 and received August 2, 1996
   - TA request (modification of the final cover system), Log No. B-23-TA-2, dated August 5, 1996 and received August 5, 1996;
   - Additional information, Response to Condition 10 dated August 16, 1996 and received August 19, 1996;
   - Additional information for TA (Log No. B-23-TA-2), dated February 19, 1997 and received February 20, 1997; and
   - The plan sheet entitled, Anchor Trench Detail, dated February 21, 1997.

   The proposed gas extraction system must be constructed in accordance with the above applications and correspondences except as modified below.

Gas Extraction System

2. The approval of this TA does not approve the items identified in Section 4 of the May 1996 TA (Log No. B-23-TA-1) request. These issues must be addressed under a separate submittal from BFI.

3. The deficiencies identified in comment 6 of the Illinois EPA's March 6, 1995 comments on the gas extraction system regarding the adequacy of the proposed perimeter monitoring system have not been adequately addressed by the TA request. In order to resolve this issue BFI must demonstrate that the monitoring well (GMW) spacing is adequate to detect any possible migration of landfill gas to off-site areas, or reduce the well spacing appropriately.

4. Secondary containment shall be provided for all piping which conveys condensate and leachate outside the landfill's final cap. This secondary containment shall extend into the landfill unit sufficiently to assure that any leaks that might occur will not cause releases into the environment. This requirement includes the piping from the top of the condensate sumps to the forced main that are located both in and outside the areal extent of the waste limits.

5. Secondary containment must be provided for all extraction well leachate discharge lines that lead from the extraction well head to the forced leachate main. Secondary containment similar to that provided for the pump stations should be used. This secondary containment design is shown in detail 6/4, Sheet 4 of 5 of the letter entitled, Response to Condition 10 (dated August 16, 1996 and received August 19, 1996). If this secondary containment design cannot be utilized BFI must submit an alternative design within 30 days of the date of the cover letter to this attachment.

6. The QA/QC documentation shall include photo documentation of a typical gas extraction well installation and photo documentation of construction of all piping and equipment which exits the areal extent of the unit.

7. In Section 2.0 of the TA request (Log No. B23-TA-1), BFI indicates that the portions of the gas extraction system (GES) which are located on the solid waste unit will not be included in the RCRA Part B renewal permit which is to be submitted. While this portion of the system may lie on the solid waste portion of the facility they are subject to RCRA permitting since they part of the GES. The Illinois EPA will coordinate any permit requirement to eliminate, to the extent possible, duplicative permitting requirements.

Final Cap Design

8. Additional clay added to the compacted clay cap shall be applied in loose lifts not to exceed six inches. Compaction equipment shall use only fully penetrating sheepsfoot.

9. Any vegetation that is present on the existing compacted clay layer shall be removed or otherwise addressed to assure that the roots that have penetrated into the cap will not impact the permeability of the final cover.

10. Within 30 days of the date of this letter BFI shall provide:

- BFI must identify how grid location (10100N, 9100E), which had a permeability greater than 1x10E-07 cm/sec at 1.3x10E-7 cm/s, will be addressed in order to obtain an adequate permeability. The first paragraph of page 15 of the Class III modification request (modification of the final cover system), Log No. B-23-M-19, dated July 1996 and received August 2, 1996 indicates that all grid locations have sufficient permeability, however, this location's permeability is not adequate.

- BFI modified the design of the toe drainage system in the plan sheet entitled, Anchor Trench Detail, dated February 21, 1997. BFI must provide information on the toe drainage discharge pipe intervals and/or location(s).

General

11. Major modification to the system including changes to physical dimensions or materials of construction are subject to Illinois EPA approval prior to construction.

12. A Construction Certification Report shall be submitted to the Illinois EPA within 30 days after BFI has completed the activities proposed in the TA request. This Certification Report must be certified by a qualified, independent, registered professional engineer. BFI must obtain Illinois EPA approval of the Construction Certification Report prior to operation of the gas extraction system identified in Condition No.1 above.

13. The Construction Certification Report must describe the construction activities BFI conducted under the authority of this TA and include "as-built" drawings that include the following:

a. the locations of all mechanical equipment, geosysthetic panels, and piping relative to each unit;

b. the approximate elevations of long pipe runs;

c. the pipe dimensions, types of joints (e.g., welded or flanged);

d. the materials of construction of the pipes, pumps, manifolds, seals, connections, geosysthetic components; and

e. any changes that were made to the systems described in the applications and correspondences identified above.

1992-328-LFM Modification No. 3 (Log No. 1996-117)

— Site 15 permit —

State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

217/524-3300

August 5, 1996

CERTIFIED MAIL
Z 363 613 844

Browning-Ferris Industries of Illinois, Inc.
Attn: Mr. Mike Williams
701 Green Bay Road
Zion, Illinois 60099

Re: 0978020001 – Lake County
BFI #1, Phase B
Permit No. 1992-328-LFM
Modification #3
Log No. 1996-117
Expiration Date: June 25, 1999
Permit File

Dear Mr. Williams:

Permit modification is hereby granted to Browning-Ferris Industries of Illinois, Inc. as owner and operator allowing a significant modification of the above referenced facility all in accordance with the application and plans prepared by Mr. Bryan N. Holbert of RMT, Inc. and signed and sealed by Mr. Andrew J. Querio, P.E. of RMT, Inc. This permit modification (Modification No. 3) approves a landfill gas extraction system and a revised final cover system. Final plans, specifications, application and supporting documents as submitted and approved shall constitute part of this permit and are identified on the records of the Illinois Environmental Protection Agency, Bureau of Land by the permit number(s) and log number(s) designated in the heading above.

The permit is issued subject to the standard conditions attached hereto and incorporated herein by reference, and further subject to the following special conditions. In case of conflict between the application and plans submitted and these special conditions, the special conditions of this permit shall govern.

Permit No. 1992-328-LFM, approves the Significant Modification of the development of Cells 1 and 2 of Phase B of this facility subject to the conditions attached hereto, so as to comply with the applicable requirements of 35 Illinois Administrative Code, Subtitle G (hereinafter "35 IAC") Parts 810, 811, 812 and 813.

Cells 1 and 2 of Phase B have approximate areas of 4.9 acres and 4.7 acres respectively, and an "in-place" gross waste capacity of approximately 653,300 cubic yards. The landfill is being

permitted as a putrescible and chemical waste landfill and the types of waste disposed in it shall be limited to municipal waste and non-hazardous special waste.

The application approved by Permit No. 1992-328-LFM consists of the following documents:

DOCUMENT AND DATE	DATE RECEIVED
Original Application October 23, 1992	October 26, 1992
Application Waiver February 2, 1993	February 3, 1993
Application Waiver September 10, 1993	September 13, 1993
Application Waiver October 13, 1993	October 14, 1993
Application Addendum December 15, 1993	December 16, 1993
Application Addendum December 22, 1993	December 27, 1993
Application Addendum February 3, 1994	February 4, 1994
Application Addendum March 1, 1994	March 7, 1994
Application Addendum March 16, 1994	March 21, 1994
Application Waiver May 5, 1994	May 5, 1994
Application Waiver February 23, 1993	February 24, 1993
Application Addendum April 16, 1993	April 19, 1993

DOCUMENT AND DATE	DATE RECEIVED
Application Waiver June 16, 1993	June 17, 1993
Application Waiver July 15, 1993	July 16, 1993

The application approved by Modification No. 1 consists of the following documents:

DOCUMENT AND DATE	DATE RECEIVED
Original Application July 28, 1994	July 29, 1994
Application Addendum November 3, 1994	November 4, 1994

The application approved by Modification No. 2 consists of the following documents:

DOCUMENT AND DATE	DATE RECEIVED
Original Application February 10, 1995	February 14, 1995
Application Addendum May 5, 1995	May 8, 1995
Application Addendum via facsimile June 6, 1995	June 6, 1995
Application Addendum June 19, 1995	June 20, 1995

The application approved by Modification No. 3 consists of the following documents:

DOCUMENT AND DATE	DATE RECEIVED
Original Application April 4, 1996	April 8, 1996

DOCUMENT AND DATE	DATE RECEIVED
Application Addenda	
April 25, 1996	April 26, 1996
June 21, 1996	June 24, 1996
July 2, 1996	July 5, 1996
July 3, 1996	July 5, 1996

This modification includes a compilation of all previous permits and applicable permit conditions, and incorporates previously approved applications granted under Permit No. 1992-328-LFM, unless specifically modified by this permit modification. Condition No. VI.9 has been added due to a determination by the Bureau of Air, Permit Section that a permit is needed for the gas management system. Condition No. VII.8 has been added to notify the operator that revised closure cost estimates need to be submitted in the form of a significant modification due to the change in the final cover system. Condition No. I.5 has been added referencing the construction quality assurance procedures to be used for the geosynthetic drainage layer of the final cover system. Condition II.6 has been revised by substituting the geosythetic drainage layer for the 12 inch sand drainage layer in the final cover system.

Pursuant to Section 39(a) of Illinois Environmental Protection Act (hereinafter "the Act") and 35 IAC, 813.104(b), this permit is issued subject to the development, operating, and reporting requirements for non-hazardous waste landfills in 35 IAC Parts 810, 811, 812 and 813, as modified by 35 IAC Part 814, Subpart C, the standard conditions attached hereto, and the following special conditions. In case of conflict between the permit application and these conditions (both standard and special), the conditions of this permit shall govern.

I. CONSTRUCTION QUALITY ASSURANCE

1. All necessary surface drainage control facilities shall be constructed prior to other disturbance in any area.

2. No part of the unit subject to Permit No. 1992-328-LFM shall be placed into service (i.e. begin waste disposal) until a acceptance report for all the activities listed below has been submitted to and approved by this Agency as a significant modification pursuant to 35 IAC, 811.505(d) and 813.203.

   a. Compaction of the subgrade and foundation to design parameters;

   b. Installation of the underdrain collection system;

   c. Installation of the compacted earth liner;

d. Installation of the geomembrane liner;

e. Installation of the leachate drainage and collection system;

f. Construction of ponds, ditches, lagoons and berms.

g. Installation of the gas management system.

3. The permittee shall designate an independent third party contractor as the Construction Quality Assurance (CQA) Officer(s). The CQA Officer(s) shall be an Illinois Certified Professional Engineer who is independent from and not under the control or influence of the operator, any employee of the operator, or any other corporation, company or legal entity that is a subsidiary, affiliate, parent corporation or holding corporation associated with the operator.

4. All standards for testing the characteristics and performance of materials, products, systems and services shall be those established by ASTM unless otherwise stated in the permit application.

5. All sampling, testing, inspection and installation procedures for the geosynthetic drainage layer (geonet) of the final cover system shall conform with the revised construction quality assurance program contained in Log No. 1992-328 and received by the Agency on December 27, 1993.

II. OPERATING CONDITIONS

1. Pursuant to 35 IAC, 811.107(a) and 811.107(b), throughout the operating life of this landfill, waste shall not be placed in a

manner or at a rate which results in unstable internal or external slopes or interference with construction, operation or monitoring activities.

2. The operator of this solid waste facility shall not conduct the operation in a manner which results in any of the following:

a. refuse in standing or flowing waters;

b. leachate flows entering waters of the State;

c. leachate flows exiting the landfill confines (i.e., the facility boundaries established for the landfill in a permit or permits issued by the Agency);

d. open burning of refuse in violation of Section 9 of the Act;

e. uncovered refuse remaining from any previous operating day or at the conclusion of any operating day, unless authorized by permit;

f. failure to provide final cover within time limits established by Illinois Pollution Control Board (the Board) regulations;

g. acceptance of wastes without necessary permits;

h. scavenging as defined by Board regulations;

i. deposition of refuse in any unpermitted (i.e., without an Agency approved significant modification authorizing operation) portion of the landfill;

j. acceptance of a special waste without a required manifest;

k. failure to submit reports required by permits or Board regulations;

l. failure to collect and contain litter from the site by the end of each operating day.

3. Moveable, temporary fencing shall be used to prevent blowing litter when the refuse is above the natural ground line.

4. The operator shall cover all exposed waste by the end of each day of operation with a uniform layer of six (6) inches of clean soil material or a layer of non-woven polypropylene geotextile fabric.

5. Non-woven polypropylene geotextile fabric may be used as an alternate material for daily cover pursuant to 35 IAC, 811.106(b) and 812.111(b). The use of this material as daily cover shall be subject to the following conditions:

a. If any alternate materials other than those approved by this permit are to be used, their use must be approved by this Agency through the permit process.

b. At any one time, the total area, using non-woven polypropylene geotextile fabric as daily cover, shall be no more than 100 ft. x 200 ft. Beyond this maximum, conventional daily cover shall be used on all areas in which waste has been disposed and to which intermediate or final cover has not been applied.

c. Areas, upon which alternate cover has been used, must be covered with either conventional cover or additional waste within six days.

d. Conventional daily cover shall be used if weather or other conditions adversely affect the ability of the fabric to prevent problems with blowing litter, fire, odors, or vectors.

e. Geotextile fabric shall be anchored adequately to prevent wind damage. If the panels are torn during or after placement they must be repaired immediately or the damaged area must be covered with six inches (6") of daily cover soil. If tires are used as weights for the alternate daily cover, they shall be converted tires, in accordance with 35 IAC, Part 848: Management of Used and Waste Tires.

f. When the geotextile fabric is applied, the operator shall keep a record including a description of the weather conditions, the type of alternate cover used and its performance. A summary of this information shall be provided with this facility's annual reports.

g. Geotextile fabric which have been used for daily cover may not be reused for any purpose (including road underlayment and erosion control) outside of permitted disposal boundaries.

h. Any geotextile material that meets the alternate daily cover specifications in Permit Application Log No. 1992-328 may be used in accordance with this permit.

6. No later than 60 days after placement of the final lift of waste in any area, the area shall receive a final cover system of low permeability material consisting of a 40-mil VLDPE geomembrane overlain by 2 feet of compacted clay. The final protective layer of the final cover system shall be constructed atop the low permeability layer and shall consist of, from bottom to top, a geosynthetic drainage layer (geonet), 8 oz/sy non-woven geotextile, 2.5 feet of general backfill and 0.5 feet of topsoil.

7. All waste, which is not covered within 60 days of placement of another lift of waste or final cover, shall have an intermediate cover of compacted clean soil with a minimum thickness of one (1) foot applied to it.

8. The operator shall implement a load checking program that meets the requirements of 35 IAC, 811.323. If regulated hazardous waste or other unacceptable wastes are discovered, the Agency shall be notified no later than 5:00 p.m. the day it is detected. The load checker shall prepare a report describing the results of each inspection. A summary of these reports shall be submitted to the Agency as part of this facility's annual report.

9. No special waste shall be received for disposal at this facility without a non-hazardous special waste stream permit granted by the Agency.

10. All of this facility's previously issued, "individual" non-hazardous special waste stream permits, which have not yet expired, shall also remain in effect. However, their respective expiration dates are not modified by the issuance this permit.

11. In managing non-hazardous special waste at this landfill, the operator shall comply with the requirements of 35 IAC, Part 811, Subpart D. These requirements include:

    a. A prominent sign at the entrance of the facility notifying waste generators and transporters of the documents by which loads of special wastes must be accompanied;

    b. Special waste manifesting;

    c. Special waste profile identification sheets and special waste recertifications;

    d. Recordkeeping requirements; and

    e. Procedures for excluding regulated hazardous wastes.

12. The permittee shall submit an annual report to this Agency for all non-hazardous special waste in accordance with 35 Ill. Adm. Code, Subtitle G, Part 809, Subpart E.

13. The operating hours for this facility shall be limited to between 6:00 a.m. - 5:00 p.m., Monday through Friday and between 6:00 a.m. - 12:00 p.m. on Saturdays. The landfill shall be closed on Sundays and legal holidays. Operating hours are those hours during which waste may be accepted at this facility.

14. The operation of this facility shall not cause a violation of the Noise Control Regulations in 35 IAC Subtitle H, Section 901.

III. GENERAL CONDITIONS

1. This permit is issued with the expressed understanding that no process discharge to Waters of the State or to a sanitary sewer will occur from these facilities except as authorized by a permit issued by the Bureau of Water Pollution Control.

2. Site surface drainage, during development, during operation and after the site is closed, shall be managed in accordance with the approved drainage control plan.

3. If changes occur which modify any of the information the Permittee has used in obtaining a permit for this facility, the Permittee shall notify the Agency. Such changes would include but not be limited to any changes in the names or addresses of both

beneficial and legal titleholders to the herein-permitted site. The notification shall be submitted to the Agency within fifteen (15) days of the change and shall include the name or names of any parties in interest and the address of their place of abode; or, if a corporation, the name and address of its registered agent.

4. The Agency reserves the right to require installation of additional monitoring devices, to require analyses for certain parameters, to alter the sample parameters list and to modify the method of evaluating the monitoring results as necessary to fulfill the intent and purpose of the Act or Board Regulations.

5. This permit is subject to review and modification by the Agency as deemed necessary to fulfill the intent and purpose of the Act, and all applicable environmental rules and regulations.

6. Pursuant to 35 IAC, 813.201(a), any modifications to this facility shall be proposed in the form of a permit application and submitted to the Agency.

7. Pursuant to 35 IAC, 813.301, an application for permit renewal shall be filed with the Agency at least 90 days prior to the expiration date of this permit.

IV. LEACHATE MANAGEMENT/MONITORING

1. The following monitoring points are to be used in the Leachate Monitoring Program for this facility:

Leachate Collection Manholes

Applicant Designation	Agency Designation
Undesignated Manhole In Cell No.1	L301
Undesignated Manhole In Cell No. 2	L302

2. Pursuant to 35 IAC 811.309(g), 811.319(a)(1)(C)(ii), 810.103, 811.202, 722.111 and 721, Subpart C, leachate monitoring (i.e., sampling, measurements and analysis) must be started at each manhole when that manhole accumulates a measurable quantity of leachate for the first time. The concentrations or values for the

parameters contained in List L1 (below) shall be determined on a quarterly basis for each "producing" manhole and submitted with the quarterly groundwater reports. Condition IV.3. presents the sampling, testing and reporting schedules in tabular form. Leachate monitoring at each manhole shall continue as long as groundwater monitoring at this landfill is necessary pursuant to 35 IAC, 811.319(a)(1)(C).

LIST L1

Routine Leachate Monitoring Parameters	STORET
Temp. of Leachate Sample (°F)	00011
Specific Conductance	00094
pH	00400
Elevation Leachate Surface	71993
BTM of Well Elevation	72020
Leachate Level from Measuring Point (ft.)	72109
Arsenic (total)	01002
Barium (total)	01007
Cadmium (total)	01027
Chromium (hexavalent)	01032
Chromium (total)	01034
Copper (total)	01042
Cyanide	00720
Fluoride	00951
Iron (total)	01045
Lead (total	01051
Manganese (total)	01055
Nickel (total)	01067
Silver (total)	01077
Zinc (total)	01092
Total Dissolved Solids	70300
Total Suspended Solids	00530
Biochemical Oxygen Demand (BOD5)	00310
Mercury (total)	71900
COD	00335
Boron (total)	01022
Calcium (total)	00916
Cobalt (total)	01037
Magnesium (total)	00927
Potassium (total)	00937
Selenium (total)	01147
Sodium (total)	00929
Alkalinity as $CaCO_3$	00410
Chloride (total)	00940
Sulfate	00945
Total Organic Carbon, TOC	00680
Total Organic Halogens, TOX	78115
Nitrogen, Ammonia-N	00610

LIST L2

Annual Leachate Monitoring Parameters	STORET
Temp. of Leachate Sample (°F)	00011
Specific Conductance	00094
pH	00400
Elevation Leachate Surface	71993
BTM of Well Elevation	72020
Leachate Level from Measuring Point (ft.)	72109
1,1,1-2-Tetrachloroethane	77562
1,1,1,-Trichloroethane	34506
1,1,2,2-Tetrachloroethane	34516
1,1,2-Trichloroethane	34511
1,1-Dichloroethane	34496
1,1-Dichloroethylene	34501
1,1-Dichloropropene	77168
1,2,3-Trichlorobenzene	77613
1,2,3-Trichloropropane	77443
1,2,4-Trichlorobenzene	34551
1,2,4-Trimethylbenzene	77222
1,2-Dibromo-3-Chloropropane	38760
1,2-Dichloroethane	34531
1,2-Dichloroethylene (Dichloroacetylene)	77090
1,2-Dichloropropane	34541
1,3,5-Trimethylbenzene	77226
1,3-Dichloropropane	77173
1,3-Dichloropropene	34561
1,4-Dichloro-2-Butane	
1,4-Diflurobenzene	
1-Butanol Phenol	
1-Propanol	77018
2,2-Dichloropropane	77170
2,4,5-tp (Silvex)	39760
2,4-Dichlorophenoxyacetic Acid (2,4-D)	39730
2,4-Dimethylphenol	34606
2-Chloroethyl Vinyl Ether	34576
2-Chloronaphthalene	34581
2-Hexanone	77103
2-Propanol (Isopropyl Alcohol)	81310
4-Bromofluorobenzene	
4-Methyl-2-Pentanone	78133

LIST L2 (cont.)

Annual Leachate Monitoring Parameters	STORET
4-Nitrophenol	34646
Acetone	81552
Acrolein	34210
Alachlor	77825
Aldicarb	39053
Aldrin	39330
Aluminum	01105
Ammonia Nitrogen - N	00610
Antimony	01097
Arsenic (total)	01002
Atrazine	39033
Barium	01007
Beryllium (total)	01012
Bicarbonate	
Biochemical Oxygen Demand (BOD_5)	00310
Bis (2-Chloroethoxy) Methane	34278
Bis (2-Ethylhexyl) Phthalate	39100
Boron	01022
Bromobenzene	81555
Bromochloromethane	77297
Bromodichloromethane	32101
Bromoform	32104
Bromomethane	34413
Butanol	45265
Butyl Benzyl Phthalate	34292
Cadmium (total)	01027
Calcium	00916
Carbofuran	81405
Carbon Disulfide	77041
Carbon Tetrachloride	32101
Chemical Oxygen Demand (COD)	00335
Chlordane	39350
Chloride	00940
Chlorobenzene	34301
Chloroethane	34311
Chloroform	32106
Chloromethane	34418
Chromium	01034

LIST L2 (cont.)

Annual Leachate Monitoring Parameters	STORET
Chromium (hexavalent)	01032
Chlorodibromomethane	
Cis-1,2-Dichloroethylene	77093
Cis-1,3-Dichloropropene	34704
Cobalt	01037
Copper (total)	01042
Cyanide	00720
DDT	39370
Di-N-Butyl Phthalate	39110
Dibromomethane	77596
Dichlorodifluormethane	34668
Dieldrin	39380
Diethyl Phthalate	34336
Dimethyl Phthalate	34341
Endrin	39390
Ethyl Acetate	81585
Ethyl Methacrylate	73570
Ethylbenzene	78113
Ethylene Dibromide (EDB)	77651
Fluoride	00951
Heptachlor Epoxide	39420
Heptachlor	39410
Hexachlorobutadiene	39702
Iron	01045
Isophorone	34408
Isopropylbenzene	77223
Lead	01051
Lindane	39782
Magnesium	00927
Manganese	01055
Mercury	71900
Methoxychlor	39480
Methylene Chloride	34418
Methyl Ethyl Ketone	81595
Naphthalene	34696
Nickel	01067
Nitrate-Nitrogen	00620
Nitrobenzene	34447

LIST L2 (cont.)

Annual Leachate Monitoring Parameters	STORET
Oil, Hexane Soluble (or Equivalent)	00550 (00556, 00560)
Parathion	39540
Pentachlorophenol	39032
Phenanthrene	34461
Phenol	32730
Polychlorinated Biphenyls	39516
Potassium	00937
Selenium	01147
Silver	01077
Sodium	00929
Strontium-90	13501
Styrene	77128
Sulfate	00945
Tert-Butylbenzene	77353
Tetrachloroethylene	34475
Tetrahydrofuran	81607
Thallium	01059
Tin	01102
Toluene	34010
Total Dissolved Solids (TDS)	70300
Total Organic Carbon (TOC)	00680
Toxaphene	39400
Trans-1,2-Dichloroethylene	34546
Trans-1,3-Dichlorpropene	34699
Trichloroethylene	39180
Trichlorofluoromethane	34488
Tritium	82126
Vanadium	01087
Vinyl Acetate	77057
Vinyl Chloride	39175
Xylene (total)	81551
Zinc	01092
m-Dichlorobenzene	34566
m-Xylene	77134
n-Butylbenzene	77342
n-Propylbenzene	77224
o-Chlorotoluene	77910
o-Dichlorobenzene	34536

LIST L2 (cont.)

Annual Leachate Monitoring Parameters	STORET
o-Xylene	77135
p-Chlorotoluene	77911
p-Cresol	77146
p-Dichlorobenzene	34571
p-Isopropyltoluene	
p-Xylene	77133
sec-Butylbenzene	77350

LIST L3
RCRA Parameters for Leachate

Ignitability	STORET
Flashpoint, Pensky-Martens Closed Cup (°F)	00497
Corrosivity	
pH	00400
Reactivity	
Reactive Cyanide	99040
Reactive Sulfide	99042
Toxicity (TCLP)	
Arsenic	99012
Barium	99014
Cadmium	99016
Chromium	99018
Chromium, Hexavalent	99019
Lead	99020
Mercury	99022
Selenium	99024
Silver	99026
Endrin	99028
Lindane	99030
Methoxychlor	99032
Toxaphene	99034
2,4-D	99036
2,4,5-TP Silvex	99038

LIST L3 (cont.)
RCRA Parameters for Leachate

Toxicity (TCLP)	
Benzene	99128
Carbon tetrachloride	99050
Chlordane	99148
Chlorobenzene	99096
Chloroform 99149	
o-Cresol	99150
m-Cresol	99151
p-Cresol	99152
Cresol	99153
1,4-Dichlorobenzene	99154
1,2-Dichloroethane	99155
1,1-Dichloroethylene	99156
2,4-Dinitrotoluene	99157
Heptachlor (and its epoxide)	99158
Hexachlorobenzene	99159
Hexachloro-1, 3-Butadiene	99160
Hexachloroethane	99161
Methyl Ethyl Ketone	99060
Nitrobenzene	99062
Pentachlorophenol	99064
Pyridine	99066
Tetrachloroethylene	99068
Trichloroethylene	99076
2,4,5-Trichlorophenol	99078
2,4,6-Trichlorophenol	99080
Vinyl Chloride	99162

Notes for all leachate monitoring parameters:

a. The test methods for leachate monitoring shall be those approved in the USEPA's Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW846), Third Edition or the equivalent thereof.

b. All parameters shall be determined from unfiltered samples.

Notes specific to RCRA parameters:

a. Flashpoint shall be reported in degrees Fahrenheit. The parameters for reactivity

and toxicity shall be reported in parts per million.

b. In some instances, analyses for "totals" may be substituted for the reactive and TCLP parameters as described on Pages 9 and 10 of the enclosed "Instructions [for] Special Waste Stream Application - (1991-Revised Green Sheet)."

3. Leachate monitoring data shall be collected and reported to this Agency in accordance with the following schedule:

SAMPLING PERIODS	MONITORING POINTS	PARAMETER LIST	REPORT DUE DATE
January or February	L301 and L302	Lists L1 and L3	April 15
April or May	L301 and L302	Lists L2 and L3	July 15
July or August	L301 and L302	Lists L1 and L3	October 15
October or November	L301 and L302	Lists L1 and L3	January 15

4. Pursuant to 35 IAC 811.309(g)(1), any chemical constituent in List L1 that is not detected in the leachate, may be deleted from List L1. However, if subsequently in annual monitoring that constituent is detected, it shall be added back to List L1. All changes to the leachate parameter lists must be approved by the Agency through the permit process.

5. Pursuant to 35 IAC 811.309(h)(1), leachate from this landfill shall be collected, treated, or disposed of beginning as soon as it is first produced and continued for at least five (5) years after closure. Collection, treatment and disposal of leachate may cease only when the conditions described in 35 IAC 811.309(h)(2) have been achieved. Leachate removed from this landfill shall be treated at a permitted facility or may be recycled at the active working face as a temporary means for leachate management.

6. Discharge of leachate to an off-site treatment works in Illinois different than the facility identified in Permit Application Log No. 1992-328 (Metalworking Lubricants

in Indiana) shall be the subject of a Significant Modification of Permit to the Agency to demonstrate compliance with 35 IAC 811.309 (e).

7. Pursuant to 35 IAC 811.307(a) and (b), 811.308(a) and (h) and 811.309(a), throughout the period that the leachate collection/management system must be operated, the maximum leachate head above the liner shall be one (1) foot.

8. In the event that the leachate monitoring program identifies a constituent in the leachate that is not already in the parameter lists for the groundwater monitoring program, the operator shall, within 90 days of such discovery, submit a permit application to the Agency proposing to include that constituent in the groundwater monitoring program.

V. GROUNDWATER MONITORING

1. The groundwater monitoring program must be capable of determining background groundwater quality hydraulically upgradient of and unaffected by the units and to detect, from all potential sources of discharge, any releases to groundwater within the facility. This Agency reserves the right to require installation of additional monitoring wells as may be necessary to satisfy the requirements of this permit.

2. The groundwater monitoring wells shall be constructed and maintained in accordance with the requirements of 35 IAC, 811.318(d) and designs approved by the Agency.

3. All new groundwater monitoring wells shall be installed in the locations shown in Figures C-15, Appendix C, Volume II, dated October 23, 1992 of Permit Application Log No. 1992-328, as modified by Drawing No. A-1, dated June 9, 1995 of Log No. 1995-053 and screened in the hydrogeologic unit(s) identified as potential contaminant pathway(s). Monitoring wells GT15 and G146 shall be installed within 60 days of the date of this permit.

4. Within 60 days of installation of any groundwater monitoring well, boring logs compiled by a qualified geologist, well development data and as-built diagrams shall be submitted to the Agency utilizing the enclosed "Well Completion Report" form. For each well installed pursuant to this permit, one form must be completed.

5. Groundwater monitoring wells shall be easily visible, labeled with their Agency monitoring point designations and fitted with padlocked protective covers.

6. In the event that any well becomes consistently dry or unserviceable and therefore require replacement, a replacement well shall be installed within ten (10) feet of the existing well. The Agency shall be notified in writing at least 15 days prior to the

installation of all replacement wells. A replacement well that is more than ten feet from the existing well or which does not monitor the same geologic zone is considered to be a new well and must be approved via a significant modification permit.

7. All borings, wells and piezometers not used as monitoring points shall be abandoned in accordance with the decommissioning and reporting procedures, contained in the Illinois Department of Public Health's (IDPH) Water Well Construction Code, 77 IAC, Part 920 (effective 1/1/92). In the event specific guidance is not provided by IDPH procedures, the enclosed IEPA monitoring well plugging procedures shall be followed.

8. Elevation of stick-up is to be surveyed and reported to the Agency when: a. The well is installed (with the as-built diagrams), b. every two years thereafter, or c. whenever there is reason to believe that the elevation has changed.

9. Groundwater sampling and analysis shall be performed in accordance with the requirements of 35 IAC 811.318(e) and the specific procedures and methods approved by the Agency.

10. The applicable groundwater quality standards (AGQS) for the facility are subject to the following conditions:

    a. Temperature and the field parameters requiring depth or elevation measurements are not considered groundwater constituents and do not require AGQS.

    b. For constituents which have not been detected in the groundwater, the approved method detection limit (MDL) or practical quantitation limit (PQL) shall be used as the AGQS.

    c. The current AGQS's for this facility are given below in Lists G1 and G2.

    d. All MAPC and AGQS values are shown in ug/l unless otherwise noted in the parameter column. The first valve provided under the MAPC and AGQS columns apply to the "aquifer" wells. The second valve applies to the "till" wells. Single values provided apply to "aquifer" and "till " wells, except the value for Cobalt, dissolved and Copper, dissolved which apply only to the "aquifer" wells.

    e. AGQS values must be determined for all of the parameters which appear in either Lists G1 or G2 without AGQS's. These shall be proposed in a permit application to be submitted to the Agency no later than July 1, 1995. The AGQS values shall be calculated using four (4) consecutive quarters of groundwater monitoring data and employing appropriate statistical methods.

LIST G1 (Quarterly Groundwater Monitoring List)

FIELD PARAMETERS	STORETS
pH	00400
Specific Conductance	00094
Temperature of Water Sample (°F)	00011
Depth to Water (ft. below land surface)	72019
Depth to Water (ft. below measuring point)	72109
Elevation of Measuring Point (Top of casing ft. MSL)	72110
Elevation of Groundwater Surface (ft. MSL)	71993
Elevation of Bottom of Well (ft. MSL)	72020

LABORATORY PARAMETERS	STORETS	MAPC	AGQS
Arsenic (MG/L)	01002	0.045	0.045
Arsenic (Dissolved, MG/L)	01000	0.017/0.141	0.017/0.141
Barium (MG/L)	01007	1.245	1.245
Barium (Dissolved, MG/L)	01005	0.149/0.175	0.149/0.175
Boron (MG/L)	01022		
Boron (Dissolved, MG/L)	01020		
Cadmium (MG/L)	01027	0.001	0.001
Cadmium (Dissolved, MG/L)	01025	0.006/0.14	0.006/0.014
Iron (MG/L)	01045	120.55	120.55
Iron (Dissolved, MG/L)	01046	0.243/0.421	0.243/0.421
Magnesium (MG/L)	00927		
Magnesium (Dissolved, MG/L)	00925	23/133	23/133
Mercury (MG/L)	71900		
Mercury (Dissolved, MG/L)	71890	0.0007/0.0006	0.0007/0.0006
Nickel (MG/L)	01067	0.595	0.595
Nickel (Dissolved, MG/L)	01065	0.052/0.045	0.052/0.045
Selenium (MG/L)	01147	0.02	0.02
Selenium (Dissolved, MG/L)	01145	0.042/0.041	0.042/0.041
Silver (MG/L)	01077	0.07	0.07
Silver (Dissolved, MG/L)	01075	0.002/0.027	0.002/0.027
Zinc (MG/L)	01092	0.67	0.67
Zinc (Dissolved, MG/L)	01090	0.054/0.066	0.054/0.066
Cyanide (MG/L)	00720	0.04	0.04
Cyanide (Dissolved, MG/L)	00723	0.009/0.025	0.009/0.025
Fluoride (MG/L)	00951	0.774	0.774
Fluoride (Dissolved, MG/L)	00950	0.77/0.716	0.77/0.716
Total Organic Carbon TOC (Dissolved MG/L)	00680	16/23	16/23

LIST G1 (Quarterly Groundwater Monitoring List) (cont.)

LABORATORY PARAMETERS	STORETS	MAPC	AGQS
Total Organic Halogens TOX (Dissolved)	78115	1.66	0.054
Alkalinity as $CaCO_3$ (Dissolved, MG/L)	00608	205/413	205/413
Ammonia as (N) (MG/L)	00610	0.58/0.46	0.58/0.46
Sulfate (MG/L)	00945	344.57	344.57
Sulfate (Dissolved, MG/L)	00946	345/614	345/614
Chloride (MG/L)	00940	7	7
Chloride (Dissolved, MG/L)	00941	7/111	7/111
Chromium (MG/L)	01034	0.228	0.228
Chromium (Dissolved, MG/L)	01030	0.051/0.043	0.051/0.043
Manganese (MG/L)	01055	2.171	2.171
Manganese (Dissolved, MG/L)	01056	0.147/0.277	0.147/0.277
Potassium (MG/L)	00937		
Potassium (Dissolved, MG/L)	00935		
Total Dissolved Solids (TDS)(MG/L)	70300		
Calcium (MG/L)	01027		
Calcium (Dissolved, MG/L)	01025	64/163	64/163
Cobalt (MG/L)	01037	0.24	0.24
Cobalt (Dissolved, MG/L)	01035	0.005	0.005
Copper (MG/L)	01042	0.24	0.24
Copper (Dissolved, MG/L)	01040	0.008	0.008
Lead (MG/L)	01051	0.232	0.232
Lead (Dissolved, MG/L)	01049	0.009/0.019	0.009/0.019
Sodium (MG/L)	00929	114.756	114.756
Sodium (Dissolved, MG/L)	00930	73/55	73/55
1,1 Dichloroethane	34496	5	5
1,1 Dichloroethene	34501	5	5
Trans-1,2 Dichloroethene	34546	5	5
Ethyl Benzene	78113	5	5
Naphthalene	34696		
Phenols	32730	52	52
Toluene	34010	5	5
Trichloroethene	39180	5	5
Trichlorofluoromethane	34488	5	5
Vinyl Chloride	39175	10	10
Xylenes (Total)	81551	5	5
Atrazine	39033		

LIST G1 (Quarterly Groundwater Monitoring List) (cont.)

LABORATORY PARAMETERS	STORETS	MAPC	AGQS
Bromomethane (Methyl Bromide)	34413		
n-Butylbenzene	77342		
sec-Butylbenzene	77350		

LIST G2 (Groundwater - Annual)

ORGANIC PARAMETERS	STORETS	MAPC	AGQS
Carbofuran	81405		
1,1,1-Trichloroethane	34506		
Carbon Tetrachloride	32102	5	5
Chlordane	39350		
o-Chlorotoluene	77970		
p-Chlorotoluene	77970	5	5
Chlorodibromomethane (Dibromochloromethane)	32105		
Dibromomethane (Methylene Bromide)	77596		
m-Dichlorobenzene	34566		
o-Dichlorobenzene	34536		
Dichlorodifluoromethane	34668		
Ethylene Dibromide (EDB) (1,2-Dibromomethane)	77651		
Heptachlor	39410		
Heptachlor Epoxide	39420		
Hexachlorobutadiene	39702		
Isopropylbenzene	77223		
p-Isopropyltoluene	34723		
Lindane	39782		
Methoxychlor	39480		
Pentachlorophenol	39032		
Polychlorinated Biphenyls	39516		
n-Propylbenzene	77224		
Styrene	77128		
Tert-Butylbenzene	77353		
Tetrachloroethylene	34475	5	5
Toxaphene	39400		
m-Xylene	77134		
o-Xylene	77135	5	5

LIST G2 (Groundwater - Annual) (cont.)

ORGANIC PARAMETERS	STORETS	MAPC	AGQS
p-Xylene	77133		
1,1,1-2-Tetrachloroethane	77562		
1,1,2,2-Tetrachloroethane	34516		
1,1-Dichloropropene	77168		
1,2,3-Trichlorobenzene	77613		
1,2,3-Trichloropropane	77443		
1,2,4-Trichlorobenzene	34551		10
1,2,4-Trimethylbenzene	77222	10	10
1,2-Dibromo-3-Chloropropane	38760		
Cis-1,2-Dichloroethylene	77093	5	5
1,2-Dichloroethane	34531	5	5
1,2-Dichloropropane	34541	5	5
1,3,5-Trimethylbenzene	77226		
1,3-Dichloropropane	77173		
1,3-Dichloropropene	34561		
2,2-Dichloropropane	77170		
2,4,5-tp (Silvex)	39760		
2,4-Dichlorophenoxyacetic Acid (2,4-D)	39730		
4-Chlorotoluene			
Dichlorofluoromethane			
Diethyl ether	81576		
Methyl ethyl ketone	81595	100	100
Alachlor	77825		
Aldicarb	39053		
Benzene	34030	5	5
Chlorobenzene	34301		
Chloroethane	34311	5	5
Chloroform	32106	5	5
Chloromethane	34709	5	5
p-dichlorobenzene	34571	5	5
Dichloromethane	34713	5	5
Acetone	81552	100	100

Note:

a. All parameters with the "(Dissolved)" label to the right shall be determined using groundwater samples which have been filtered through a 0.45 micron filter. All other parameters shall be determined from unfiltered samples.

b. The monitoring results shall be reported in ug/l units unless otherwise indicated.

11. The following monitoring points are to be used in the groundwater monitoring program for this facility:

Background Groundwater Quality Wells

Applicant Designation	Agency Designation
G121	G121
G123	G123
G134	G124

Detection Monitoring Wells

Applicant Designation	Agency Designation
G122	G122
G127	G127
G136	G136
G141	G141
GT13	#GT13
GT14	#GT14
GT15	#GT15
GT16	#GT16
GT17	#GT17
G144	*#G144
G145	#G145
G146	#G146
G147	#G147
G148	#G148

Represents monitoring point(s) added to the monitoring program.
* Represents monitoring point(s) deleted from the monitoring program.

12. The approved monitoring program shall begin immediately after the issuance of the first significant modification of permit authorizing initial landfilling operations, and continue for at least fifteen (15) years after closure and shall not cease until the conditions described in 35 IAC, 811.319(a)(1)(C) have been achieved. The operator shall collect samples from all of the monitoring points listed in Condition V.11 for the parameters listed in Condition V.10 (Lists G1 and G2) and the sample results reported to this Agency, all in accordance with the following schedule:

Sampling Period	Parameter List	Report Due Date
January or February	List G1	April 15
April or May	List G1	July 15
July or August	List G1	October 15
October or November	Lists G1 and G2	January 15

13. Pursuant to 35 IAC, 811.319(a)(4)(A), any of the following events shall constitute an observed increase only if the concentrations of the constituents monitored can be measured at or above the practical quantitation limit (PQL):

    a. The concentration of any constituent in List G1 of Condition V.10. shows a progressive increase over four (4) consecutive quarters.

    b. The concentration of any constituent monitored in accordance with List G1 or List G2 of Condition V.10. exceeds the MAPC at an established monitoring point within the zone of attenuation.

    c. The concentration of any organic constituent in List G2, monitored in accordance with Condition V.10 exceeds the preceding measured concentration at any established point.

    d. The concentration of any constituent monitored at or beyond the zone of attenuation exceeds an AGQS.

14. For each sampling event, using the methods in Condition V.13 above, the permittee must determine if an observed increase in groundwater quality has occurred by comparing sample results from each downgradient well to the upgradient well's background data established during the first year of monitoring. This comparison must evaluate each parameter for each well.

15. For each round of sampling described in Condition V.12., the operator must determine if an observed increase has occurred within 45 days of the date the samples were collected. If an observed increase is identified, the operator must also notify the Agency in writing within 10 days and follow the confirmation procedures of 35 IAC, 811.319(a)(4)(B). The operator must also complete the confirmation procedures within 90 days of the initial sampling event.

16. Within 90 days of confirmation of any monitored increase, the operator shall submit a permit application for a significant modification to begin an assessment monitoring program in order to determine whether the solid waste disposal facility is the source of

the contamination and to provide information needed to carry out a groundwater impact assessment in accordance with 35 IAC 811.319(c).

17. Issuance of this permit does not constitute agreement with the permittee's contention that this facility is exempt from 35 Ill. Adm. Code 811.315 and the Agency request for inclusion of the zone of attenuation and landfill invert on geologic cross-sections.

VI. LANDFILL GAS MANAGEMENT/MONITORING

1. The gas monitoring probes within the waste shall be monitored for the following parameters:

   a. Methane;
   b. Pressure;
   c. Nitrogen*;
   d. Oxygen; and
   e. Carbon Dioxide

   *Note: For routine monitoring, Nitrogen may be reported as the net remaining volume fraction after the other measured constituents have been accounted for.

2. The ambient air monitoring devices shall be used to test the air downwind of the landfill for methane.

3. Gas monitoring shall continue for at least fifteen (15) years after closure and may be discontinued only after the conditions described in 35 IAC, 811.310(c)(4) have been achieved.

4. Sampling and testing of the gas monitoring probes within the waste and ambient air monitoring devices shall be performed at least monthly throughout the unit's operating life and during the first five (5) years after its closure. During the remainder of the post-closure care period, this monitoring frequency may be reduced to quarterly.

5. In the event of any of the occurrences listed below, the operator shall, within 180 days of the occurrence, submit to the Agency an application for a significant modification either proposing a revision to the gas collection/management system to correct the problem or demonstrating that the unit is not the cause of the occurrence.

   a. A methane concentration greater than 50 percent of the lower explosive limit in air is detected below the ground surface by a monitoring device or during ambient air monitoring;

b. A methane concentration greater than 25 percent of the lower explosive limit is detected in any building on or near the facility; or

c. Malodors, attributed to the unit, are detected beyond the property boundary.

6. The gas monitoring probes within the waste shall be inspected at least monthly for structural integrity and proper operation.

7. The results from gas monitoring for each year, ending on March 31, shall be submitted to the Agency in the annual report required by 35 IAC, 813.501.

8. At the end of the post-closure care period, the gas monitoring probes within the waste shall be decommissioned. In decommissioning the probes within the waste boundaries, the pipes shall be cut off at least two (2) feet below the low permeability layer and plugged. Then the low permeability layer, the protective layer and the vegetation shall be restored in the excavation areas.

9. This permit (Modification No. 3) does not relieve the operator from obtaining a permit from the Bureau of Air, Permit Section for the gas management system.

10. Installation of the gas extraction system shall be completed as quickly as possible to minimize the release of odors. Furthermore, no refuse uncovered during excavation shall be left exposed overnight.

11. Borings for gas well installations shall terminate at elevations which will insure that the boreholes do not encounter the landfill invert or adversely affect the integrity of the liner.

12. Refuse removed during construction of the gas extraction system shall be properly disposed of in an Illinois Environmental Protection Agency permitted landfill as a Special Waste.

13. The gas wells, probes and condensate drains shall be inspected at least monthly for structural integrity and proper operation.

14. While the site is being developed or operated as a gas control or collection facility, corrective action shall be taken if erosion or ponding are observed, if cracks greater than one inch wide have formed, if gas, odor, vegetative or vector problems arise, or if leachate popouts or seeps are present in the areas disturbed by constructing this gas collection facility.

15. Any penetration or disturbance of the final cover material at this facility caused by construction of the gas control system shall be sealed or repaired to ensure that the approved final cover exists above all buried appurtenances of the gas collection system.

16. Condensate from the gas accumulation system, and leachate pumped and removed from the landfill shall be disposed at an IEPA permitted publicly-owned treatment works, or a commercial treatment or disposal facility. The leachate/condensate liquid shall be analyzed individually to determine if hazardous waste characteristics are present. A written log showing the volume of liquid discharged to the treatment facility each day by the landfill will be maintained at the landfill. This log will also show the liquid analyses.

17. All water, condensate, leachate or water commingled with leachate or condensate from the site shall be discharged in accordance with a permit issued by IEPA Bureau of Water, Permit Section.

18. Any liquid waste generated by the system must be properly managed at an IEPA permitted publicly owned treatment works or commercial treatment or disposal facility. Please be aware that this will entail obtaining a special waste stream permit from the Bureau of Land and in the event that a treatment facility is used, a supplemental construction and operating permit for the treatment facility from the Division of Water Pollution Control may be necessary.

19. During site development and operation, all records of field investigations, measurements, inspections, sampling and corrective action taken are to be maintained at the site and made available to IEPA personnel.

VII. CLOSURE/POST CLOSURE CARE

1. Upon completion of closure activities, the operator shall notify the Agency that the site has been closed in accordance with the approved closure plan utilizing the Agency's "Affidavit for Certification of Completion of Closure of Non-Hazardous Waste Facilities."

2. Inspections of the closed landfill shall be conducted in accordance with the approved post-closure care plan. Records of field investigations, inspections, sampling and corrective action taken are to be maintained at the site and made available to IEPA personnel. During the post-closure care period, these records are to be maintained at the office of the site operator.

3. If necessary, the soil over the entire planting area shall be amended with lime, fertilizer and/or organic matter. On sideslopes, mulch or some other form of stabilizing material is to be provided to hold seed in place and conserve moisture.

4. When the post-closure care period has been completed, the operator shall notify the Agency utilizing the Agency's "Affidavit for Certification of Completion of Post-Closure Care for Non-Hazardous Waste Facilities".

5. The current cost estimate for closure and post-closure of BFI No. 1, Phase B, provided in the Permit Application, Log No. 1992-328, pursuant to 35 IAC 811.704, is $4,500,282.00. This cost estimate reflects the reduction of the post-closure cost estimate to its present value based on a 4 percent discount rate. The site operator (BFI) shall maintain financial assurance equal to or greater than the current cost estimate in accordance with 35 IAC 811.701(a).

   The cost estimate for closure and post-closure of BFI No. 1, Phase B, provided in the Permit Application Log No. 1994-354 pursuant to 35 IAC 811.704 is $6,796,395.00. This cost estimate does not reflect the reduction of the post-closure cost estimate, pursuant to 35 IAC 811.704(g). No later than April 9, 1995, the operator shall provide to the Agency financial assurance based on this revised cost estimate in accordance with 35 IAC 811.706(c)(1).

6. The operator shall provide financial assurance for closure and post-closure care pursuant to 35 IAC, 811.700(b). Documentation of this financial assurance must be submitted with the application for the first significant modification to authorize operation. However, 35 IAC, 811.700(b) financial assurance shall be required only for those areas for which authorization to operate has been obtained or is being requested.

7. The operator shall increase the total amount of financial assurance so as to equal the current cost estimate within 90 days of an increase in the current cost estimate in accordance with 35 IAC, 811.701(b).

8. The operator shall submit a permit application in the form of a significant modification to revise the closure cost estimates, due to the change in the final cover system, within 35 days of the issuance of this permit.

VIII. REPORTING REQUIREMENTS

1. This landfill's annual report for the year ending March 31, shall be submitted to the Agency by May 1, pursuant to 35 IAC, 813.501.

   The annual report shall include:

a. A waste volume summary which includes:

i. Total volume of solid waste accepted at the facility during the past year in cubic yards as measured at the gate;

ii. The remaining solid waste capacity in the unit in cubic yard as measured at the gate; and

iii. A copy of all identification reports required under 35 IAC 811.404.

b. Monitoring data from the leachate collection system and groundwater monitoring network, including:

i. Graphical results of monitoring efforts;

ii. Statistical summaries and analysis of trends;

iii. Changes to the monitoring program; and

iv. Discussion of error analysis, detection limits and observed trends.

c. Proposed activities for the upcoming year including:

i. Amount of waste expected;

ii. Structures to be built; and

iii. New monitoring stations to be installed.

d. Any significant modification affecting the operation of the facility.

e. The signature of the operator or duly authorized agent as specified in 35 IAC 812.104.

2. In addition to the annual report, the quarterly reports on the test results from groundwater and leachate monitoring shall be submitted to the Agency in accordance with the schedules described in Conditions IV.3. and V.12, pursuant to 35 IAC, 813.501.

IX. ACCEPTANCE OF SPECIAL WASTE

1. The permittee is authorized to accept the wastes identified in Condition IX.2 below, provided the generator complies with the following requirements:

   a. The waste is analyzed in accordance with the requirements of Condition IX.3 and complies with the acceptance criteria in the approved waste analysis plan;

   b. The waste is delivered by an Illinois licensed special waste hauler or an exempt hauler as defined in 35 IAC, Section 809.211; and

   c. The waste is accompanied by a required manifest, if required.

2. This facility is authorized to accept non-hazardous special waste that meets the definition of industrial process waste or pollution control waste as found in Section 3.17 and 3.27, respectively, of the Illinois Environmental Protection Act.

3. The permittee shall obtain a completed Special Waste Preacceptance form and a preacceptance analysis from each generator. In addition, the annual generator certification form, which certifies the waste has not changed since the last analysis, must be completed and included in the operating record. A complete lab analysis must be provided with the exceptions listed below. Analysis shall be conducted using SW-846 test methods. The waste shall be reanalyzed at least every five years and must identify the actual concentration of each chemical constituent and state of each physical parameter. In all cases a copy of the lab analysis (on lab letterhead and signed by a responsible party such as the person conducting the analysis or his supervisor) must be included in the operating record with the special waste preacceptance form (Profile Identification Sheet). The analysis may not be greater than one year old at the time. A new analysis is required if the composition of the waste changes (normal variations in waste composition are expected and are not included in this requirement). All waste must be analyzed as follows:

   a. The permittee shall conduct the following lab analyses to determine the concentrations of the following parameters.

      Paint Filter Test
      Flash point
      Sulfide (reactive)
      Cyanide (reactive)
      Phenol (total)
      pH
      Toxicity Characteristic Constituents

b. For any waste streams containing a liquid phase(s) (fails paint filter), each phase must be analyzed for total organic halogen (TOX) using the test method specified in 35 IAC, Part 729. Any waste containing 10,000 PPM or greater of TOX must be analyzed to determine the specific constituents, and their concentrations, that make up TOX. These constituents and their concentration should be reported on the lab analysis report. Any liquid containing multiple phases must include individual analyses for each phase.

c. The permittee shall conduct analysis for reactive sulfides and cyanides. For waste containing 250 ppm or greater reactive cyanide or 500 ppm or greater reactive sulfide it is presumed hazardous pursuant to 35 IAC, Section 721.123(a)(5) unless specific information to show it does not present danger to human health or the environment is provided. Analysis for total sulfide and/or cyanide may be substituted for reactive concentrations if they are equal to or less than 10 ppm. For wastes containing greater than 10 ppm reactive cyanide or reactive sulfide, the permittee shall not accept the waste unless the generator provides a signed and dated statement indicating that none of the following have occurred:

   i. The waste has never caused injury to a worker because of H2S and/or HCN generation;

   ii. That the OSHA work place air concentration limits for H2S and/or HCN have not been exceeded in areas where the waste is generated stored or otherwise handled; or

   iii. That air concentrations of H2S and/or HCN, above 10 ppm, have not been encountered in areas where the waste is generated, stored or otherwise handled.

d. The Permittee shall conduct analysis for phenols. If the total phenol concentration is greater than 1000 ppm, the waste will be required to be drummed and labeled, unless justification that this precaution is not necessary is provided. The justification must demonstrate skin contact is unlikely during transport or disposal.

e. The Permittee shall conduct metals and organics analysis. You may utilize either procedure (i.e., total or TCLP), but any constituent whose total concentration exceeds the TCLP limit specified in 35 IAC, Section 721.124 must be analyzed using the TCLP test and the results reported, unless an alternative test has been approved by the Agency. TCLP test methods must be in accordance with SW 846-1311.

f. EXCEPTIONS:

i. The generator may certify that the eight pesticides (D012, D013, D014, D015, D016, D017, D020 and D031) would not reasonably be expected to be present in their waste based on the nature of the generator's business.

ii. Petroleum contaminated media and debris from LUST sites subject to corrective action regulation under 35 IAC, Part 731 are temporarily exempt from complete TCLP analysis and the generator may limit analyses to flashpoint, paint filter test and TCLP lead.

4. Special waste generated due to an emergency situation may be disposed without complete TCLP analysis if:

a. The disposal facility ensures that the generator has received an incident number from the Illinois Emergency Management Agency at 1/800/782-7860 within Illinois or 1/217/782-7860 outside of Illinois and,

b. The disposal facility receives authorization from the Emergency Response Unit at 1/217/782-3637 and,

c. The waste is analyzed for the required chemical constituents.

5. The Special Waste Preacceptance Form shall be utilized for the special waste profile identification requirements of 35 IAC, Section 811.404(a).

6. The Annual Generator Recertification for Disposal Special Waste form shall be utilized for the special waste recertification requirements of 35 IAC, Section 811.404(b).

7. No liquid waste as determined by the Paint Filter Test shall be disposed unless the waste is from a household or is in a small container similar in size to that normally found in household waste and the container was designed for use other than storage. the prohibition applies to on-site generated wastes except for leachate or gas condensate that is specifically approved for recirculation into the landfill by permit. However, minor amounts of liquid resulting from precipitation during transport and disposal operations shall not be construed as a violation of this condition.

8. An individual waste stream permit is no longer required by this Agency for this facility. Therefore, a waste stream permit number will no longer be required on the manifest when shipping waste to this facility as authorized by this permit.

9. The operator shall retain all special waste records until the end of the post-closure period in accordance with 35 Ill. Adm. Code 811.405.

The original and two (2) copies of all certifications, logs or reports and three (3) copies of groundwater monitoring chemical analysis forms which are required to be submitted to the Agency by the permittee should be mailed to the following address:

Illinois Environmental Protection Agency
Planning and Reporting Section
Bureau of Land -- #24
2200 Churchill Road
Post Office Box 19276
Springfield, Illinois 62794-9276

Within 35 days after the notification of the final permit decision the applicant may petition for a hearing before the Illinois Pollution Control Board to contest the decision of the Agency, however, the 35-day period for petitioning for a hearing may be extended for a period of time not to exceed 90 days by written notice provided to the Board from the applicant and the Agency within the 35-day initial appeal period.

Sincerely,

Edwin C. Bakowski, P.E.
Manager, Permit Section
Bureau of Land

KES
ECB:MKM\mls\961732S.WPD

cc: Lake County Health Department
RMT, Inc.

STANDARD CONDITIONS FOR CONSTRUCTION/DEVELOPMENT PERMITS ISSUED BY THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

July 1, 1979

The Illinois Environmental Protection Act (Illinois Revised Statutes, Chapter 111-1/2, Section 1039) grants the Environmental Protection Agency authority to impose conditions on permits which it issues.

These standard conditions shall apply to all permits which the Agency issues for construction or development projects which require permits under the Divisions of Water Pollution Control, Air Pollution Control, Public Water Supplies, and Land and Noise Pollution Control. Special conditions may also be imposed by the separate divisions in addition to these standard conditions.

1. Unless this permit has been extended or it has been voided by a newely issued permit, this permit will expire two years after date of issuance unless construction or development on this project has started on or prior to that date.

2. The construction or development of facilities covered by this permit shall be done in compliance with applicable provisions of Federal laws and regulations, the Illinois Environmental Protection Act, and Rules and Regulations adopted by the Illinos Pollution Control Board.

3. There shall be no deviations from the approved plans and specifications unless a written request for modification of the project, along with plans and specifications as required, shall have been submitted to the Agency and a supplemental written permit issued.

4. The permittee shall allow any agent duly authorized by the Agency upon the presentation of credentials:

   a. to enter at reasonable times the permittee's premises where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit.

   b. to have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit.

   c. to inspect at reasonable times, including during any hours of operation of equipment constructed or operated under this permit, such equipment or monitoring methodology or equipment required to be kept, used, operated, calibrated and maintained under this permit.

d. to obtain and remove at reasonable times samples of any discharge or emission of pollutants.

e. to enter at reasonable times and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring, or recording any activity, discharge, or emission authorized by this permit.

5. The issuance of this permit:

a. shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are to be located;

b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities;

c. does not release the permittee from compliance with other applicable statutes and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations;

d. does not take into consideration or attest to the structural stability of any units or parts of the project;

e. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.

6. Unless a joint construction/operation permit has been issued, a permit for operating shall be obtained from the Agency before the facility or equipment covered by this permit is placed into operation.

7. These standard conditions shall prevail unless modified by special conditions.

8. The Agency may file a compliant with the Board for modification, suspension or revocation of a permit:

a. upon discovery that the permit application contained misrepresentations, misinformation or false statements or that all relevant facts were not disclosed; or

b. upon finding that any standard or special conditions have been violated; or

c. upon any violation of the Environmental Protection Act or any Rule or Regulation effective thereunder as a result of the construction or development authorized by this permit.

MLK:dh/17

1980-24-DE and 1980-24-OP Supplemental Permit No. 1996-118-SP
(Log No. 1996-118)

— SITE 2 PERMIT —

State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director
217/524-3300

2200 Churchill Road, Springfield, IL 62794-9276

July 3, 1996

CERTIFIED MAIL
Z 363 613 725

Browning Ferris Industries of Illinois, Inc.
701 Green Bay Road
Zion, Illinois 60099

Re: 0978020002 – Lake County
BFI (Zion Landfill)
Permit Nos. 1980-24-DE and 1980-24-OP
Supplemental Permit No. 1996-118-SP
Log No. 1996-118
Permit File

Gentlemen:

Supplemental permit is hereby granted to Browning Ferris Industries of Illinois, Inc. as owner and operator to modify the development and operation of the above referenced facility all in accordance with the plans prepared by Mr. Bryan N. Holbert of RMT, Inc., dated April 2, 1996 and received by the Agency on April 8, 1996 and signed and sealed by Mr. Andrew J. Querio, P.E. Final plans, specifications, application and supporting documents as submitted and approved shall constitute part of this permit and are identified on the records of the Illinois Environmental Protection Agency, Bureau of Land by the permit number(s) and log number(s) designated in the heading above.

The permit is issued subject to the standard conditions attached hereto and incorporated herein by reference, and further subject to the following special conditions. In case of conflict between the application and plans submitted and these special conditions, the special conditions of this permit shall govern.

1. This permit approves the development and construction of a landfill a dual gas/leachate extraction system for Site #2 only. The permit authorizes the installation of the dual leachate and gas extraction wells, lines, valves, condensate sumps, and other appurtenances for Site #2 only. The permit does not authorize the installation of similar systems for Site #1 or the installation of the proposed gas blower and flare systems. The application for an operating permit for the gas extraction system shall include:

   a. "As-built" construction plans of all significant components of the system;

   b. A complete description of the operation and maintenance of the system;

c. Certification that the system has been constructed in accordance with this permit;

d. An updated contingency plan describing the emergency procedures that will be implemented in the event of a fire or explosion at this facility;

e. A revised post-closure care cost estimate and total cost estimate to account for the care and maintenance of the system and disposal of condensate during the post-closure care period; and

f. A copy of the necessary permits from the Agency's Bureau of Air and Water, Permit Sections.

2. Within 30 days of the date of this permit, the operator shall provide the Agency with a revised post-closure care cost estimate and total cost estimate to account for the care and maintenance of the dual leachate and gas extraction system during the post-closure care period. The revised cost estimates shall be submitted in the form of a supplemental permit application.

3. Installation of the extraction system shall be completed as quickly as possible to minimize the release of odors. Furthermore, no refuse uncovered during excavation shall be left exposed overnight.

4. Borings for the dual leachate and gas well installations shall terminate at elevations which will insure that the bore holes do not encounter the landfill invert or adversely affect the integrity of the liner.

5. Refuse removed during construction of the dual leachate and gas extraction system shall be properly disposed of in an Illinois Environmental Protection Agency permitted landfill as a Special Waste.

6. The gas wells, probes and condensate drains shall be inspected at least monthly for structural integrity and proper operation.

7. While the site is being developed or operated as a gas control or collection facility, corrective action shall be taken if erosion or ponding are observed, if cracks greater than one inch wide have formed, if gas, odor, vegetative or vector problems arise, or if leachate popouts or seeps are present in the areas disturbed by constructing this gas collection facility.

8. Any penetration or disturbance of the final cover material at this facility caused by construction of the gas control system shall be sealed or repaired to ensure that a minimum of three (3) feet of compacted clay final cover exists above all buried appurtenances of the gas collection system.

9. Condensate from the gas accumulation system, and leachate pumped and removed from the landfill shall be disposed at an IEPA permitted publicly-owned treatment works, or a commercial treatment or disposal facility. The leachate/condensate liquid shall be analyzed individually to determine if hazardous waste characteristics are present. A written log showing the volume of liquid discharged to the treatment facility each day by the landfill will be maintained at the landfill. This log will also show the liquid analyses.

10. When this facility is no longer used for gas control or collection, the pipes, collection devices or other appurtenances will be cut off at least 2.5 feet below ground level, the pipes plugged, and three feet of clay cover material compacted in eight inch layers placed in the cut area. This cover shall be topped with six inches of soil and seeded with grass that provides a vegetative cover. In addition, if any underground storage tank is determined to be regulated by Subtitle I of RCRA, that tank must be closed in accordance with the applicable Subtitle I closure requirements.

11. All water, condensate, leachate or water commingled with leachate or condensate from the site shall be discharged in accordance with a permit issued by IEPA Bureau of Water, Permit Section.

12. The portion of this permit that also requires permits from the Bureau of Air shall not be constructed until such time that the necessary permits have also been obtained from the Bureau of Air, Permit Section.

13. Liquid levels in the condensate tank shall be checked and recorded at least one time per week during summer months and two (2) times per week during winter months.

14. During site development and operation, all records of field investigations, measurements, inspections, sampling and corrective action taken are to be maintained at the site and made available to IEPA personnel.

15. Any modification to the facility shall be the subject of an application for supplemental permit for site modification submitted to this Agency.

16. This Agency reserves the right to require installation of additional monitoring devices, to alter the selection of parameters to be analyzed and to alter monitoring frequencies as may be necessary to fulfill the intent of the Environmental Protection Act.

17. This permit is subject to review and modification by the Agency as deemed necessary to fulfill the intent and purpose of the Environmental Protection Act, and all applicable environmental rules and regulations.

STANDARD CONDITIONS FOR CONSTRUCTION/DEVELOPMENT PERMITS ISSUED BY THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

July 1, 1979

The Illinois Environmental Protection Act (Illinois Revised Statutes, Chapter 111-1/2, Section 1039) grants the Environmental Protection Agency authority to impose conditions on permits which it issues.

These standard conditions shall apply to all permits which the Agency issues for construction or development projects which require permits under the Divisions of Water Pollution Control, Air Pollution Control, Public Water Supplies, and Land and Noise Pollution Control. Special conditions may also be imposed by the separate divisions in addition to these standard conditions.

1. Unless this permit has been extended or it has been voided by a newely issued permit, this permit will expire two years after date of issuance unless construction or development on this project has started on or prior to that date.

2. The construction or development of facilities covered by this permit shall be done in compliance with applicable provisions of Federal laws and regulations, the Illinois Environmental Protection Act, and Rules and Regulations adopted by the Illinos Pollution Control Board.

3. There shall be no deviations from the approved plans and specifications unless a written request for modification of the project, along with plans and specifications as required, shall have been submitted to the Agency and a supplemental written permit issued.

4. The permittee shall allow any agent duly authorized by the Agency upon the presentation of credentials:

   a. to enter at reasonable times the permittee's premises where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit.

   b. to have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit.

   c. to inspect at reasonable times, including during any hours of operation of equipment constructed or operated under this permit, such equipment or monitoring methodology or equipment required to be kept, used, operated, calibrated and maintained under this permit.

d. to obtain and remove at reasonable times samples of any discharge or emission of pollutants.

e. to enter at reasonable times and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring, or recording any activity, discharge, or emission authorized by this permit.

5. The issuance of this permit:

a. shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are to be located;

b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities;

c. does not release the permittee from compliance with other applicable statutes and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations;

d. does not take into consideration or attest to the structural stability of any units or parts of the project;

e. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.

6. Unless a joint construction/operation permit has been issued, a permit for operating shall be obtained from the Agency before the facility or equipment covered by this permit is placed into operation.

7. These standard conditions shall prevail unless modified by special conditions.

8. The Agency may file a compliant with the Board for modification, suspension or revocation of a permit:

a. upon discovery that the permit application contained misrepresentations, misinformation or false statements or that all relevant facts were not disclosed; or

b. upon finding that any standard or special conditions have been violated; or

c. upon any violation of the Environmental Protection Act or any Rule or Regulation effective thereunder as a result of the construction or development authorized by this permit.

MLK:dh/17

18. This application has been approved pursuant to the requirements for a landfill which is currently subject to 35 Ill. Adm. Code 807. The application has not been reviewed with respect to the standards of 35 Ill. Adm. Code 811 and this supplemental permit does not constitute a partial approval of the significant modification required by 35 Ill. Adm. Code 814.104.

Except as modified in the above documents, the site shall be developed and operated in accordance with the terms and conditions of Permit Nos. 1980-24-DE and 1980-24-OP, dated August 21, 1980 and December 23, 1981, respectively, and with other permits issued for this site.

The original and two (2) copies of all certifications, logs or reports and three (3) copies of groundwater monitoring chemical analysis forms which are required to be submitted to the Agency by the permittee should be mailed to the following address:

Illinois Environmental Protection Agency
Planning and Reporting Section
Bureau of Land -- #24-S
2200 Churchill Road
Post Office Box 19276
Springfield, Illinois 62794-9276

Within 35 days of the date of mailing of the Agency's final decision, the applicant may petition for a hearing before the Illinois Pollution Control Board to contest the decision of the Agency, however, the 35-day period for petitioning for a hearing may be extended for a period of time not to exceed 90 days by written notice provided to the Board from the applicant and the Agency within the 35-day initial appeal period

Sincerely,

Edwin C. Bakowski, P.E.
Manager, Permit Section
Bureau of Land

ECB:CMR:bjh\961877.WPD

Attachment: Standard Conditions

cc: RMT, Inc.
Lake County Health Department - Mike Kuhn

Operational Permit - IEPA Letter Dated April 29, 1998

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 North Grand Avenue East, P.O. Box 19276, Springfield, Illinois 62794-9276 Mary A. Gade, Director

217/524-3300

April 29, 1998

CERTIFIED MAIL
P 344 291 431

Browning Ferris Industries
Attn: Mr. Michael W. Williams
701 N. Green Bay Road
Zion, Illinois 60099

Re: 0978020002 – Lake County
BFI (Zion Landfill)
Permit No. 1995-343-LFM
Modification No. 3
Expiration Date: March 22, 2002
Log Nos.: 1998-062 and 1998-116
Permit File

Dear Mr. Williams:

Permit is hereby granted to Browning Ferris Industries of Illinois, Inc., as owner and operator, approving modification of an existing municipal solid waste and non-hazardous special waste landfill all in accordance with the application and plans prepared by Michael S. Thompson, P.E. of CH2M Hill, Inc. Final plans, specifications, application, and supporting documents, as submitted and approved, shall constitute part of this permit and are identified in the records of the Illinois Environmental Protection Agency (the "Illinois EPA"), Bureau of Land, Division of Land Pollution Control by the permit number and log number designated in the heading above.

Permit No. 1995-343-LFM, issued March 21, 1997 approved:

a. The Significant Modification of the development and operation of this landfill so as to comply with the applicable requirements of Title 35, Illinois Administrative Code (hereinafter 35 IAC), Subtitle G, Parts 811 through 813, pursuant to 35 IAC, Sections 814.104, 814.301 and 814.302;

b. The development of a vertical expansion on the existing landfill, and horizontal expansion to the existing permitted waste boundaries. The vertical expansion encompasses approximately 35 acres above the existing landfill unit known as BFI Site #2. The waste footprint of the lateral expansion is approximately 71.40 acres east and adjacent to the existing waste boundaries. Thus, completion of the existing unit and approved expansion shall result in a single unit with an approximate area of 131.189 acres within its waste boundaries, with a total facility boundary of approximately 191.7 acres, an "in-place" net disposal capacity of approximately 10.97 million cubic yards, and a maximum final elevation of approximately 850 feet above mean sea level.

c. The revised final contours of the existing landfill outside the vertical expansion area as shown on Sheet No.7, entitled "Final Grades" of the application Log No. 1995-343.

d. Acceptance of special waste streams without individual special waste stream authorizations, in accordance with the special conditions listed in Part III of this permit.

Permit Modification No. 3 is hereby granted to Browning-Ferris Industries of Illinois, Inc., as owner and operator allowing a significant modification of an existing municipal solid waste and non-hazardous special waste landfill all in accordance with the application and plans prepared, signed and sealed by Curtis D. Madsen, P.E. of RMT, Inc. for Log No. 1998-062 and the application and plans prepared, signed and sealed by Ali Hashimi, P.E. of Weaver Boos Consultants, Inc. for Log No. 1998-116 dated February 16, 1998 and April 2, 1998 and received by the Illinois EPA on February 18, 1998 and April 3, 1998, respectively.

Modification No. 3 to Permit No. 1995-343-LFM approves the following:

a. The Construction Quality Assurance Report for the active gas collection and leachate extraction system for Site 2 contained in Log No. 1998-062. Consequently, the operation of the active gas and leachate extraction system in Site 2 is permitted; and

b. The proposed leachate disposal facility requested in Log No. 1998-116.

Except for differences described in the table below, the special conditions of the permit letter for Modification No. 3 to Permit No. 1995-343-LFM are identical to the special conditions of Modification No. 2 issued March 24, 1998.

Condition No. in Permit No. 1995-343-LFM Modification No. 2	Condition No. in Permit No. 1995-343-LFM Modification No. 3	Description of Revision
VII.1	VII.1	Added Log No. 1998-116 for the proposed leachate treatment facility.
IX.1	IX.1	Revised to reflect approved operation of the gas collection system for Site 2.
IX.6	IX.6	Changed from monthly to annual monitoring.
None	IX.11	Added to reflect the approved monitoring and maintenance plan and schedule for the active gas collection system.

IEPA Regulation Sections 811.310, 811.311, 811.312

BOARD NOTE: Subsection (h) is derived from 40 CFR 258.61 (1992).

(Source: Adopted in R88-7 at 14 Ill. Reg. 15861, effective September 18, 1990; amended in R93-10 at 18 Ill. Reg. 1308, effective January 13, 1994)

Title: IL / Title 35 · Subtitle G · Part 811 · Subpart C · 811.310
Section: 811.310 Landfill Gas Monitoring
Date: January 13, 1994
Subject Terms: waste | solid waste | solid waste facility | landfill | applicability | monitoring | well | design | construction | standard | schedule | compliance | air | emission

Section 811.310 Landfill Gas Monitoring

a) This Section applies to all units that dispose putrescible wastes.

b) Location and Design of Monitoring Wells

1) Gas monitoring devices shall be placed at intervals and elevations within the waste to provide a representative sampling of the composition and buildup of gases within the unit.

2) Gas monitoring devices shall be placed around the unit at locations and elevations capable of detecting migrating gas from the ground surface to the lowest elevation of the liner system or the top elevation of the groundwater, whichever is higher.

3) A predictive gas flow model may be utilized to determine the optimum placement of monitoring points required for making observations and tracing the movement of gas.

4) Gas monitoring devices shall be constructed from materials that will not react with or be corroded by the landfill gas.

5) Gas monitoring devices shall be designed and constructed to measure pressure and allow collection of a representative sample of gas.

6) Gas monitoring devices shall be constructed and maintained to minimize gas leakage.

7) The gas monitoring system shall not interfere with the operation of the liner, leachate collection system or delay the construction of the final cover system.

8) At least three ambient air monitoring locations shall be chosen and samples shall be taken no higher than 0.025 meter (1 inch) above the ground and 30.49m (100 feet) downwind from the edge of the unit or at the property boundary, whichever is closer to the unit.

c) Monitoring Frequency

1) All gas monitoring devices, including the ambient air monitors shall be operated to obtain samples on a monthly basis for the entire operating period and for a minimum of five years after closure.

2) After a minimum of five years after closure, monitoring frequency may be reduced to quarterly sampling intervals.

3) The sampling frequency may be reduced to yearly sampling intervals upon the installation and operation of a gas collection system equipped with a mechanical device such as a compressor to withdraw gas.

4) Monitoring shall be continued for a minimum period of: thirty years after closure at MSWLF units, except as otherwise provided by subsections (c)(5) and (c)(6), below; five years after closure at landfills, other than MSWLF units, which are used exclusively for disposing of wastes generated at the site; or fifteen years after closure at all other landfills regulated under this Part. Monitoring, beyond the minimum period, may be discontinued if the following conditions have been met for at least one year:

A) The concentration of methane is less than five percent of the lower explosive limit in air for four consecutive quarters at all monitoring points outside the unit; and

B) Monitoring points within the unit indicate that methane is no longer being produced in quantities that would result in migration from the unit and exceed the standards of subsection (a)(1).

5) The Agency may reduce the gas monitoring period at a MSWLF unit upon a demonstration by the owner or operator that the reduced period is sufficient to protect human health and environment.

6) The owner or operator of a MSWLF unit shall petition the Board for an adjusted standard in accordance with Section 811.303, if the owner or operator seeks a reduction of the postclosure care monitoring period for all of the following requirements:

i) Inspection and maintenance (Section 811.111);

ii) Leachate collection (Section 811.309);

iii) Gas monitoring (Section 811.310); and

iv) Groundwater monitoring (Section 811.319).

BOARD NOTE: Changes to subsections (c) are derived from 40 CFR 258.61 (1992).

d) Parameters to be Monitored

1) All below ground monitoring devices shall be monitored for the following parameters at each sampling interval:

A) Methane;

B) Pressure;

C) Nitrogen;

D) Oxygen; and

E) Carbon dioxide.

2) Ambient air monitors shall be sampled for methane only when the average wind velocity is less than 8 kilometers (five miles) per hour at a minimum of three downwind locations 30.49 meters (100 feet) from the edge of the unit or the property boundary, whichever is closer to the unit.

3) All buildings within a facility shall be monitored for methane by utilizing continuous detection devices located at points where methane might enter the building.

(Source: Adopted in R88-7 at 14 Ill. Reg. 15861, effective September 18, 1990; Amended at 17 Ill. Reg. 12413, effective July 19, 1993; expedited correction at 18 Ill. Reg. 7504, effective July 19, 1993; amended in R93-10 at 18 Ill. Reg. 1308, effective January 13, 1994)

Title: IL / Title 35 · Subtitle G · Part 811 · Subpart C · 811.311
Section: 811.311 Landfill Gas Management System
Date: January 13, 1994
Subject Terms: waste | solid waste | solid waste facility | landfill | compliance | standard | notification | monitoring | design | operating | equipment

Section 811.311 Landfill Gas Management System

a) The operator shall install a gas management system if any one of the following conditions are met:

1) A methane concentration greater than 50 percent of the lower explosive limit in air is detected below the ground surface by a monitoring device or is detected by an ambient air monitor located at or beyond the property boundary or 30.5 meters (100 feet) from the edge of the unit, whichever is less, unless the operator can demonstrate that the detected methane concentration is not attributable to the facility;

2) Methane is detected at a concentration greater than 25 percent of the lower explosive limit in air in any building on or near the facility, unless the operator can demonstrate that the detected methane concentration is not attributable to the facility;

3) Malodors caused by the unit are detected beyond the property boundary; or

4) Leachate is recycled in accordance with Section 811.309(e).

b) If methane gas levels exceed the limits specified in subsections (a)(1) or (a)(2), an owner or operator of a MSWLF unit shall:

1) Notify the Agency in writing, within two business days, of an observed exceedance; and

2) Implement the requirements of this Section to ensure the protection of human health.

c) Standards for Gas Venting System

1) Gas venting systems shall be utilized only as optional, temporary mitigation until the completion of an active system.

2) All materials shall be resistant to chemical reaction with the constituents of the gas.

3) The system shall be capable of venting all gas down to the water table or bottom of the liner, whichever is higher.

4) Gas venting systems shall be installed only outside the perimeter of the unit.

d) Standards for Gas Collection Systems

1) Gas collection systems may be installed either within the perimeter of the unit or outside the unit.

2) The operator shall design and operate the system so that the standards of subsections (a)(1), (a)(2), and (a)(3) will not be exceeded.

3) The gas collection system shall transport gas to a central point or points for processing for beneficial uses or disposal in accordance with the requirements of Section 811.312.

4) The gas collection system shall be designed to function for the entire design period. The design may include changes in the system to accommodate changing gas flow rates or compositions.
5) All materials and equipment used in construction of the system shall be rated by the manufacturer as safe for use in hazardous or explosive environments and shall be resistant to corrosion by constituents of the landfill gas.

6) The gas collection system shall be designed and constructed to withstand all landfill operating conditions, including settlement.

7) The gas collection system and all associated equipment including compressors, flares, monitoring installations, and manholes shall be considered part of the facility.

8) Provisions shall be made for collecting and draining gas condensate to a management system meeting the requirements of Section 811.309.

9) Under no circumstances shall the gas collection system compromise the integrity of the liner, leachate collection or cover systems.

10) The portion of the gas collection system, used to convey the gas collected from one or more units for processing and disposal shall be tested to be airtight to prevent the leaking of gas from the collection system or entry of air into the system.

11) The gas collection system shall be operated until the waste has stabilized enough to no longer produce methane in quantities that exceed the minimum allowable concentrations in subsections (a)(1), (a)(2), and (a)(3).

12) The gas collection system shall be equipped with a mechanical device, such as a compressor, capable of withdrawing gas, or be designed so that a mechanical device can be easily installed at a later time, if necessary, to meet the requirements of subsections (a)(1), (a)(2), and (a)(3).

BOARD NOTE: Subsection (b) is derived from 40 CFR 258.23(c)(1) (1992).

(Source: Adopted in R88-7 at 14 Ill. Reg. 15861, effective September 18, 1990; amended in R93-10 at 18 Ill. Reg. 1308, effective January 13, 1994)

Title: IL / Title 35 · Subtitle G · Part 811 · Subpart C · 811.312
Section: 811.312 Landfill Gas Processing and Disposal System
Date: September 18, 1990
Subject Terms: waste | solid waste | solid waste facility | landfill | compliance | monitoring

Section 811.312 Landfill Gas Processing and Disposal System

a) The processing of landfill gas for use is strongly encouraged but is not required.

b) Except as allowed in subsection (g), the landfill gas processing and disposal system, including compressors, blowers, raw gas monitoring systems, devices used to control the flow of gas from the unit, flares, gas treatment devices, air pollution control devices and monitoring equipment must remain under the control of the operator and shall be considered part of the waste disposal facility.

c) No gas may be discharged directly to the atmosphere unless treated or burned on-site prior to discharge in accordance with a permit issued by the Agency pursuant to 35 Ill. Adm. Code 200 through 245.

d) Representative flow rate measurements shall be made of gas flow into treatment or combustion devices.

e) When used for the on-site combustion of landfill gas, flares shall meet the general control device requirements of new source performance standards adopted pursuant to Section 9.1(b) of the Act.

f) Standards for On-site Combustion of Landfill Gas Using Devices Other Than Flares

1) At a minimum, landfill gas shall be measured for flow rate, heat value, and moisture content along with combustion parameters including, but not limited to, oxygen and carbon dioxide prior to treatment or combustion. Constituents of the landfill gas and combustion byproducts shall be identified for inclusion in an Agency issued permit based on the type of waste streams that are or will be in the landfill, landfill gas analysis and potential for being emitted into the air after treatment or combustion.

2) All constituents and parameters that must be measured before and after treatment or combustion shall be identified and included in the permit issued by the Agency pursuant to 35 Ill. Adm. Code 200 through 245. At a minimum, the following types of constituents must be considered for inclusion in the permit:

A) The six criteria air pollutants and the hazardous air pollutants subject to regulation under the Clean Air Act (42 U.S.C. 7401 et seq.);

B) Any list of toxic air contaminants, including carcinogens, mutagens and listed hazardous air pollutants adopted by the Board pursuant to Section 9.5 of the Act;

C) Volatile Organic Compounds;

D) Constituents present in the landfill gas; and

E) Combustion byproducts expected to be emitted from the combustion or treatment device.

g) Landfill gas may be transported off-site to a gas processing facility in accordance with the following requirements:

1) The solid waste disposal facility contributes less than 50 percent of the total volume of gas accepted by the gas processing facility. Otherwise, the processing facility must be considered a part of the solid waste management facility.

2) The landfill gas shall be monitored for the parameters listed in subsection (d)(1) as well as other constituents such as, ammonia (NH(3)), hydrogen sulfide (H(2)S) and hydrogen (H(2)) that are needed to operate the gas processing facility.

3) The gas processing facility is to be sized to handle the expected volume of gas.

4) The transportation of gas to an off-site gas processing facility shall in no way relieve the operator of the requirements of Section 811.311(a).

(Source: Adopted in R88-7 at 14 Ill. Reg. 15861, effective September 18, 1990)
Title: IL / Title 35 · Subtitle G · Part 811 · Subpart C · 811.313
Section: 811.313 Intermediate Cover
Date: September 18, 1990
Subject Terms: waste | solid waste | solid waste facility | landfill | compliance | operating

Section 811.313 Intermediate Cover

a) All waste which is not to be covered within 60 days of placement by another lift of waste or final cover in accordance with Section 811.314 shall have a cover equivalent to that provided by 0.30 meter (1 foot) of compacted clean soil material.

b) All areas with intermediate cover shall be graded so as to facilitate drainage of runoff and minimize infiltration and standing water.

c) The grade and thickness of intermediate cover shall be maintained until the placement of additional wastes or the final cover. All cracks, rills, gullies and depressions shall be repaired to prevent access to the solid waste by vectors, to minimize infiltration and to prevent standing water.

(Source: Adopted in R88-7 at 14 Ill. Reg. 15861, effective September 18, 1990)

Title: IL / Title 35 · Subtitle G · Part 811 · Subpart C · 811.314
Section: 811.314 Final Cover System
Date: January 13, 1994
Subject Terms: waste | solid waste | solid waste facility | landfill | compliance | closure | construction | standard

Section 811.314 Final Cover System

a) The unit shall be covered by a final cover consisting of a low permeability layer overlain by a final protective
layer constructed in accordance with the requirements of this Section.

b) Standards For The Low Permeability Layer

1) Not later than 60 days after placement of the final lift of solid waste, a low permeability layer shall be constructed.

2) The low permeability layer shall cover the entire unit and connect with the liner system.

3) The low permeability layer shall consist of any one of the following:

A) A compacted earth layer constructed in accordance with the following standards:

i) The minimum allowable thickness shall be 0.91 meter (3 feet);

ii) The layer shall be compacted to achieve a permeability of 1 x 10[-7] centimeters per second and minimize void spaces.

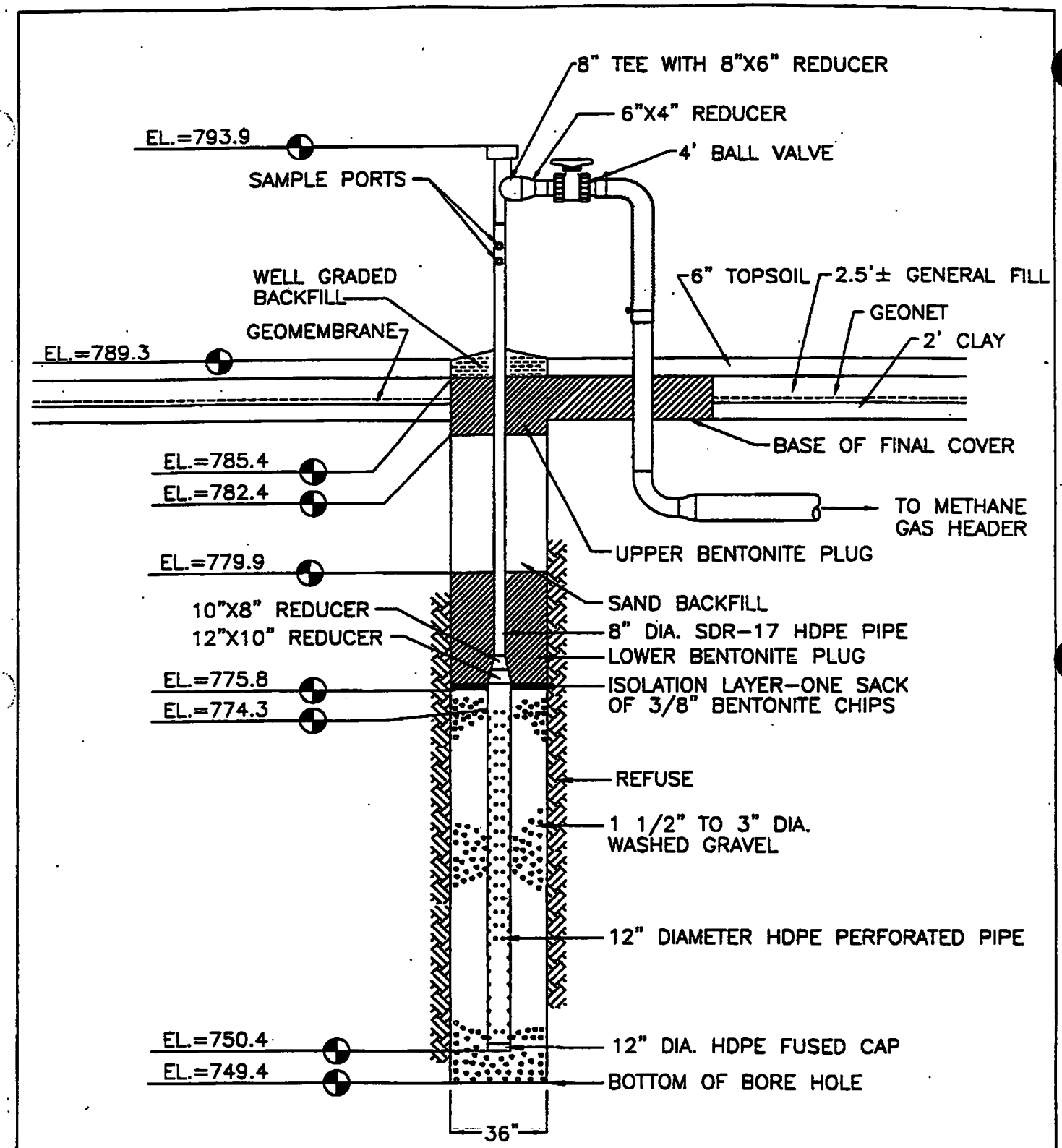
iii) Alternative specifications may be utilized provided that the performance of the low permeability layer is equal to or superior to the performance of a layer meeting the requirements of subsections (b)(3)(A)(i) and (b)(3)(A)(ii).

B) A geomembrane constructed in accordance with the following standards:

APPENDIX B

APPENDIX B - EQUIPMENT MANUFACTURERS OPERATION AND MAINTENANCE MANUALS

APPENDIX C - GAS EXTRACTION WELL AND BORING LOGS



Extraction Well No. EW-1		
SCALE: N.T.S.	APPROVED BY:	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		

1/152

CQM, Inc.
2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-1	Surface Elevation:	789.3
Exact Location (Coordinates):	12416N 9311E	Total Depth:	39.9'
Installation Date:	2/3/97	Date Completed:	2/3/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	23.9'	Length of Solid Pipe:	19.6'

Depth	Material Drilled	Comments
0-6	Clay / Dirt	
7-13	Clay / Dirt	Very little refuse in waste
14-20		
21-27		
28-34		
35-41	End of Borehole @ 39.9'	Dry
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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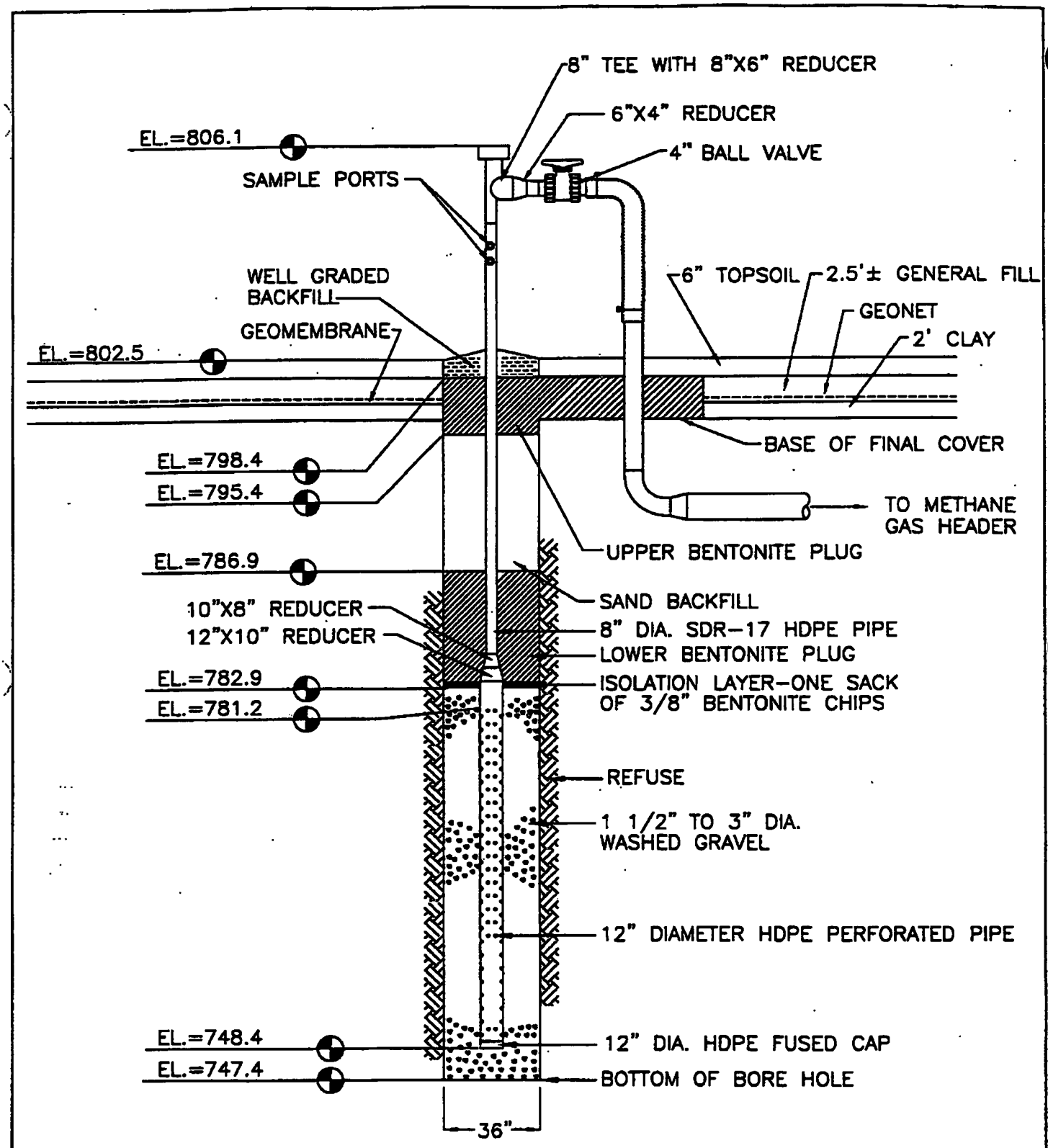
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-2		
SCALE: N.T.S.	APPROVED BY:	DRAWN BY: TLS
DATE: Nov 1997	TJA	REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		3

CQM, Inc.
2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-2	Surface Elevation:	802.5
Exact Location (Coordinates):	12031N 9350E	Total Depth:	55.1'
Installation Date:	2/3/97	Date Completed:	2/3/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	32.8'	Length of Solid Pipe:	24.9'

Depth	Material Drilled	Comments
0-6	0-8' Clay	
7-13	Refuse/Clay	Very little refuse in clay material.
14-20	Clay	
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 55.1'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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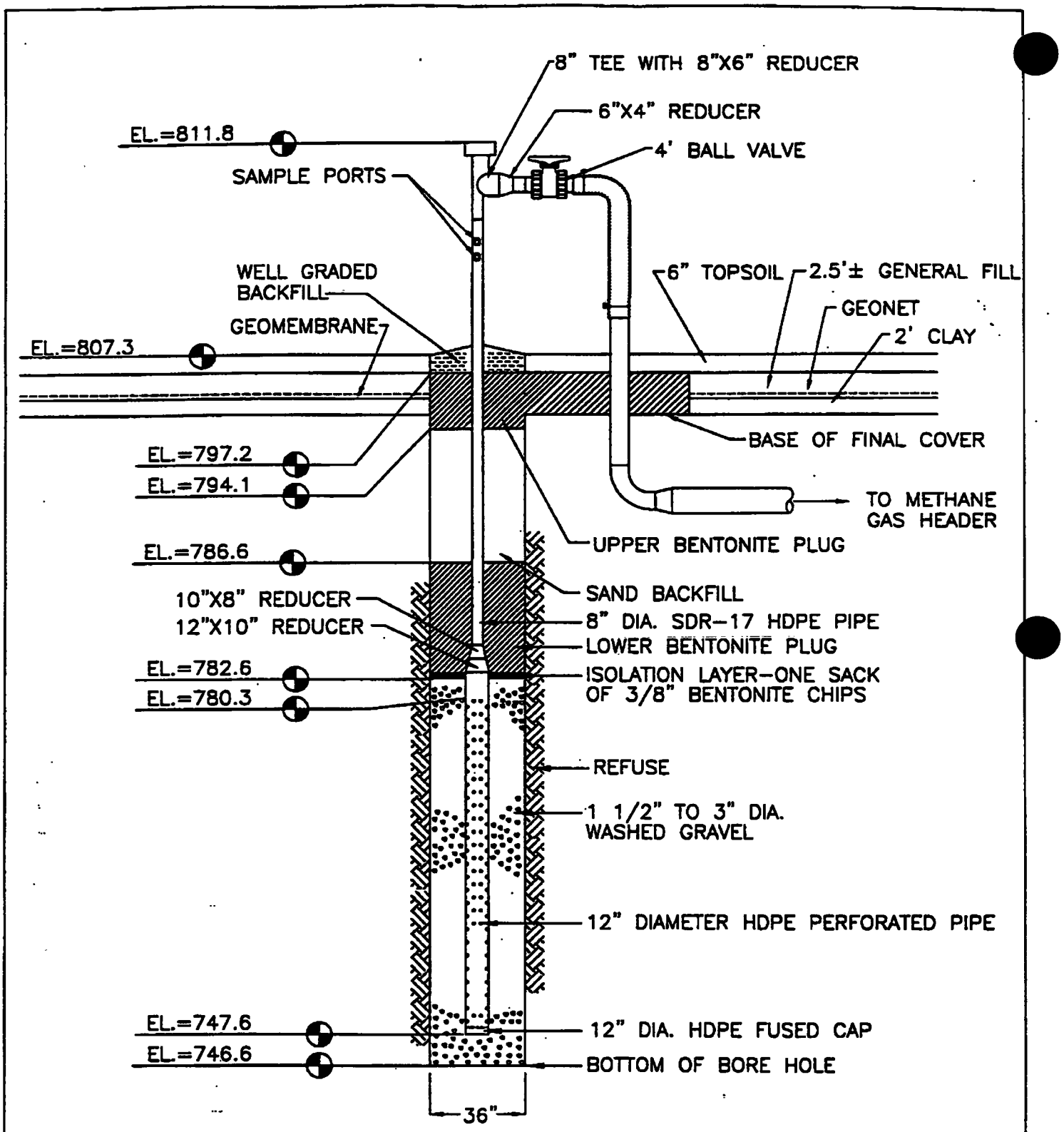
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-3

SCALE: N.T.S.	APPROVED BY:	DRAWN BY: TLS
DATE: Nov 1997	TJA	REVISED:

Zion Landfill – Site 1A
Zion, Illinois

CQM, Inc.

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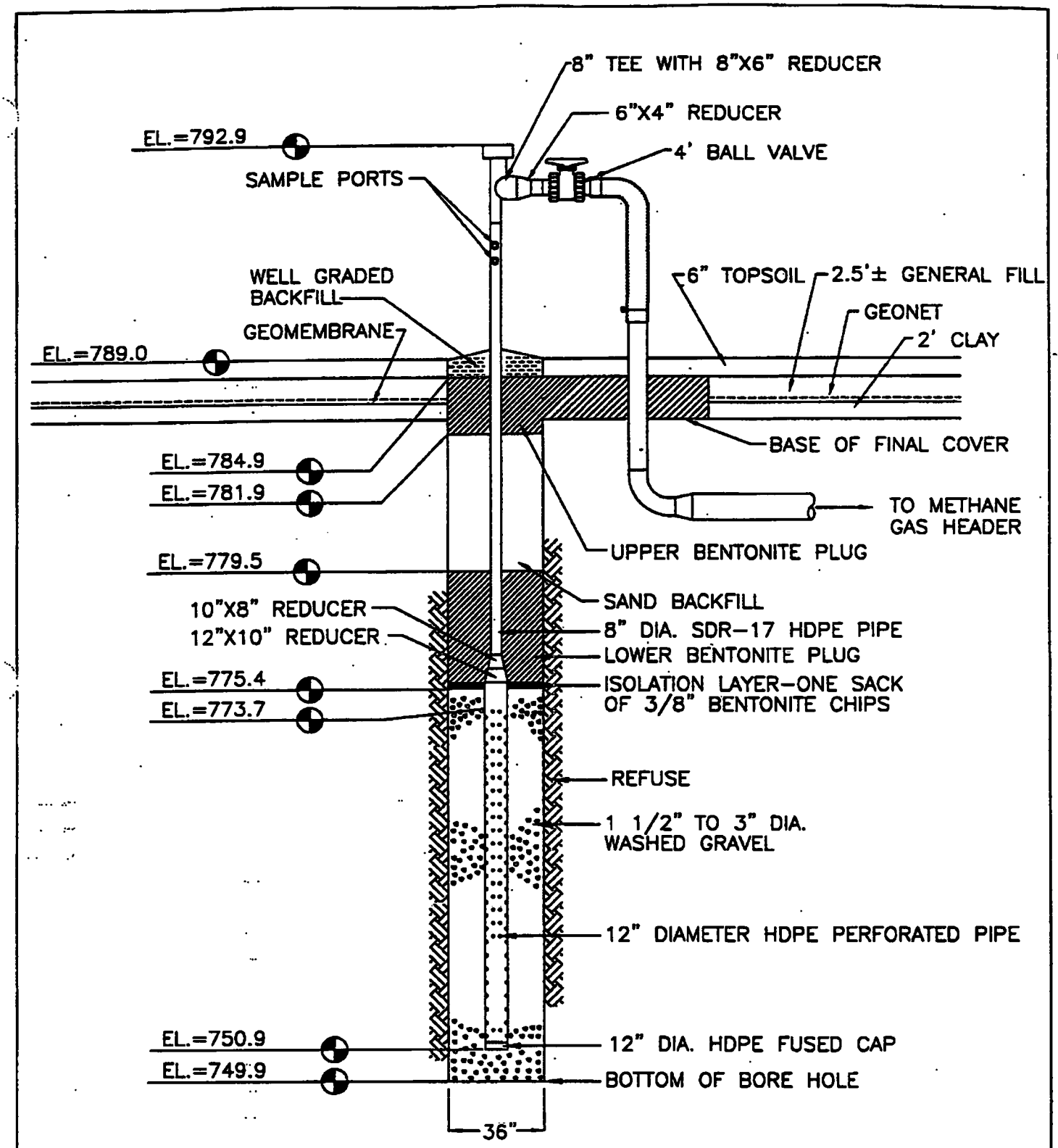
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-3	Surface Elevation:	807.3
Exact Location (Coordinates):	12137N 9119E	Total Depth:	60.7'
Installation Date:	2/3/97	Date Completed:	2/3/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	32.7'	Length of Solid Pipe:	31.5'

Depth	Material Drilled	Comments
0-6	0-5' Clay-Brown	
7-13	Refuse	Dark gray color mixed with clay
14-20	Refuse (paper, plastic, and wood)	
21-27	Refuse	Dry
28-34		
35-41		
42-48		
49-55		
56-62	End of Borehole @ 60.7'	Dry
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-4

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 1A
Zion, Illinois

CQM, Inc.

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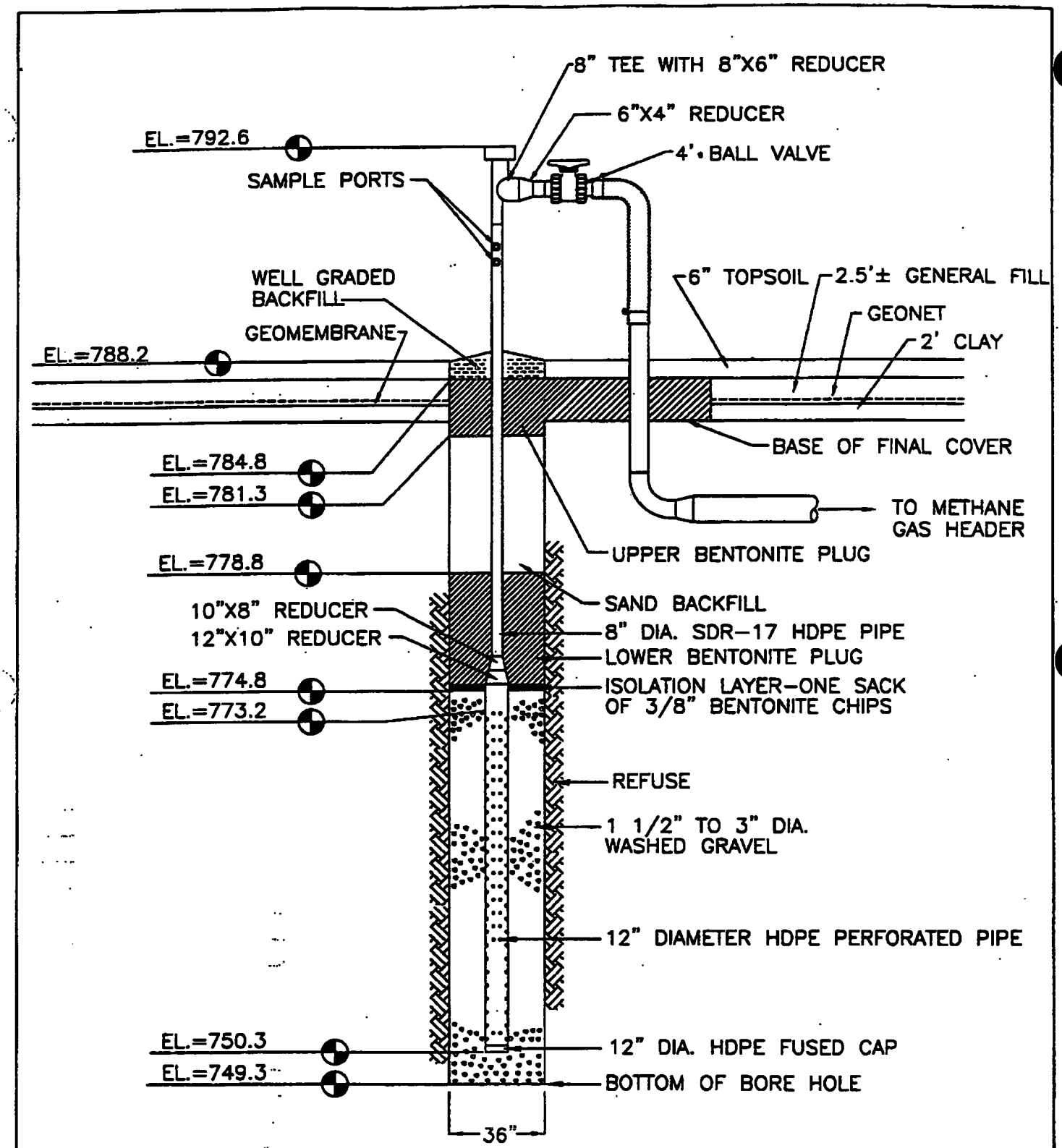
2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-4	Surface Elevation:	789
Exact Location (Coordinates):	12426N 9097E	Total Depth:	39.1'
Installation Date:	2/3/97	Date Completed:	2/3/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	22.8'	Length of Solid Pipe:	19.2'

Depth	Material Drilled	Comments
0-6	0-3.5' Clay	
7-13	Refuse	Black/Damp
14-20		Dry
21-27		
28-34		
35-41	End of Borehole @ 39.1'	Dry
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-5

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 1A
Zion, Illinois

CQM, Inc.

CQM, Inc.
2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-5	Surface Elevation:	788.2
Exact Location (Coordinates):	12420N 8890E	Total Depth:	38.9'
Installation Date:	2/5/97	Date Completed:	2/5/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	22.9'	Length of Solid Pipe:	19.4'

Depth	Material Drilled	Comments
0-6	0-4.5' Clay	
7-13	Refuse (paper, plastic, and wood)	Black-Clay/Refuse
14-20		Dry
21-27		
28-34		
35-41	End of Borehole @ 38.9'	Dry
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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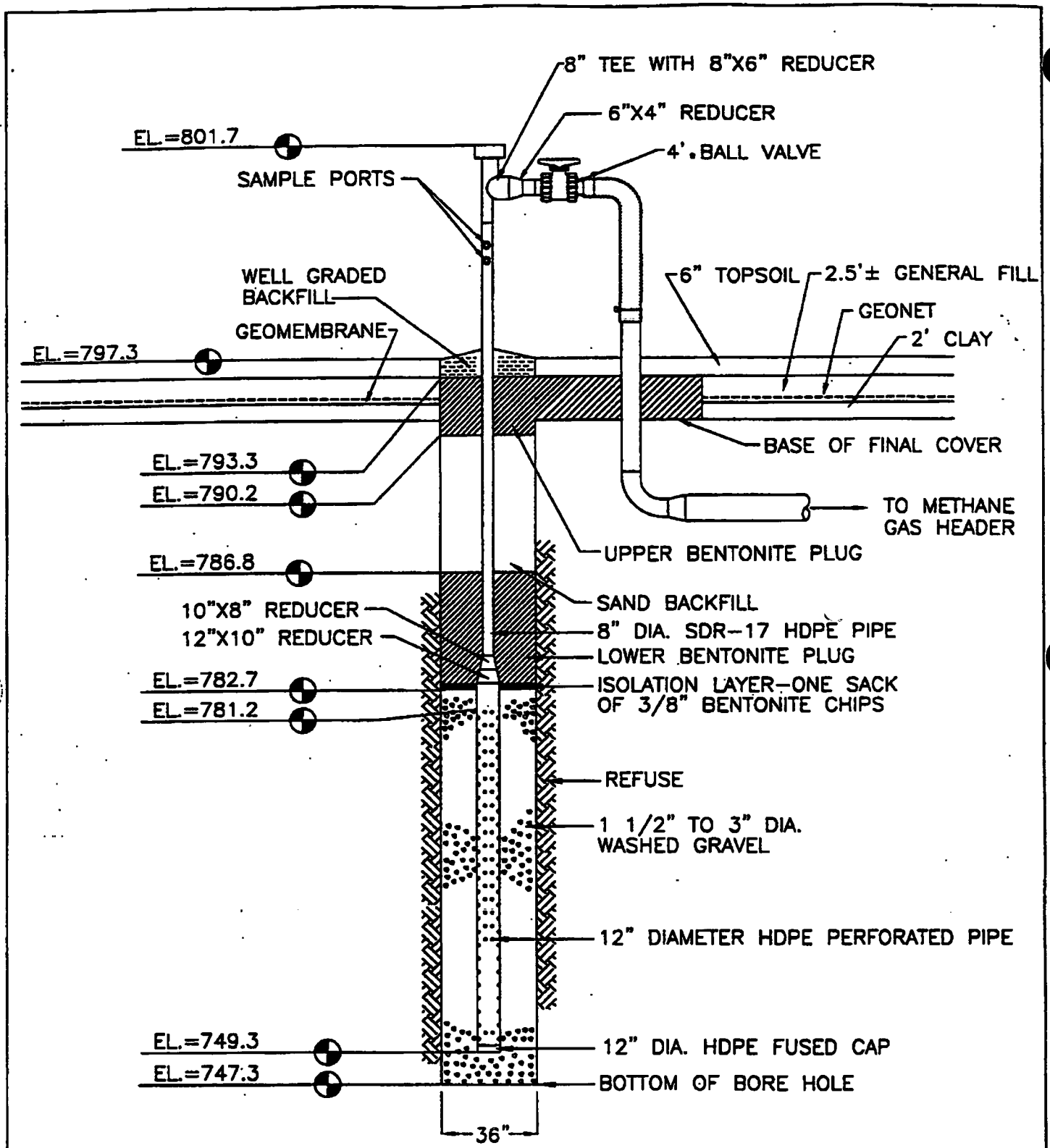
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-6		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		

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2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-6	Surface Elevation:	797.3
Exact Location (Coordinates):	12245N 8894E	Total Depth:	50.0'
Installation Date:	2/3/97	Date Completed:	2/3/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	31.9'	Length of Solid Pipe:	20.5'

Depth	Material Drilled	Comments
0-6	0-4' Topsoil/Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 50.0'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
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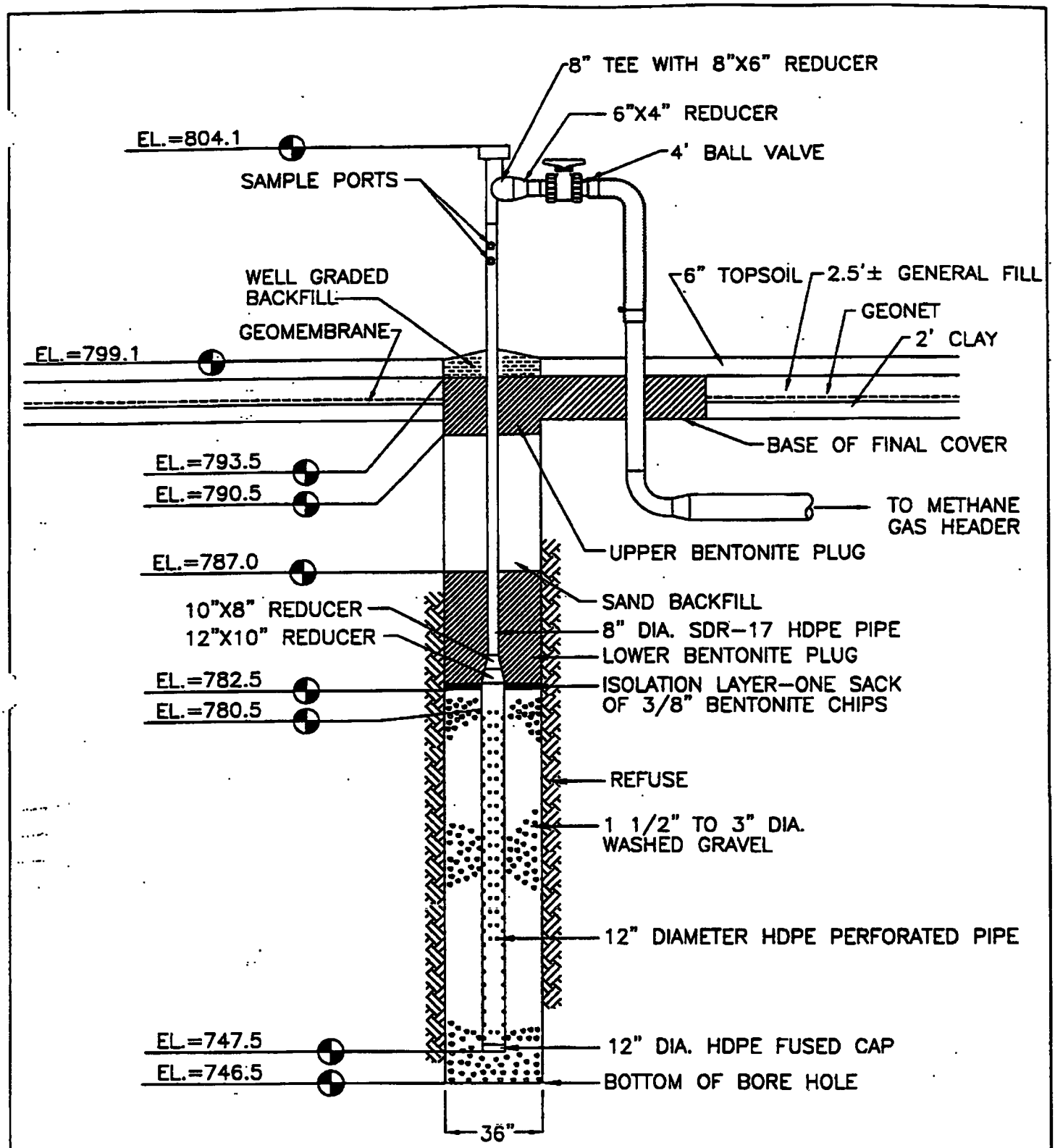
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-7		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		13

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Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-7	Surface Elevation:	799.1
Exact Location (Coordinates):	12078N 8892E	Total Depth:	52.6'
Installation Date:	2/5/97	Date Completed:	2/5/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	33.0'	Length of Solid Pipe:	23.6'

Depth	Material Drilled	Comments
0-6	0-4' Topsoil, 4' - 6.5' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 52.6'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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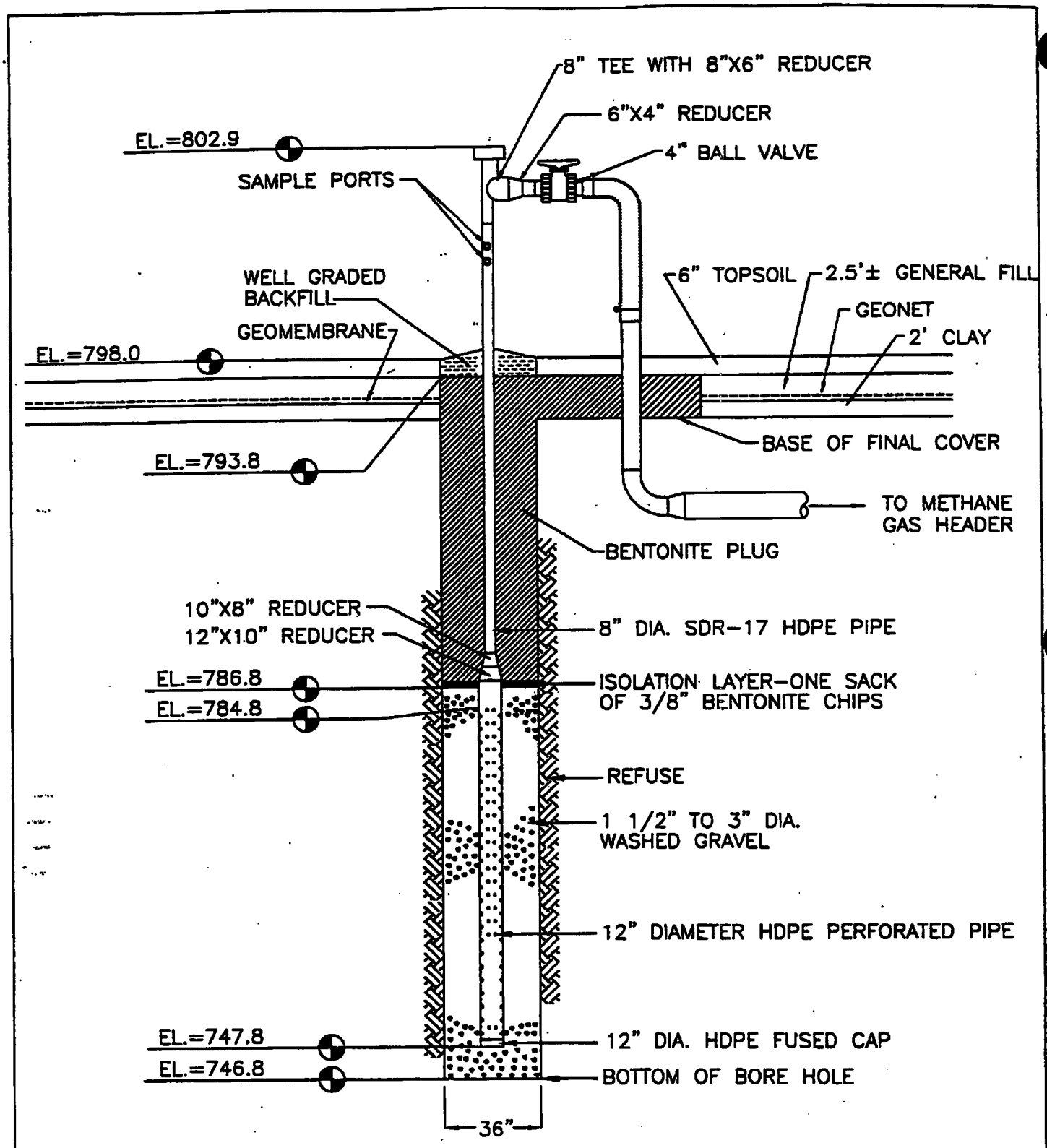
175-181		
182-188		
189-200		



Extraction Well No. EW-8		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		15

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2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-8	Surface Elevation:	798.0
Exact Location (Coordinates):	11913N 8884E	Total Depth:	51.2'
Installation Date:	2/5/97	Date Completed:	2/5/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	37.0'	Length of Solid Pipe:	18.1'

Depth	Material Drilled	Comments
0-6	0-2' Topsoil, 2'-10' Clay	
7-13	Refuse	Dry
14-20		
21-27		Wet 26 ft.
28-34		
35-41		87° @ 40'
42-48		
49-55	End of Borehole @ 51.2'	Damp
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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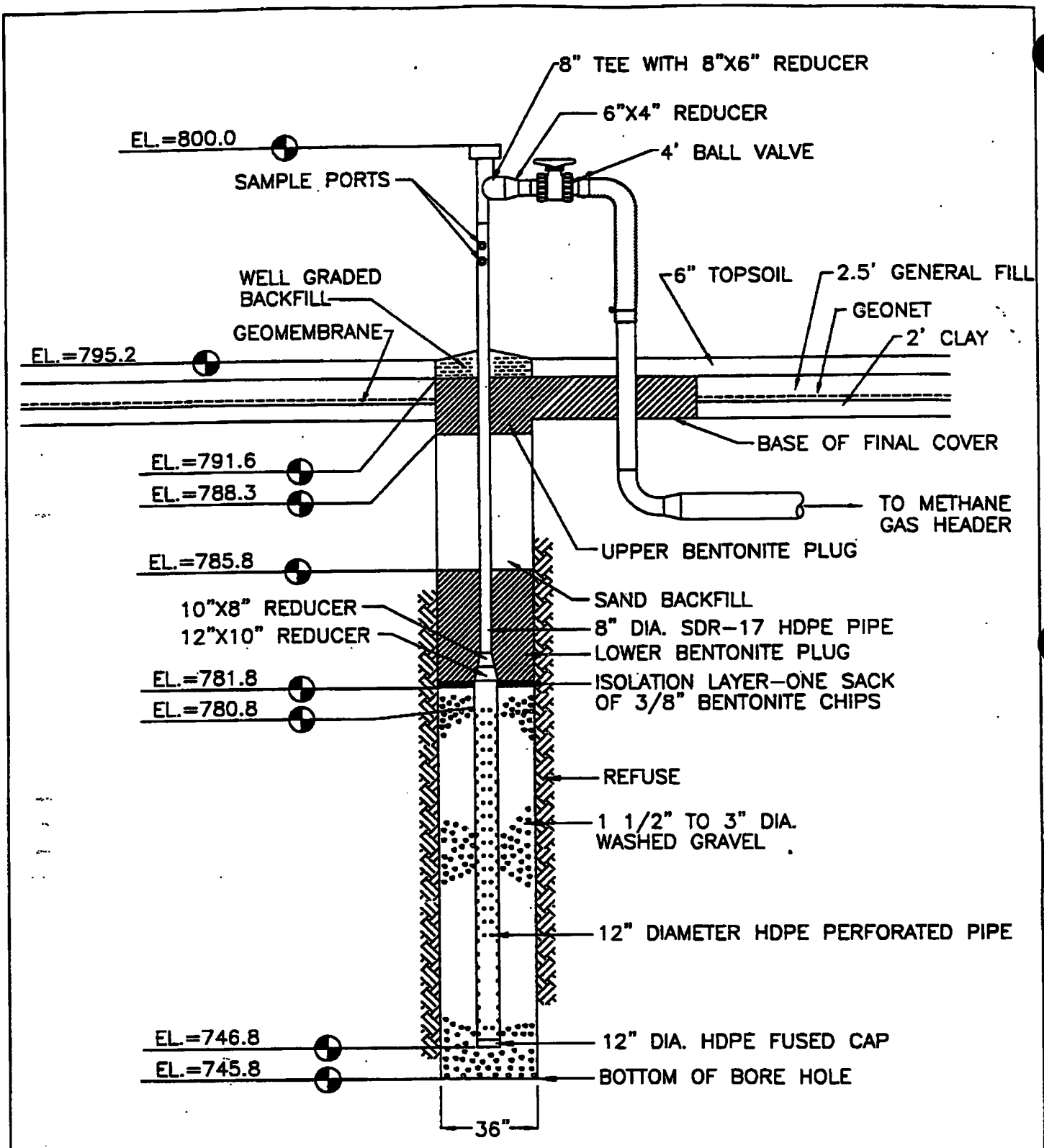
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-9		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		17

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2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-9	Surface Elevation:	795.2
Exact Location (Coordinates):	11720N 8871E	Total Depth:	49.4'
Installation Date:	2/5/97	Date Completed:	2/5/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	34.0'	Length of Solid Pipe:	19.2'

Depth	Material Drilled	Comments
0-6	0-3' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 49.4'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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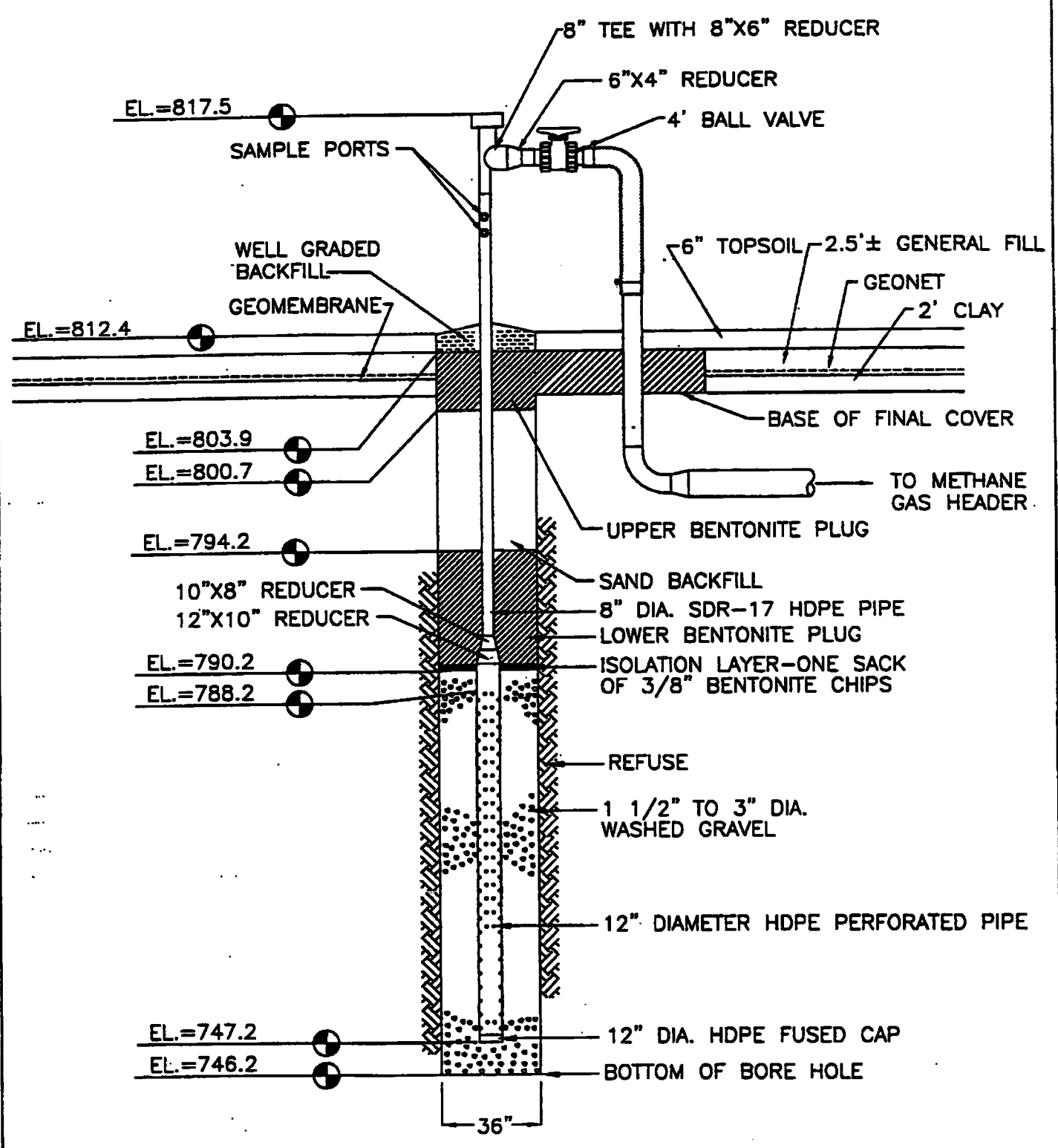
189-200		



Extraction Well No. EW-10

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 1A
Zion, Illinois

CQM, Inc.

CQM, Inc.
2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-10	Surface Elevation:	812.4
Exact Location (Coordinates):	11726N 9245E	Total Depth:	66.2'
Installation Date:	2/5/97	Date Completed:	2/5/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	41.0'	Length of Solid Pipe:	29.3'

Depth	Material Drilled	Comments
0-6	0-2' Clay	
7-13	Refuse	
14-20		Wet 15' / Liquid
21-27		
28-34		
35-41		
42-48		
49-55		
56-62		
63-69	End of Borehole @ 66.2'	Wet
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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140-146		
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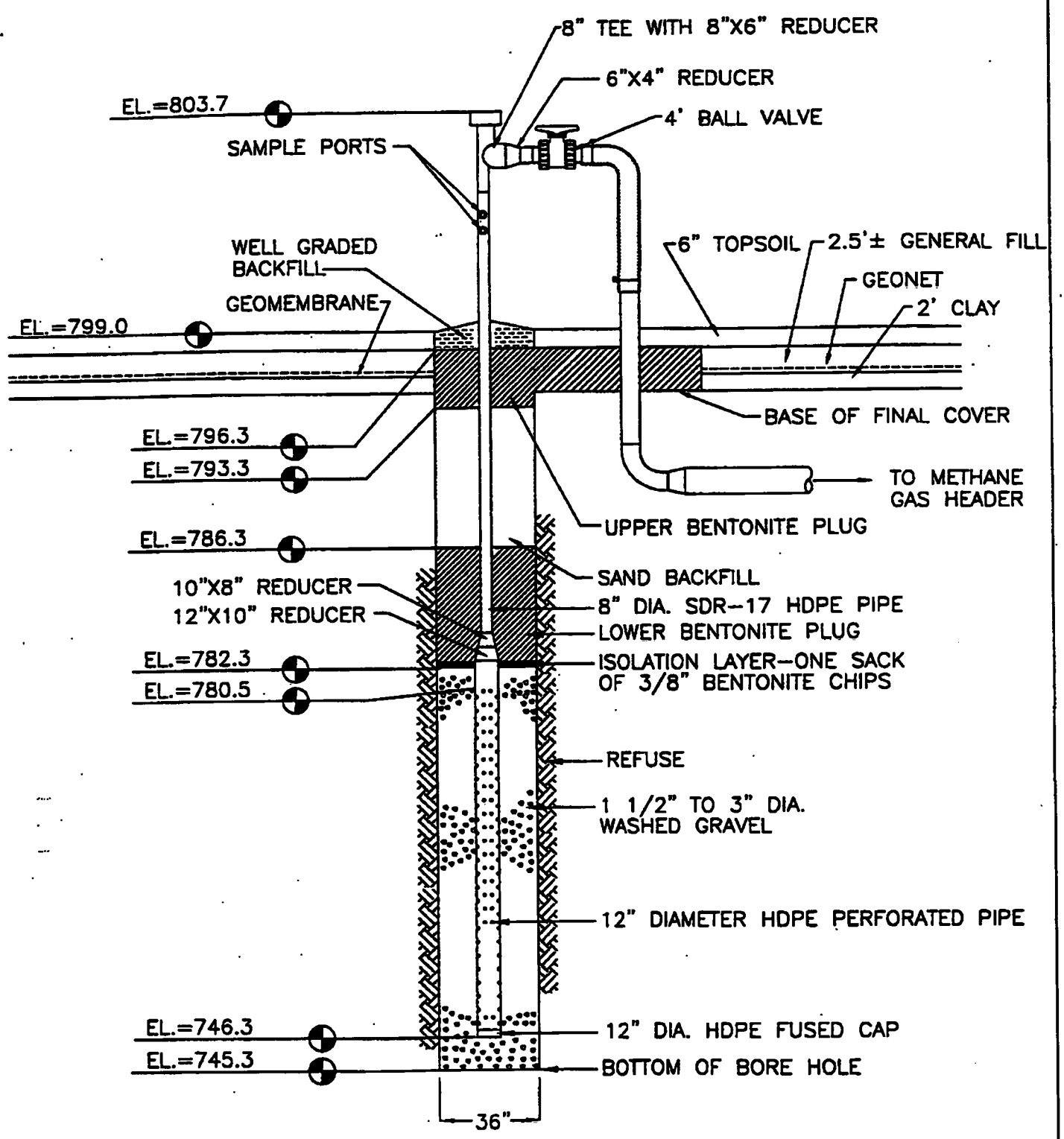
182-188		
189-200		



Extraction Well No. EW-11		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		

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2778 Manitowoc Road - Suite A
Green Bay, WI 54311
(414) 465-3911

Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-11	Surface Elevation:	799.0
Exact Location (Coordinates):	11577N 8869E	Total Depth:	53.7'
Installation Date:	2/5/97	Date Completed:	2/5/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	34.2'	Length of Solid Pipe:	23.2'

Depth	Material Drilled	Comments
0-6	0-3' Clay	
7-13	Clay/dirt	Dry
14-20		
21-27	Refuse (paper, plastic, and wood) @ 27'	
28-34		
35-41		
42-48		
49-55	End of Borehole @ 53.7'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
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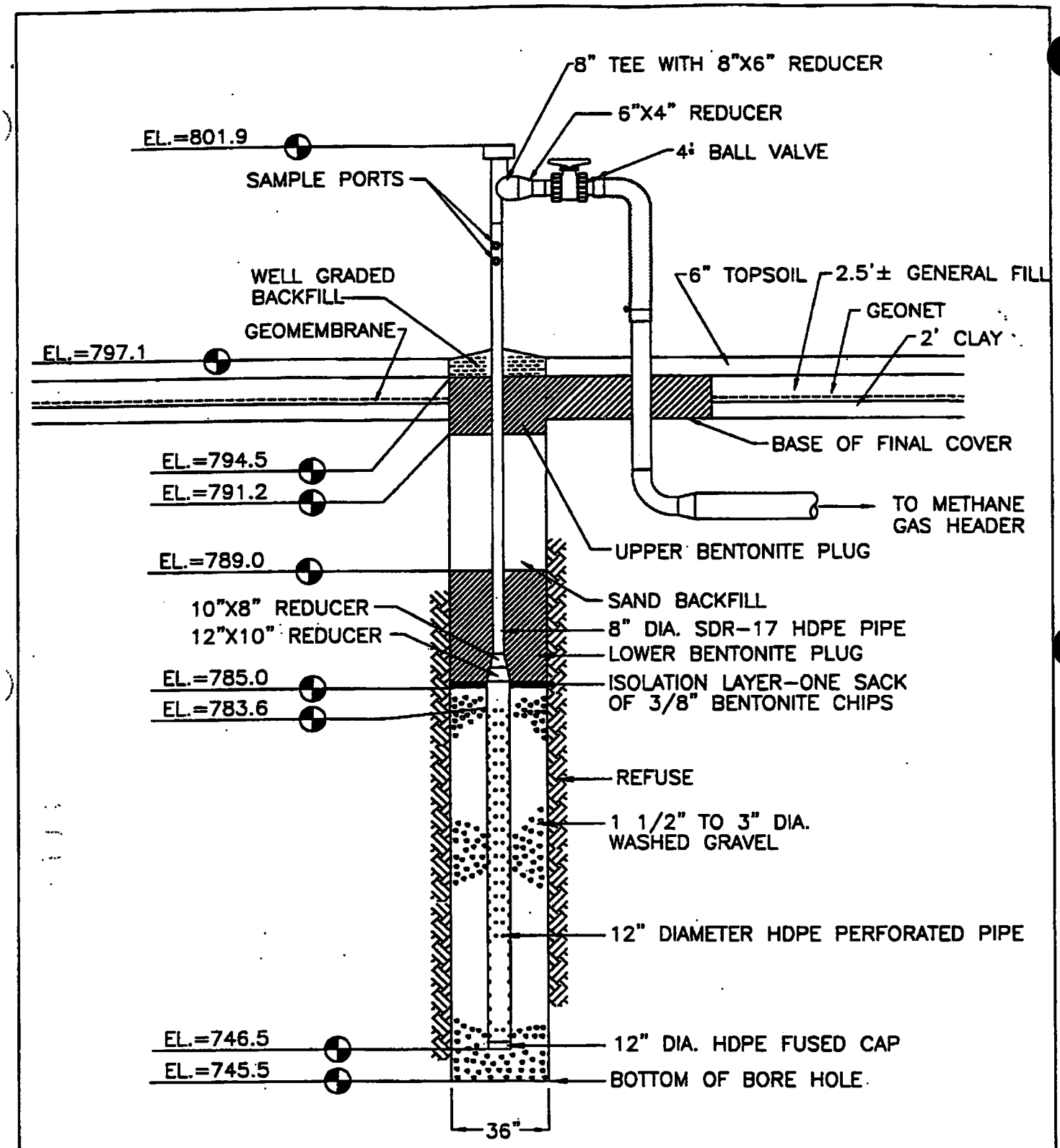
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-12

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 1A
Zion, Illinois

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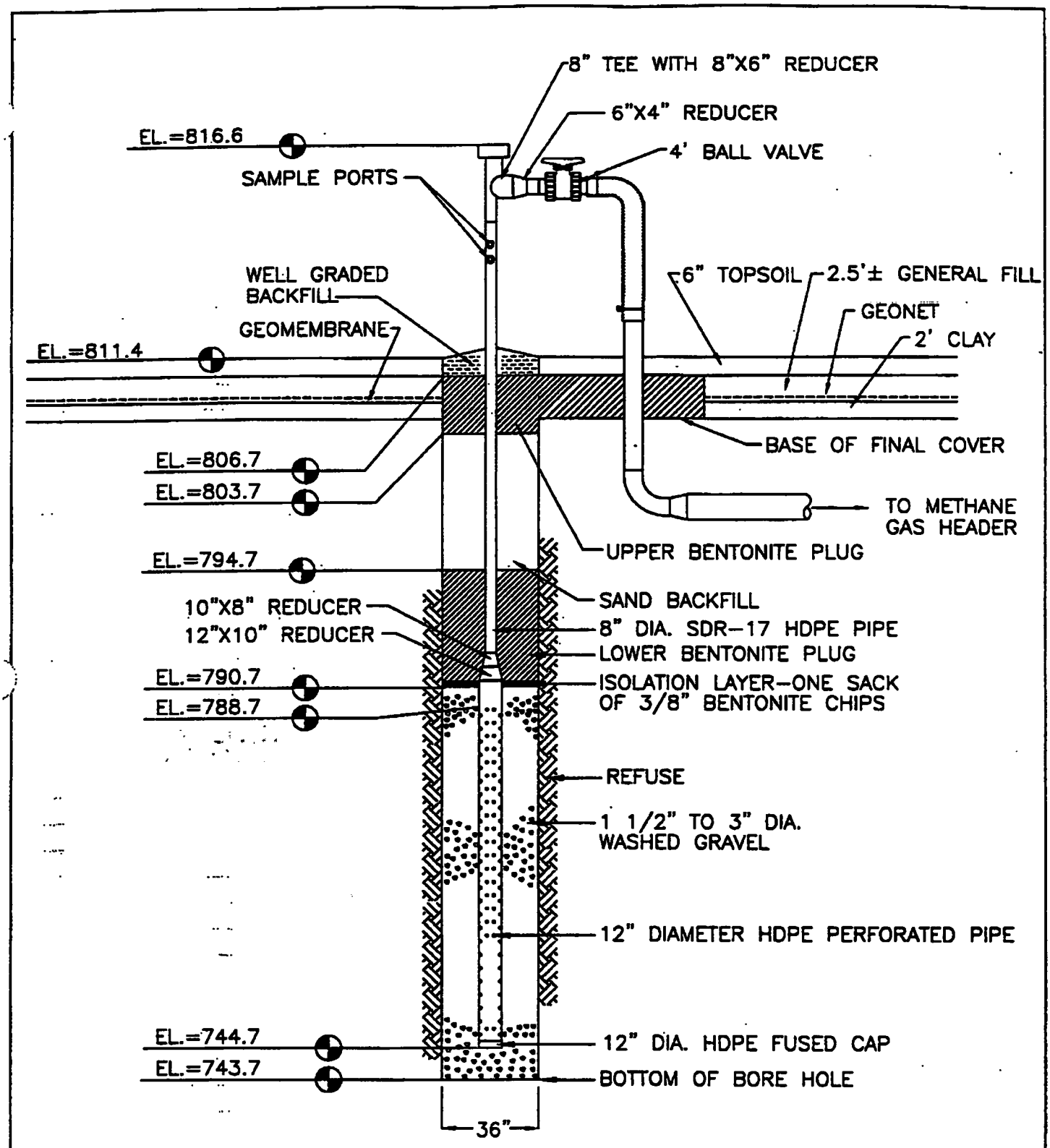
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-12	Surface Elevation:	797.1
Exact Location (Coordinates):	11430N 8851E	Total Depth:	51.6'
Installation Date:	2/6/97	Date Completed:	2/6/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	37.1'	Length of Solid Pipe:	18.3'

Depth	Material Drilled	Comments
0-6	0-2.5' Clay 2.5'-7' Clay/Refuse	
7-13	Refuse	Black/Damp
14-20		
21-27		
28-34		
35-41		Wet @ 35'
42-48		
49-55	End of Borehole @ 51.6'	Wet
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-13		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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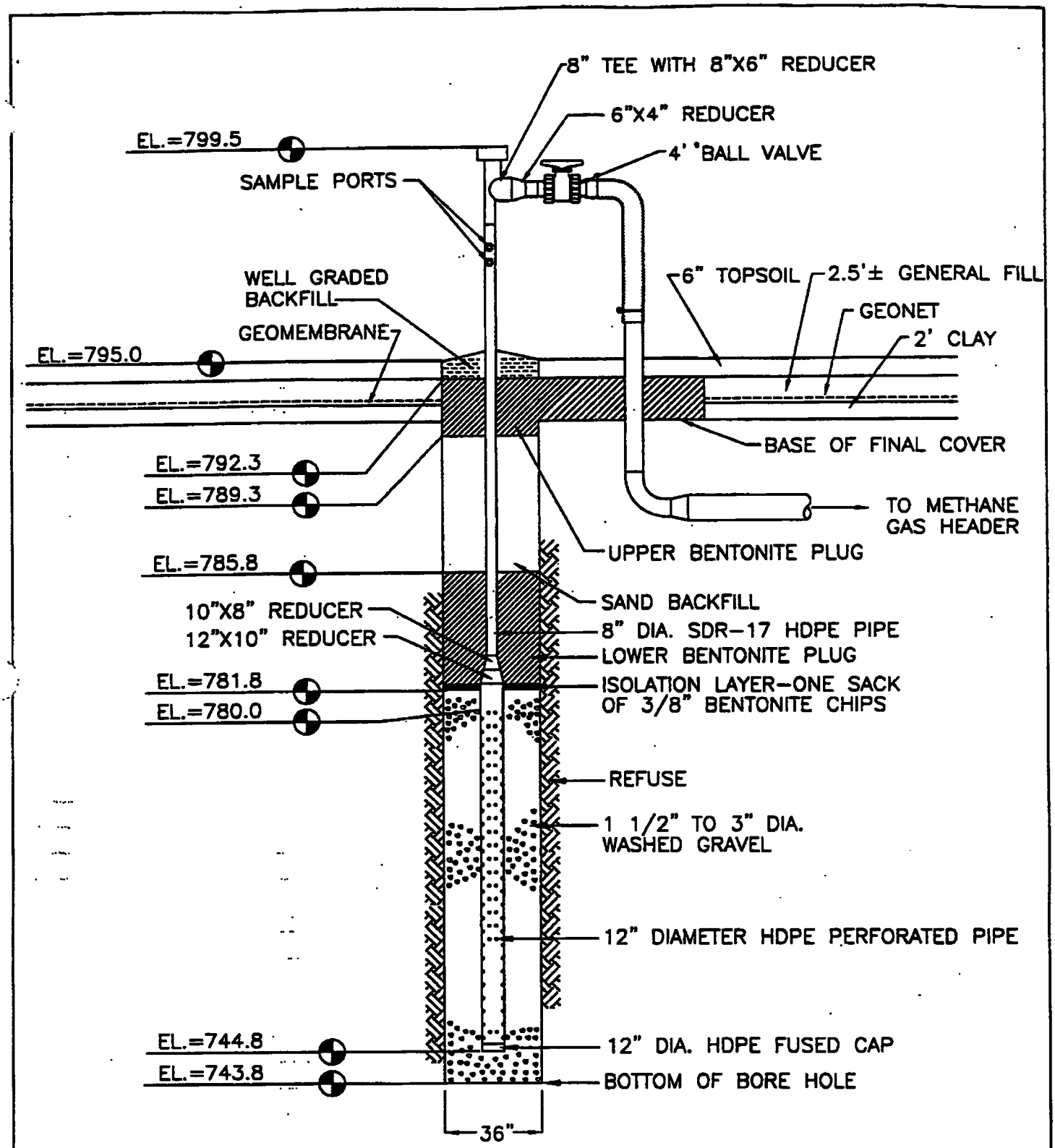
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-13	Surface Elevation:	811.4
Exact Location (Coordinates):	11427N 9169E	Total Depth:	67.7'
Installation Date:	2/6/97	Date Completed:	2/6/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	44.0'	Length of Solid Pipe:	27.9'

Depth	Material Drilled	Comments
0-6	0-3' Clay 3'-7' Clay/Refuse	
7-13	Sludge/Clay	Damp
14-20	Refuse (paper, plastic, and wood)	
21-27		
28-34		
35-41		
42-48		Wet @ 48'
49-55		
56-62		
63-69	End of Borehole @ 67.7'	Wet
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-14		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-14	Surface Elevation:	795.0
Exact Location (Coordinates):	11225N 8837E	Total Depth:	51.2'
Installation Date:	2/6/97	Date Completed:	2/6/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	35.2'	Length of Solid Pipe:	19.5'

Depth	Material Drilled	Comments
0-6	0-3' Clay 3'-9' Clay/Refuse	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 51.2'	Damp
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
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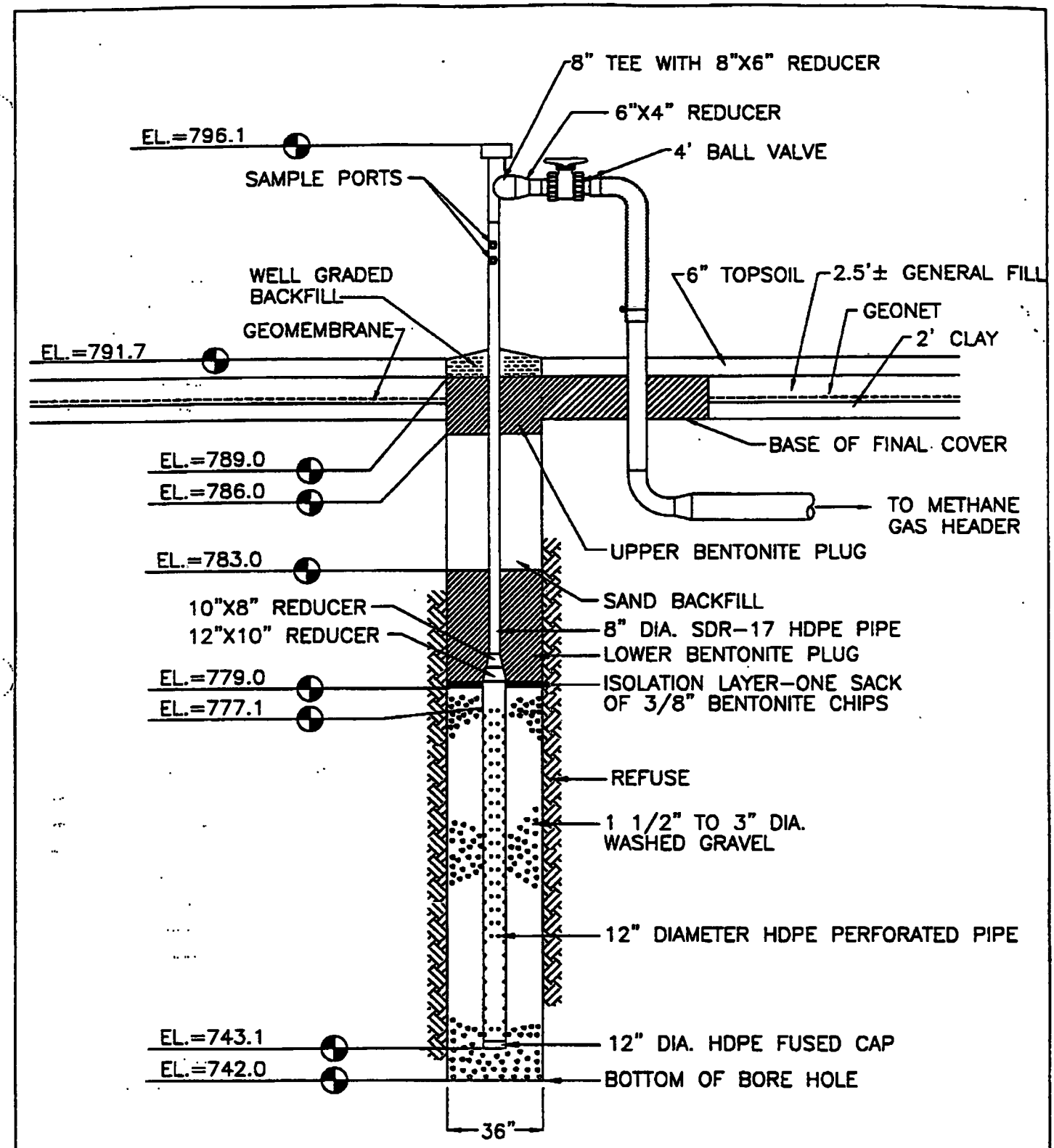
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-15		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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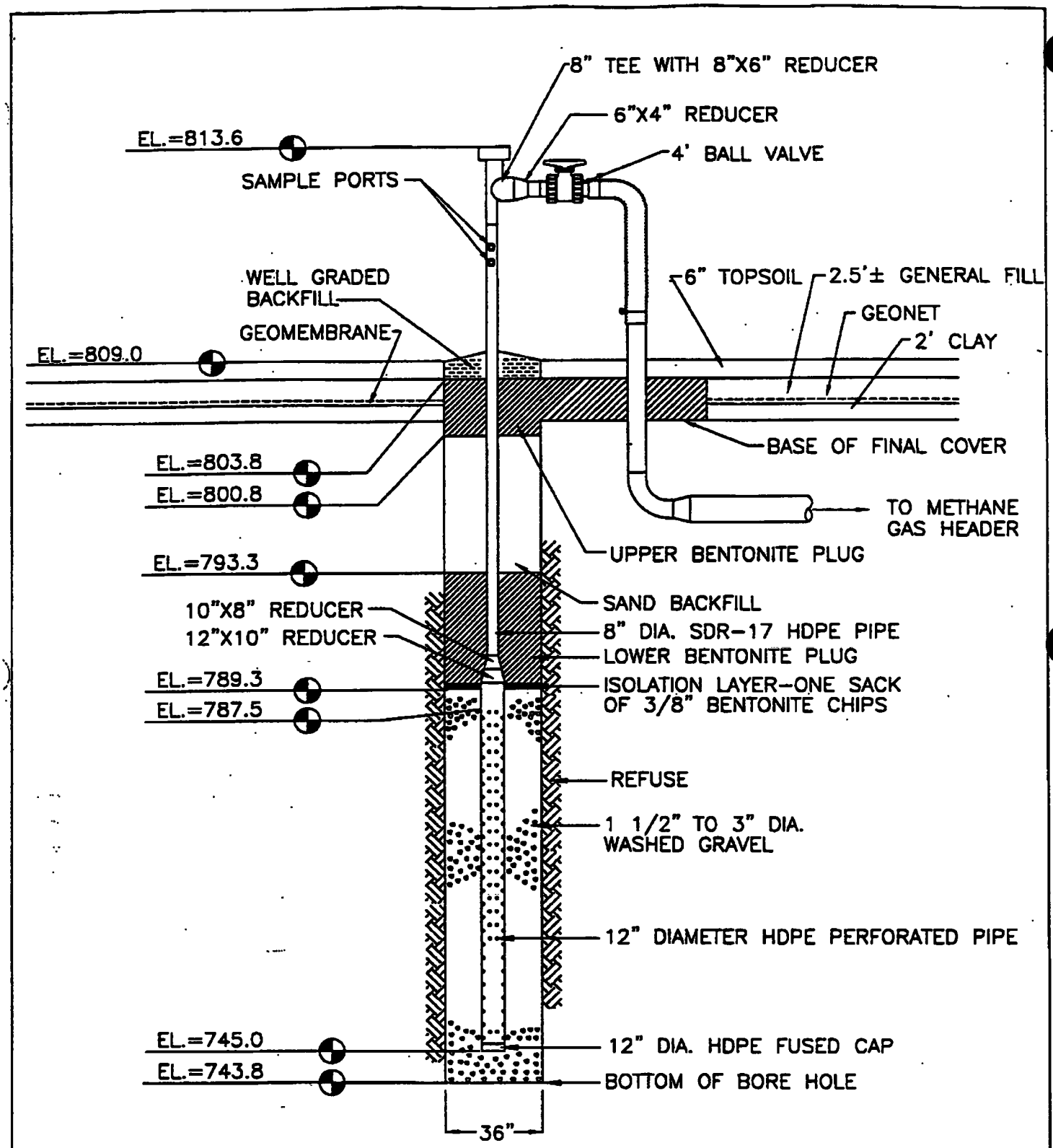
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-15	Surface Elevation:	791.7
Exact Location (Coordinates):	11054N 8814E	Total Depth:	49.7'
Installation Date:	2/6/97	Date Completed:	2/6/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	34.0'	Length of Solid Pipe:	19.0'

Depth	Material Drilled	Comments
0-6	0-3' Clay 3'-7' Clay/Refuse	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 49.7'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-16		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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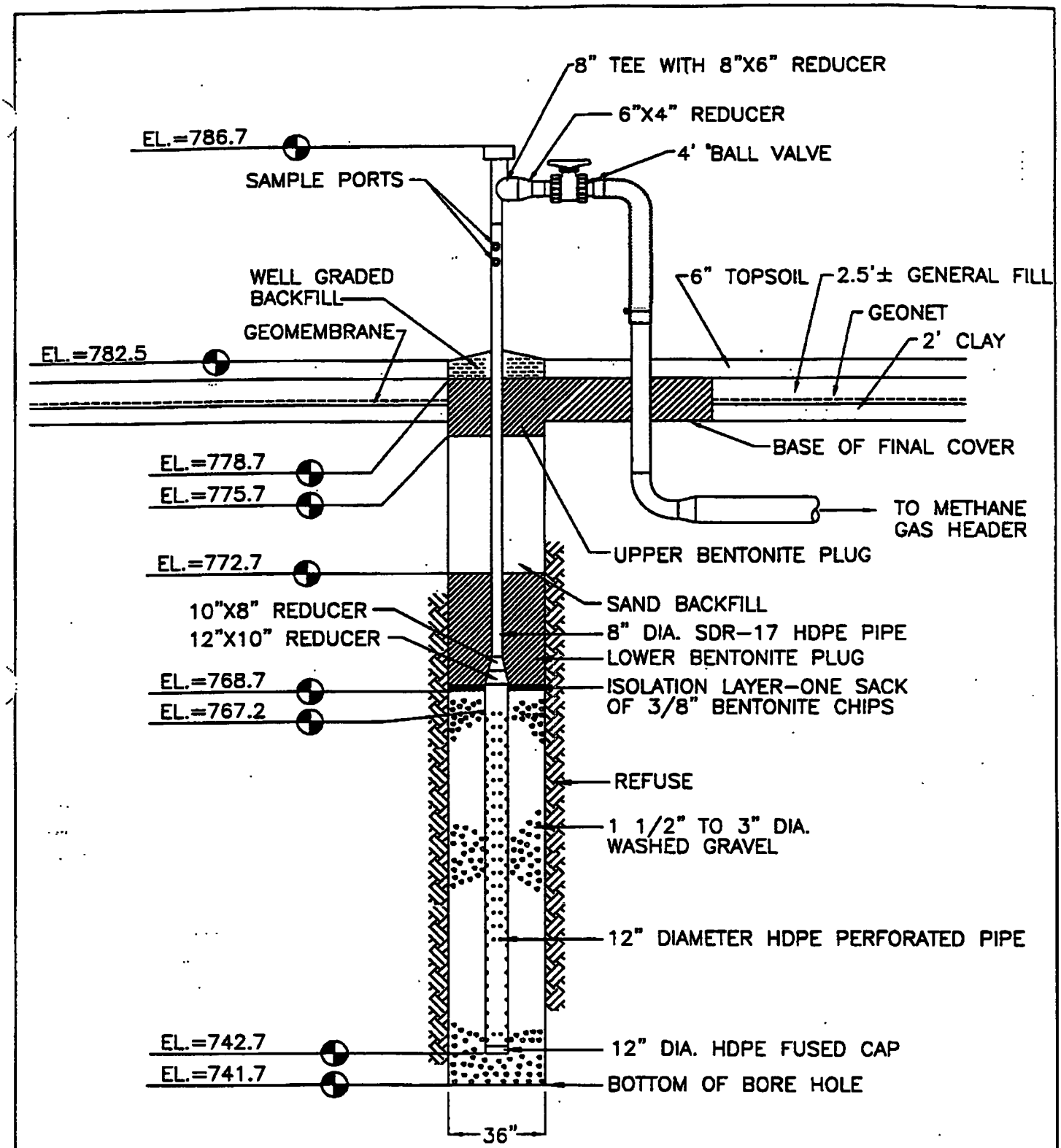
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-16	Surface Elevation:	809.0
Exact Location (Coordinates):	11171N 9075E	Total Depth:	65.2'
Installation Date:	2/6/97	Date Completed:	2/6/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	42.5	Length of Solid Pipe:	26.1'

Depth	Material Drilled	Comments
0-6	0-3.5' Clay	
7-13	Refuse	Black/Wet Refuse @ 8'
14-20		
21-27		Dryer/Damp
28-34		Wet/Black
35-41		
42-48		
49-55		
56-62		
63-69	End of Borehole @ 65.2'	Wet
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-17

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 1A
Zion, Illinois

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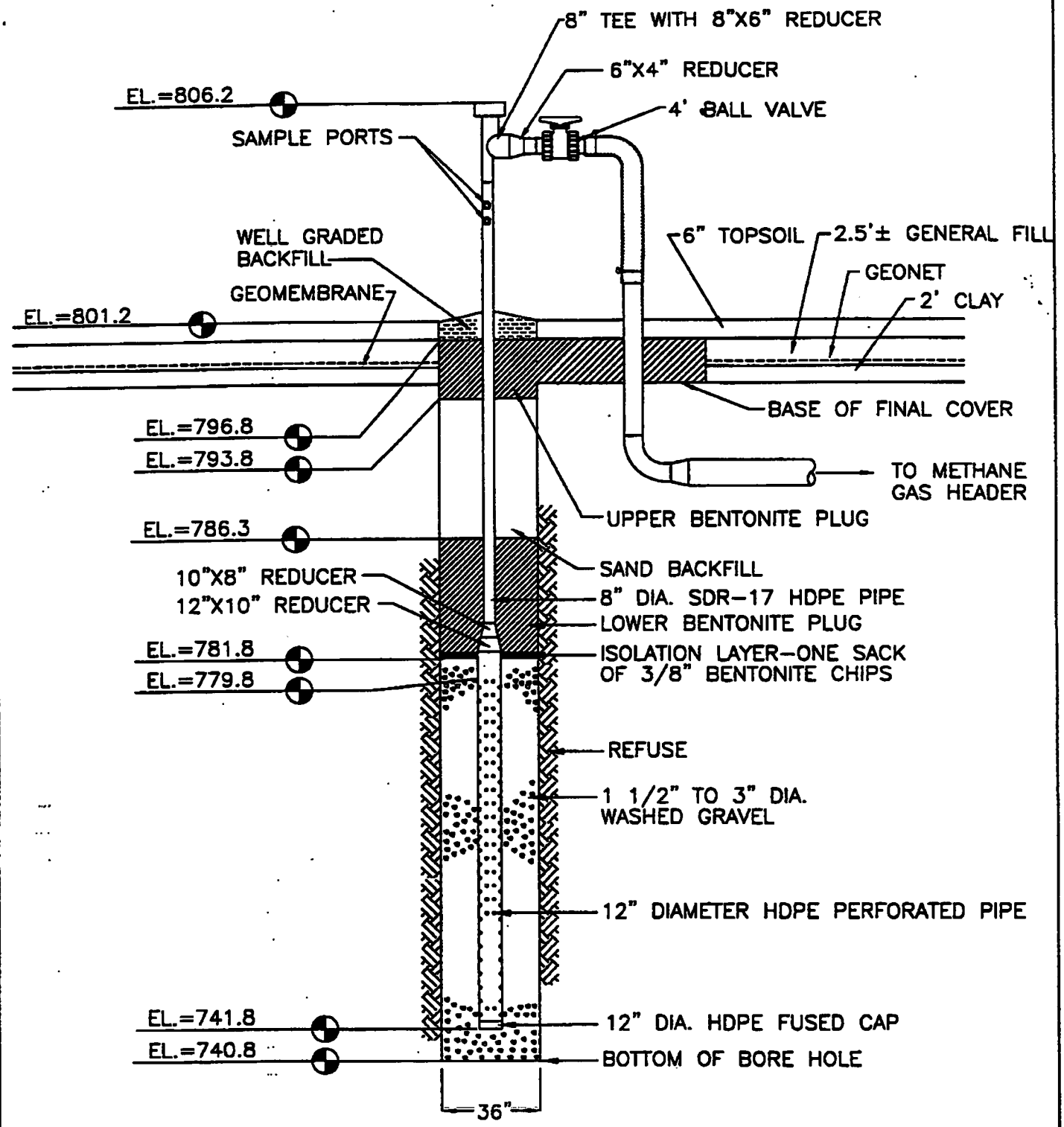
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-17	Surface Elevation:	782.5
Exact Location (Coordinates):	10865N 8801E	Total Depth:	40.8'
Installation Date:	2/7/97	Date Completed:	2/7/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	24.5'	Length of Solid Pipe:	19.5'

Depth	Material Drilled	Comments
0-6	0-3.5' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41	End of Borehole @ 40.8'	Dry
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-18		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-18	Surface Elevation:	801.2
Exact Location (Coordinates):	10825N 9077E	Total Depth:	60.4'
Installation Date:	2/10/97	Date Completed:	2/10/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	38.0'	Length of Solid Pipe:	26.4'

Depth	Material Drilled	Comments
0-6	0-3' Clay	
7-13	Refuse (paper, plastic, and wood)	Dry
14-20		
21-27		
28-34		
35-41		
42-48		Wet @ 45.0'
49-55		
56-62	End of Borehole @ 60.4'	Damp/Wet
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
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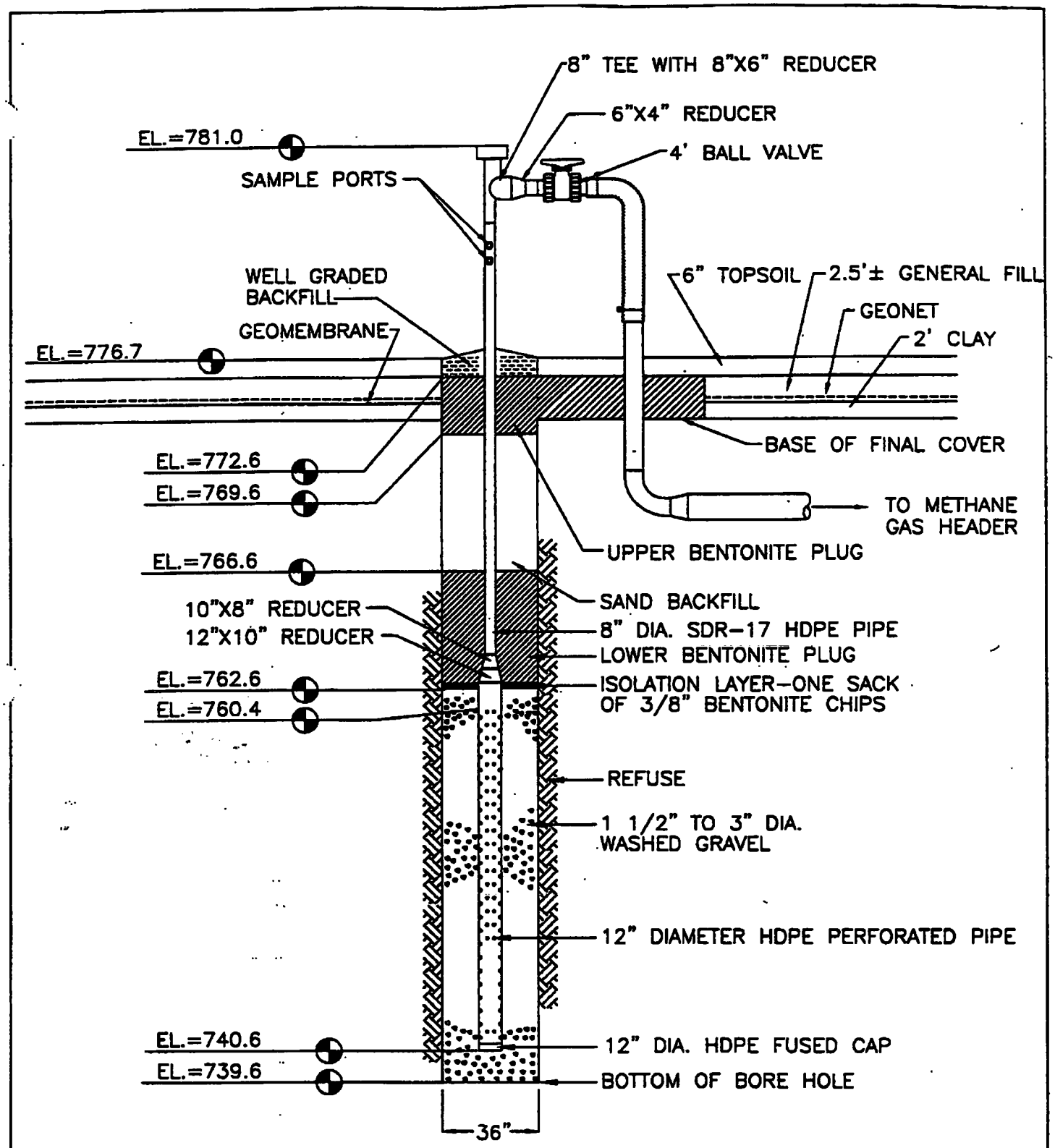
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-19		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		

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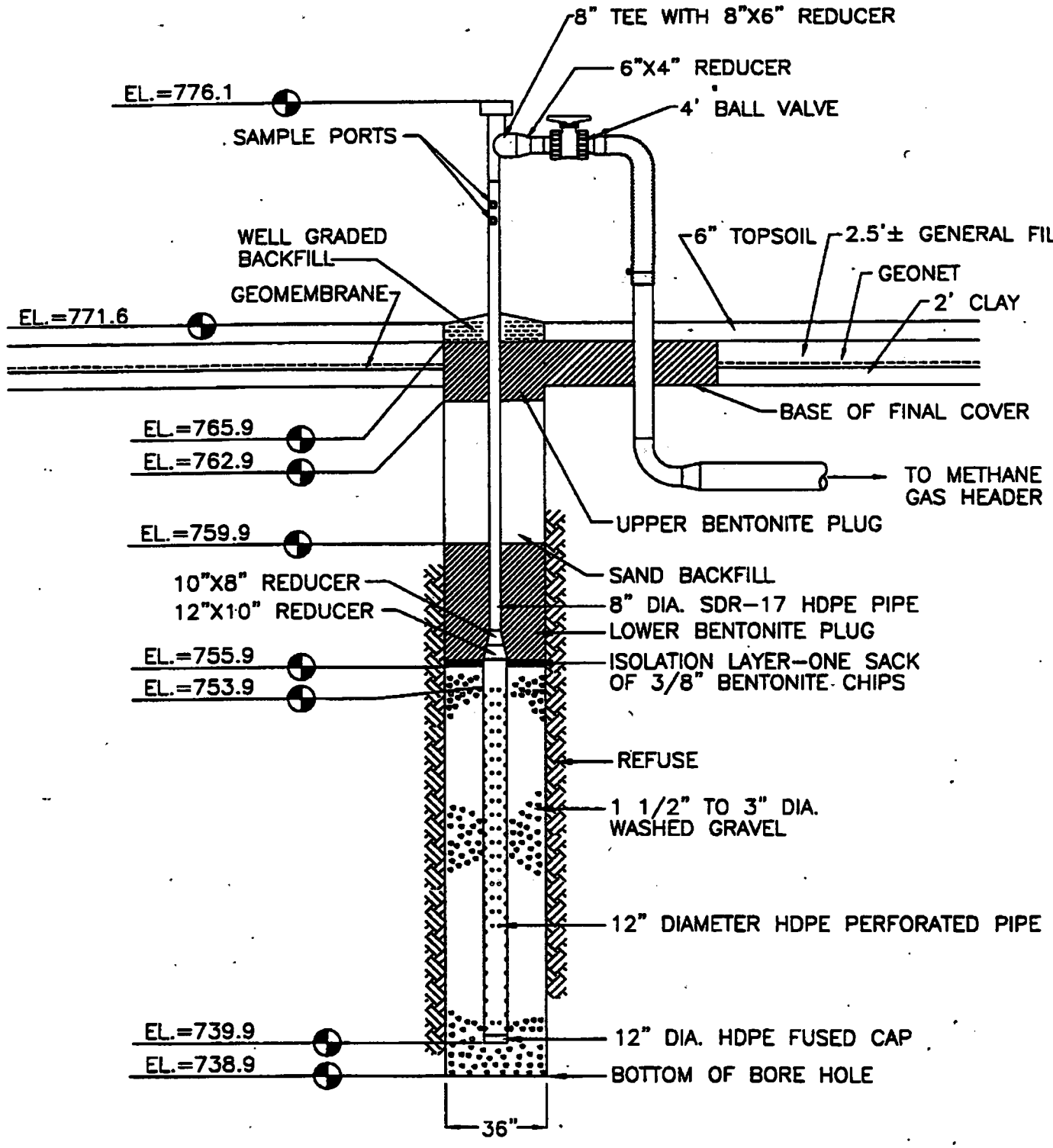
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-19	Surface Elevation:	776.7
Exact Location (Coordinates):	10662N 8813E	Total Depth:	37.1'
Installation Date:	2/10/97	Date Completed:	2/10/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	19.8'	Length of Solid Pipe:	20.6'

Depth	Material Drilled	Comments
0-6	0-3' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41	End of Borehole @ 37.1'	Dry
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-20		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		39

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-20	Surface Elevation:	771.6
Exact Location (Coordinates):	10466N 8823E	Total Depth:	32.7'
Installation Date:	2/10/97	Date Completed:	2/10/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	14.0'	Length of Solid Pipe:	22.2'

Depth	Material Drilled	Comments
0-6	0-1' Topsoil, 1'-5' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34	End of Borehole @ 32.7'	
35-41		
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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140-146		
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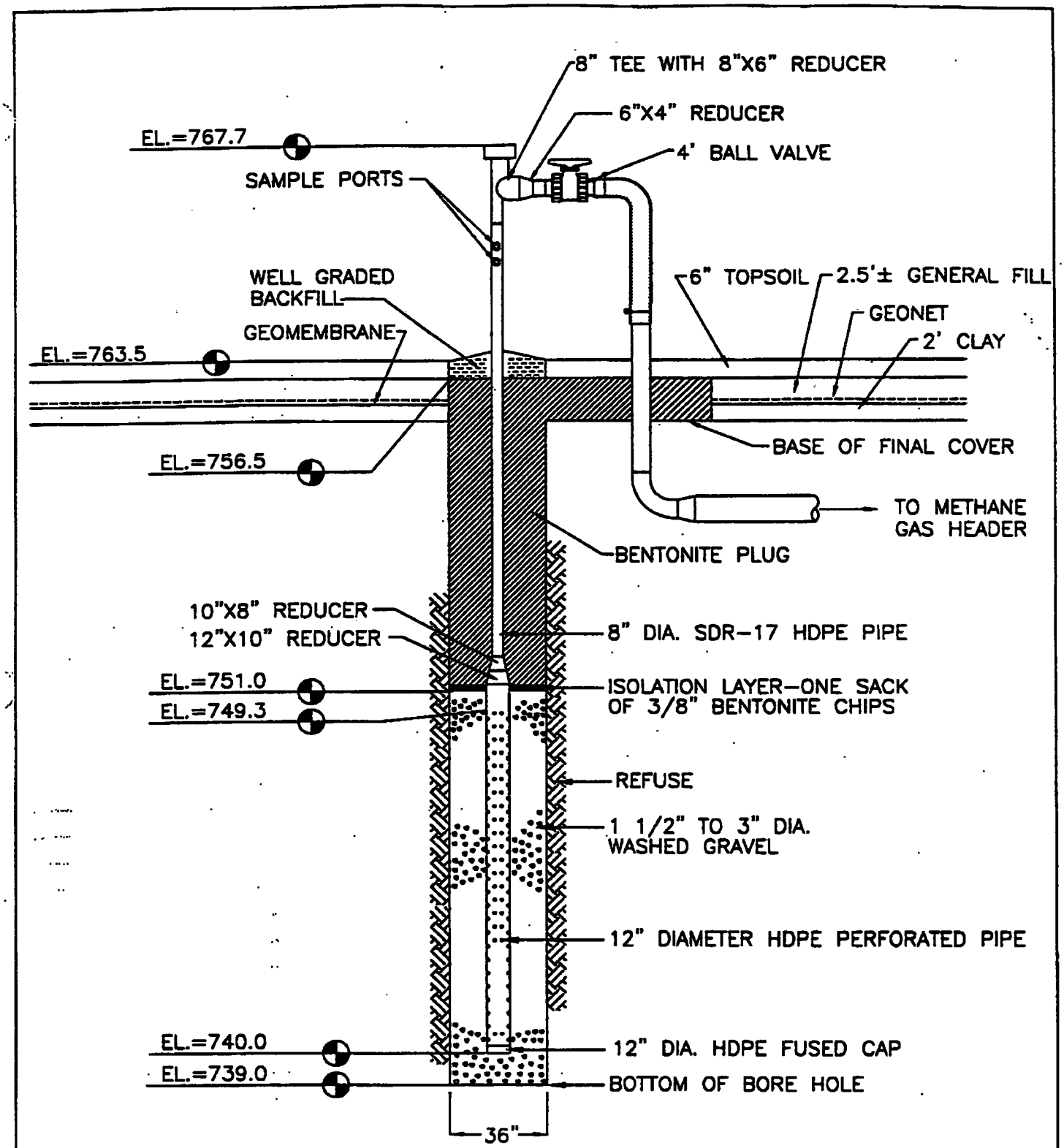
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-21		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-21	Surface Elevation:	763.5
Exact Location (Coordinates):	10293N 8794E	Total Depth:	24.5'
Installation Date:	2/10/97	Date Completed:	2/10/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	9.3	Length of Solid Pipe:	18.4'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-3.5' Clay	
7-13	Refuse	Wet
14-20		
21-27	End of Borehole @ 24.5'	Wet
28-34		
35-41		
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
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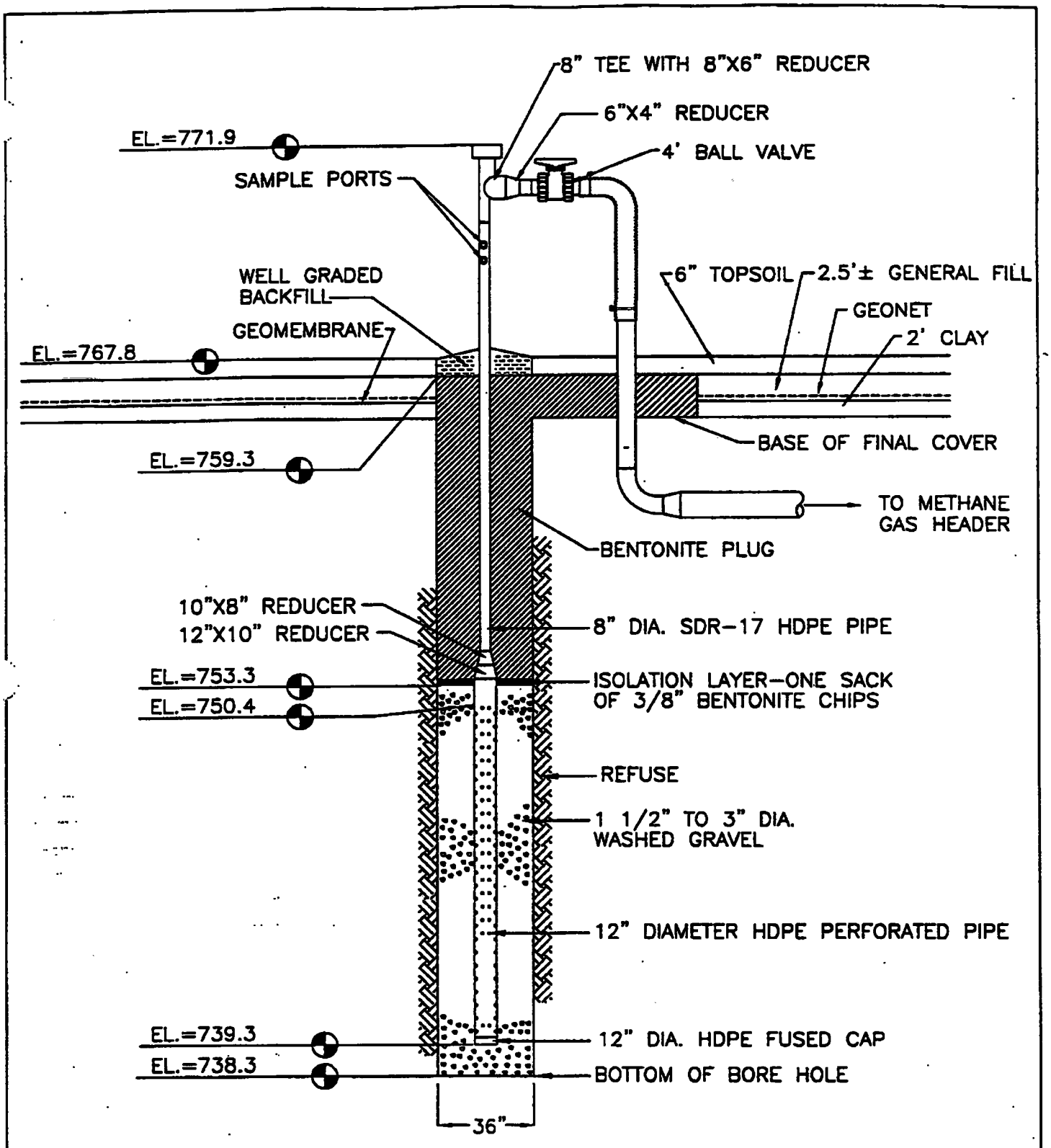
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-22		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-22	Surface Elevation:	767.8
Exact Location (Coordinates):	10281N 8992E	Total Depth:	29.5'
Installation Date:	2/10/97	Date Completed:	2/10/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	11.1	Length of Solid Pipe:	21.5'

Depth	Material Drilled	Comments
0-6	0-3' Topsoil, 3'-7' Clay	
7-13		Dry
14-20		
21-27		
28-34	End of Borehole @ 29.5'	Dry
35-41		
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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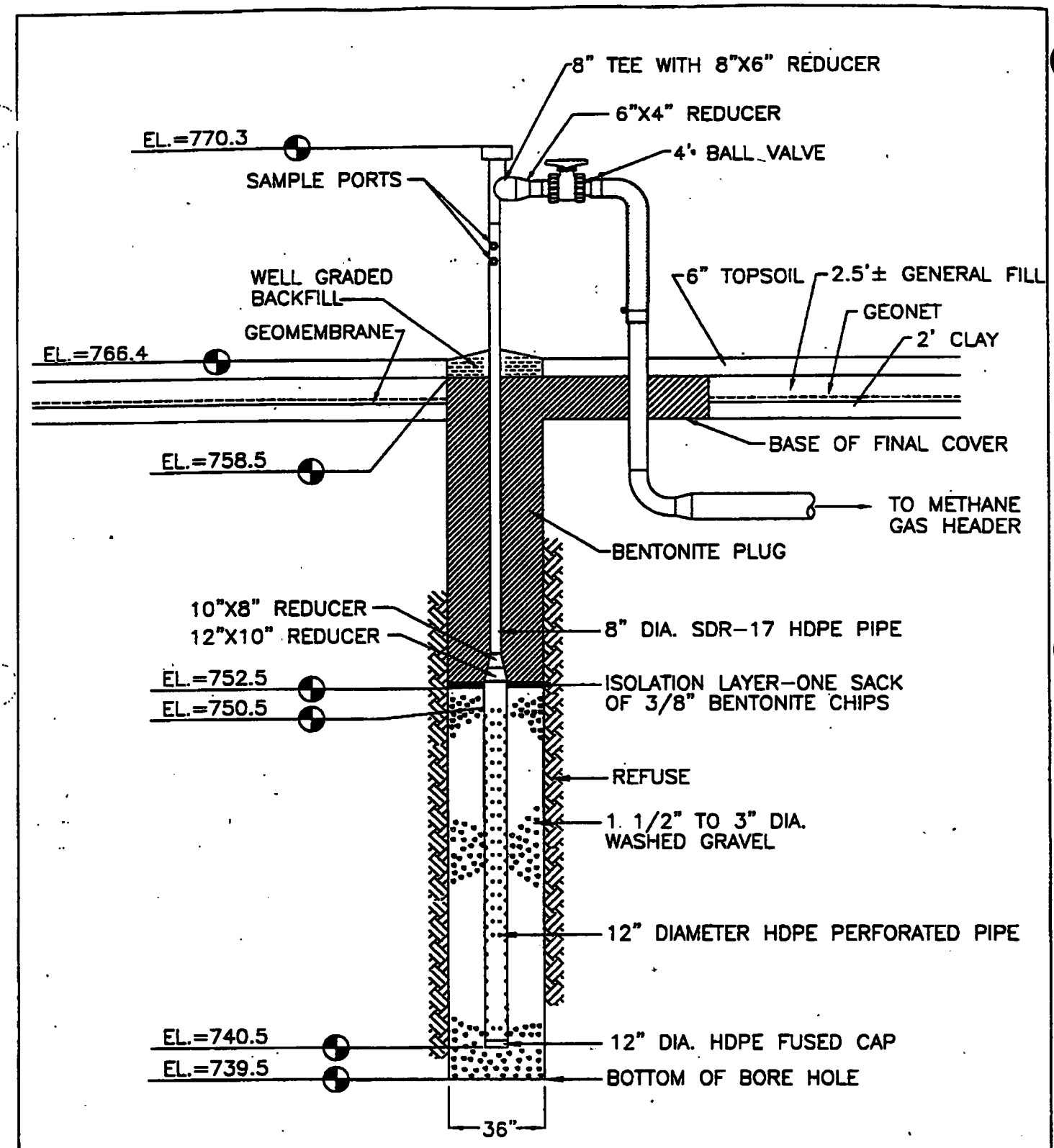
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-23		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-23	Surface Elevation:	766.4
Exact Location (Coordinates):	10253N 9175E	Total Depth:	26.9'
Installation Date:	2/10/97	Date Completed:	2/10/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	10.0'	Length of Solid Pipe:	19.8'

Depth	Material Drilled	Comments
0-6	0-3' Topsoil, 3'-8' Clay	
7-13	Refuse	
14-20		
21-27	End of Borehole @ 26.9'	Dry
28-34		
35-41		
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
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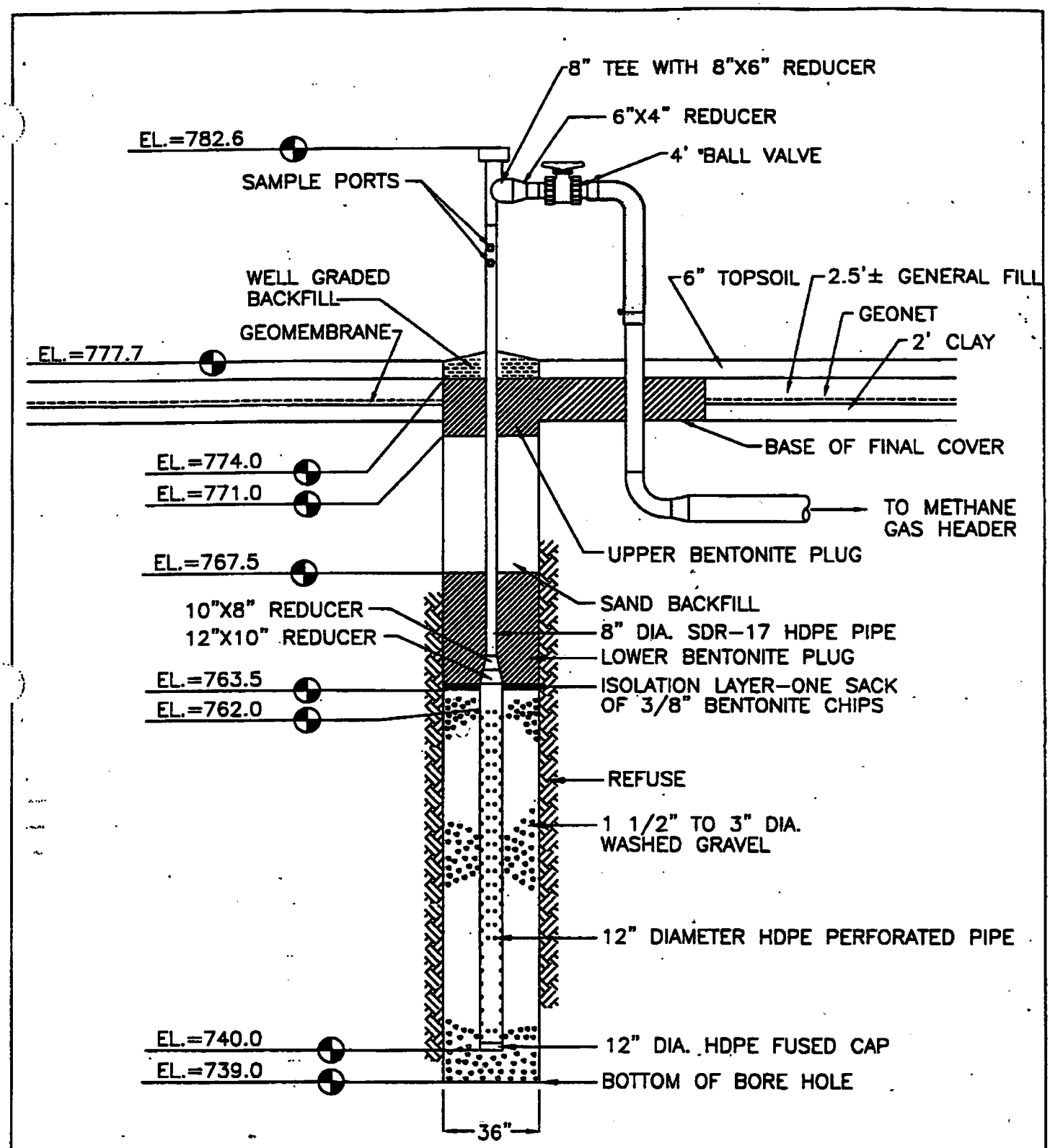
189-200		



Extraction Well No. EW-24

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 1A
Zion, Illinois

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-24	Surface Elevation:	777.7
Exact Location (Coordinates):	10446N 9176E	Total Depth:	38.7'
Installation Date:	2/11/97	Date Completed:	2/11/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	22.0'	Length of Solid Pipe:	20.6'

Depth	Material Drilled	Comments
0-6	0-6.5' Clay	
7-13	Refuse/Clay	Dry
14-20		
21-27		
28-34		
35-41	End of Borehole @ 38.7'	Dry
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
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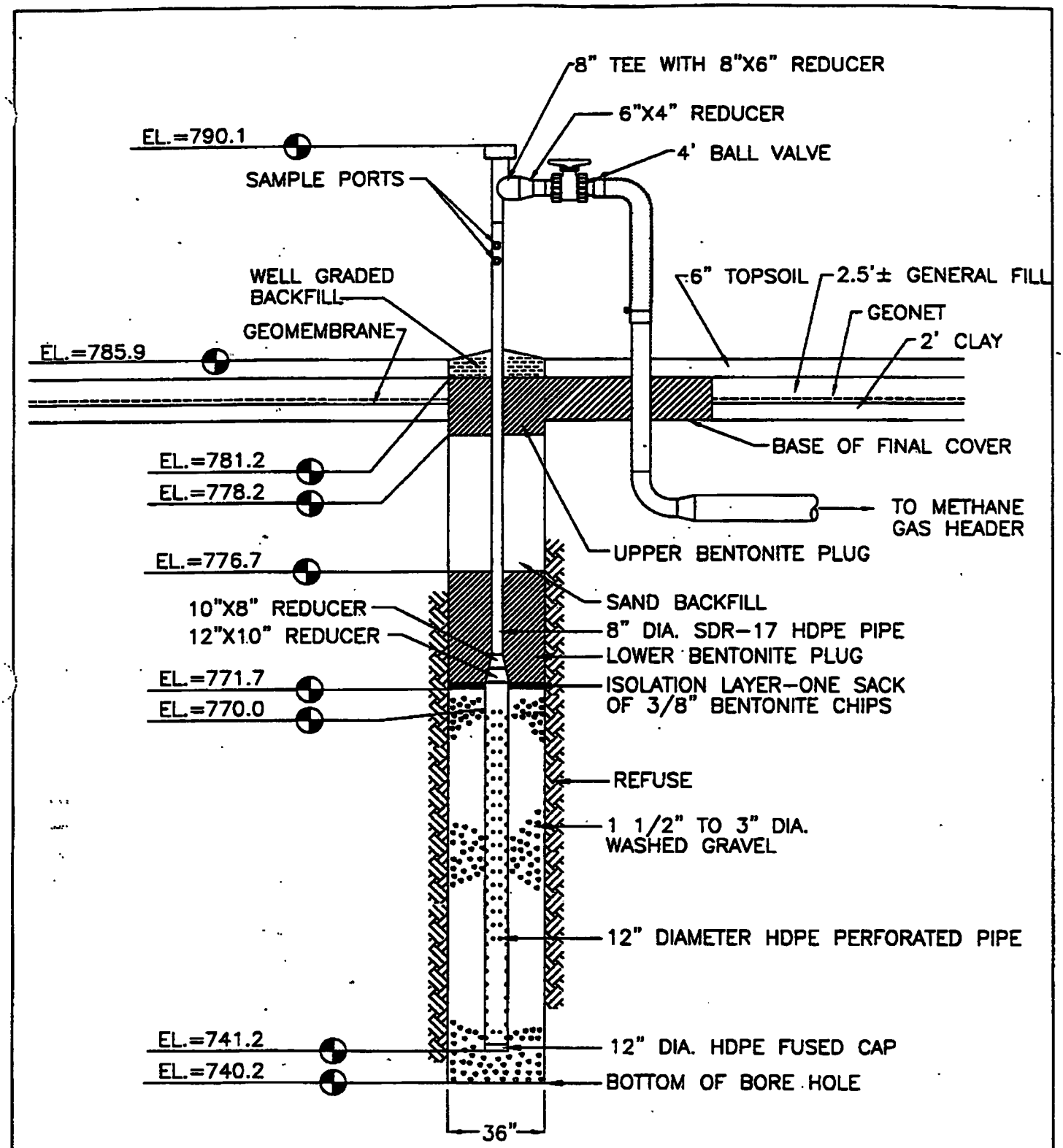
182-188		
189-200		



Extraction Well No. EW-25

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 1A
Zion, Illinois

CQM, Inc.

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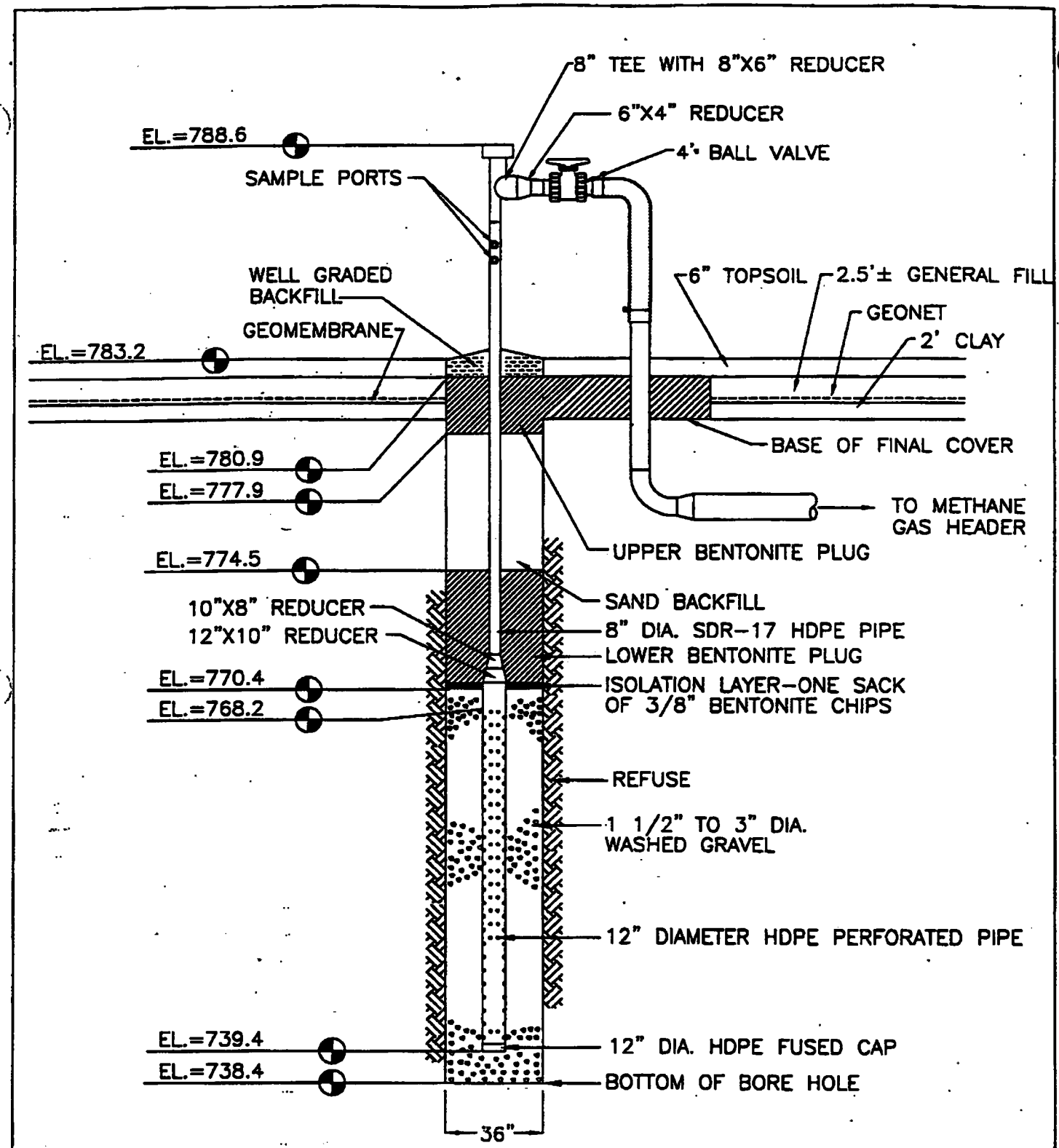
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-25	Surface Elevation:	785.9
Exact Location (Coordinates):	10551N 9011E	Total Depth:	45.7'
Installation Date:	2/11/97	Date Completed:	2/11/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	28.8'	Length of Solid Pipe:	20.1'

Depth	Material Drilled	Comments
0-6	0'-4' Clay	
7-13	Refuse/Clay	
14-20	(paper, plastic, and wood)	Dry
21-27		
28-34		
35-41		
42-48	End of Borehole @ 45.7'	Dry
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-26		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
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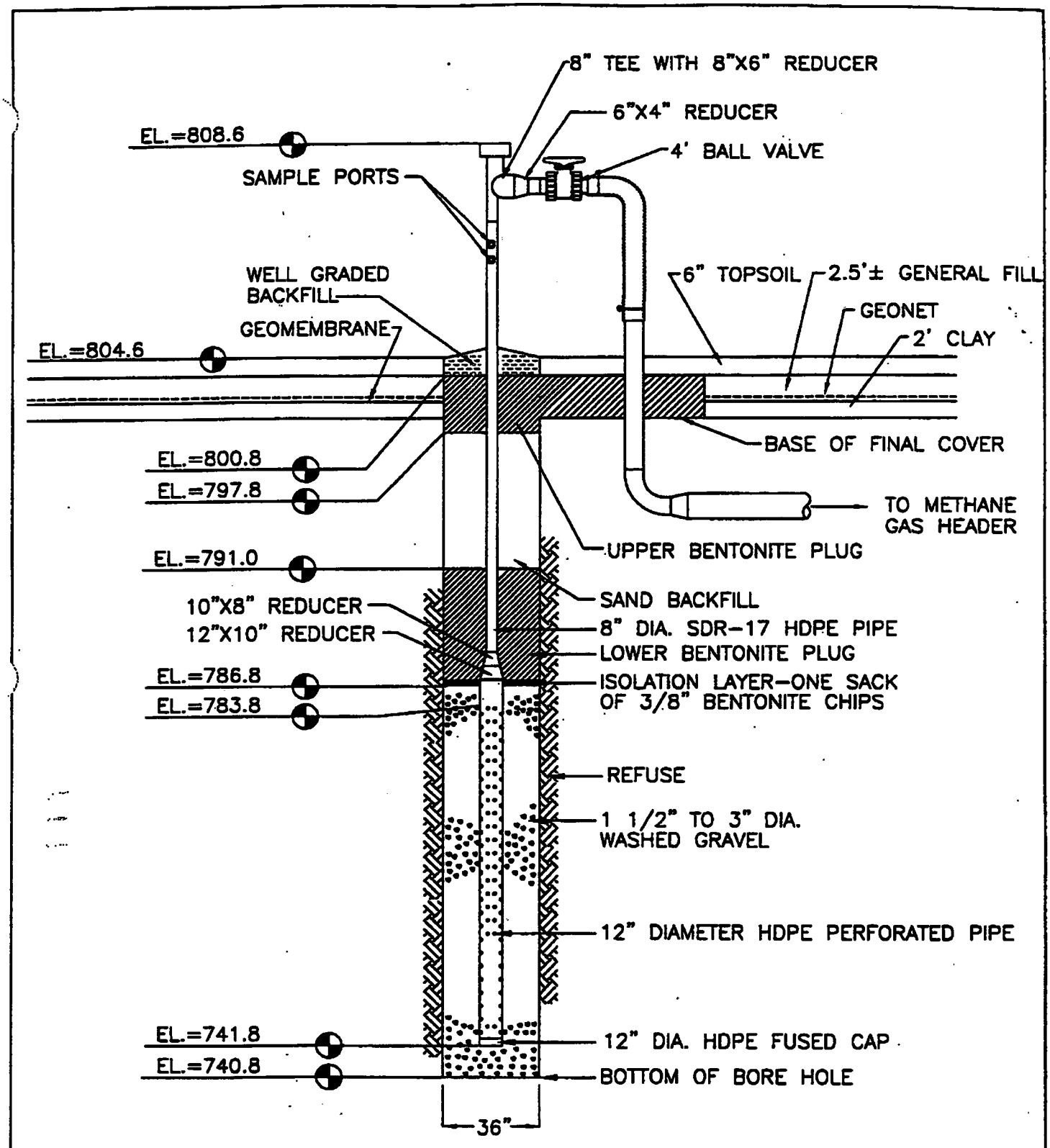
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-26	Surface Elevation:	783.2
Exact Location (Coordinates):	10580N 9312E	Total Depth:	44.8'
Installation Date:	2/11/97	Date Completed:	2/11/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	28.8'	Length of Solid Pipe:	20.4'

Depth	Material Drilled	Comments
0-6	0-6' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48	End of Borehole @ 44.8'	Dry
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-27

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 1A
Zion, Illinois

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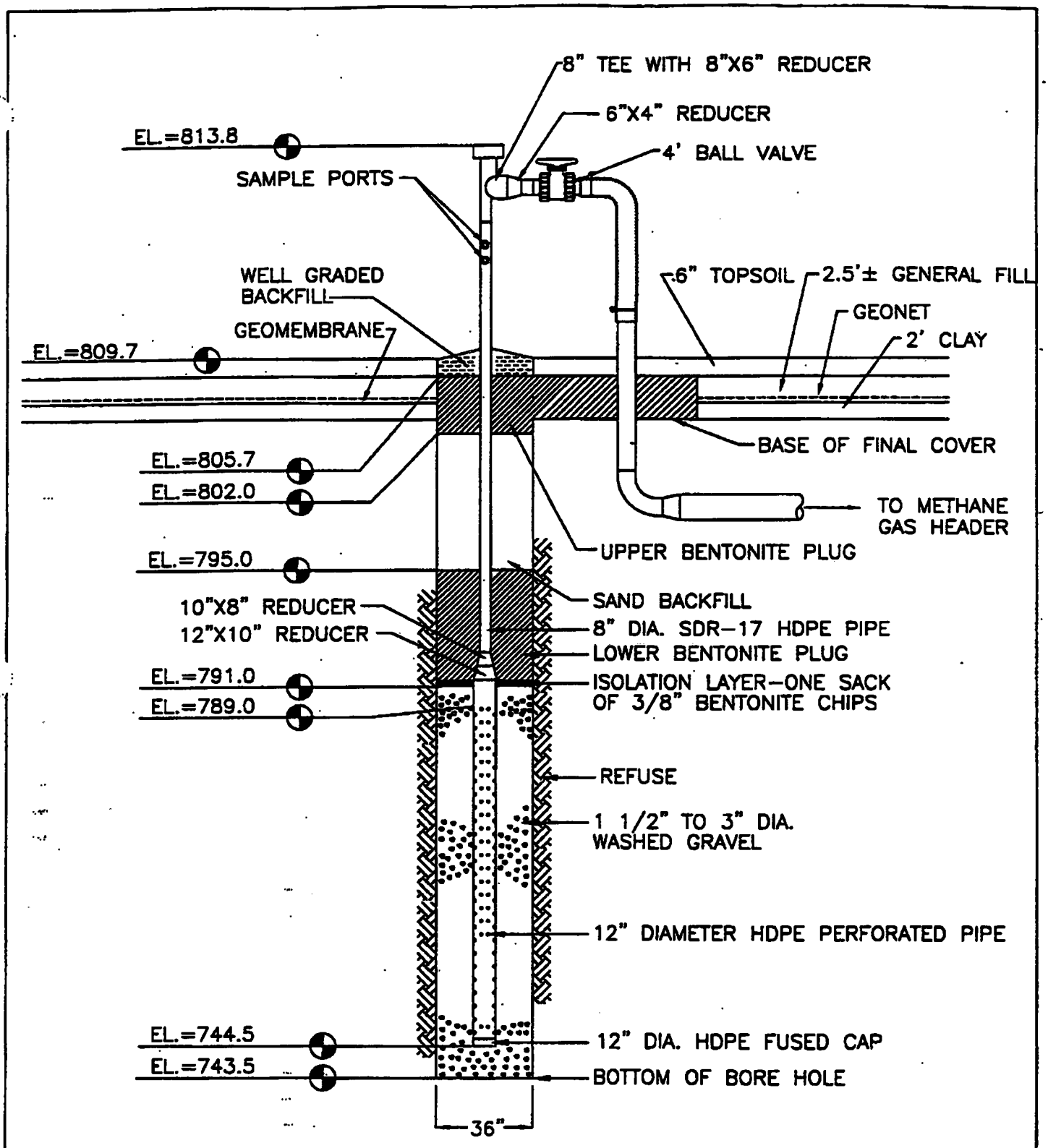
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-27	Surface Elevation:	804.6
Exact Location (Coordinates):	10933N 9293E	Total Depth:	63.8'
Installation Date:	2/11/97	Date Completed:	2/11/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	42.0'	Length of Solid Pipe:	24.8'

Depth	Material Drilled	Comments
0-6	0-15' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55		
56-62		
63-69	End of Borehole @ 63.8'	Dry
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-28		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1A Zion, Illinois		
CQM, Inc.		55

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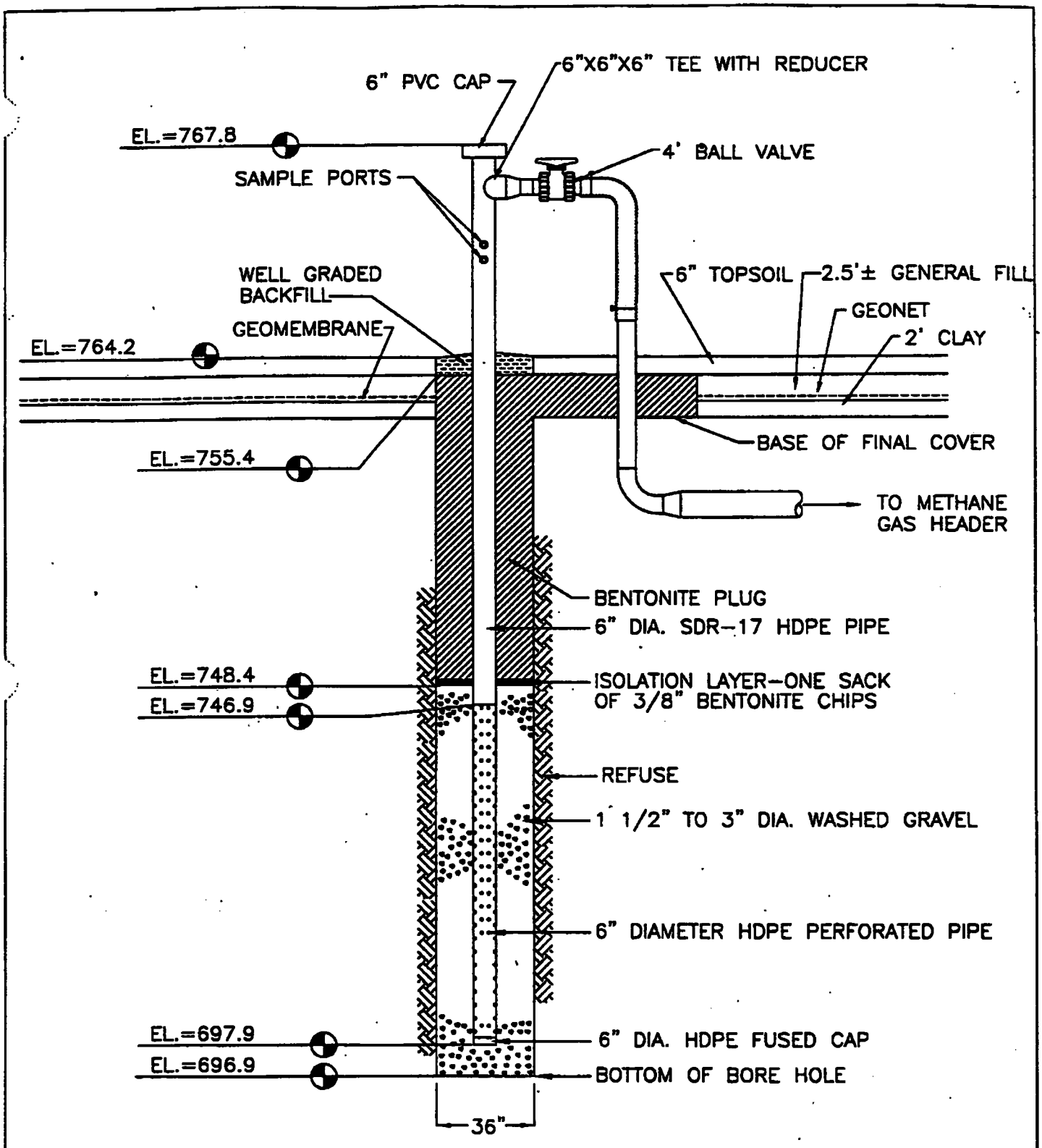
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1A	State:	Illinois
Well Number/Name:	EW-28	Surface Elevation:	809.7
Exact Location (Coordinates):	11226N 9357E	Total Depth:	66.2'
Installation Date:	2/11/97	Date Completed:	2/11/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	44.5'	Length of Solid Pipe:	24.8'

Depth	Material Drilled	Comments
0-6	0-2.5' Clay	
7-13	Refuse/Clay	Dry/Damp
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	Clay/Refuse	
56-62		
63-69	End of Borehole @ 66.2'	Damp
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-29		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1B Zion, Illinois		
CQM, Inc.		59

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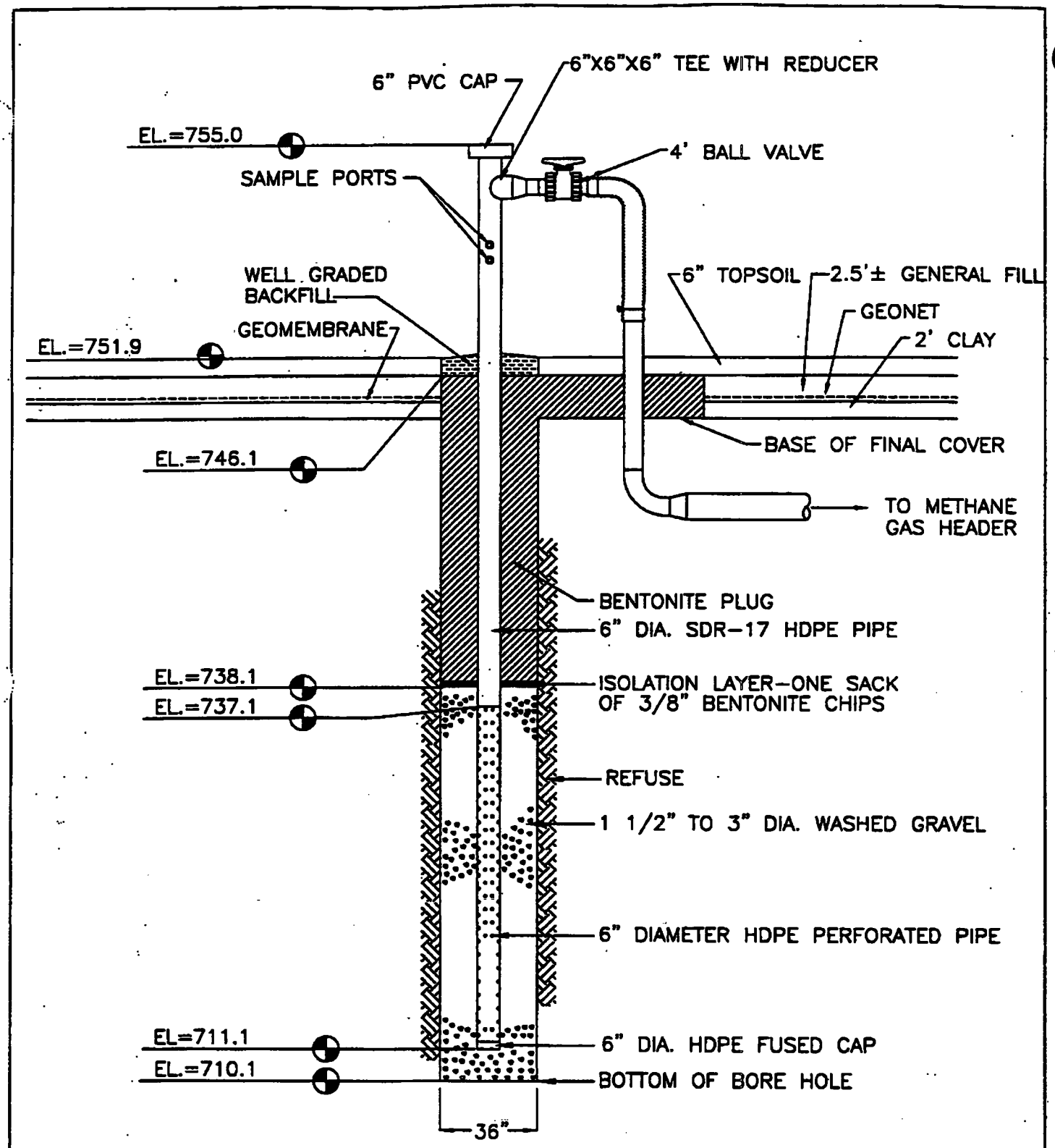
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1B	State:	Illinois
Well Number/Name:	EW-29	Surface Elevation:	764.2
Exact Location (Coordinates):	11027N 8473E	Total Depth:	67.3'
Installation Date:	2/12/97	Date Completed:	2/12/97
Bore Hole Size:	36"	Well Size:	6" HDPE
Length of Perforated Pipe:	49.0'	Length of Solid Pipe:	20.9'

Depth	Material Drilled	Comments
0-6	0-2' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55		
56-62		
63-69	End of Borehole @ 67.3'	Dry
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-30		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1B Zion, Illinois		
CQM, Inc.		61

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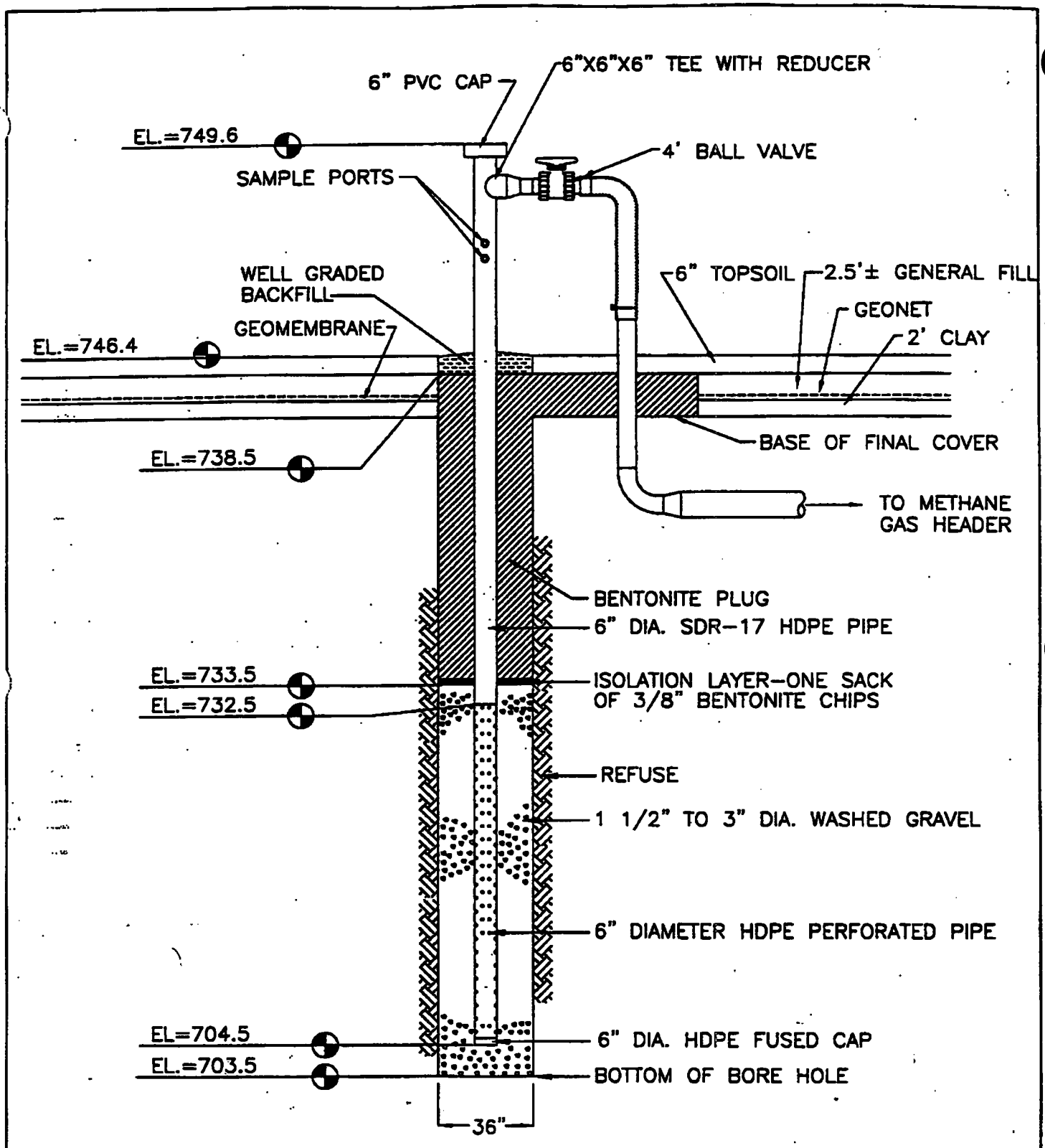
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1B	State:	Illinois
Well Number/Name:	EW-30	Surface Elevation:	751.9
Exact Location (Coordinates):	10996N 8272E	Total Depth:	41.8'
Installation Date:	2/12/97	Date Completed:	2/12/97
Bore Hole Size:	36"	Well Size:	6" HDPE
Length of Perforated Pipe:	26.0'	Length of Solid Pipe:	17.9'

Depth	Material Drilled	Comments
0-6	0-2' Clay	
7-13	Refuse (paper, plastic, and wood)	Dry
14-20		
21-27		
28-34		
35-41		
42-48	End of Borehole @ 41.8'	Dry
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-31		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1B Zion, Illinois		
CQM, Inc.		63

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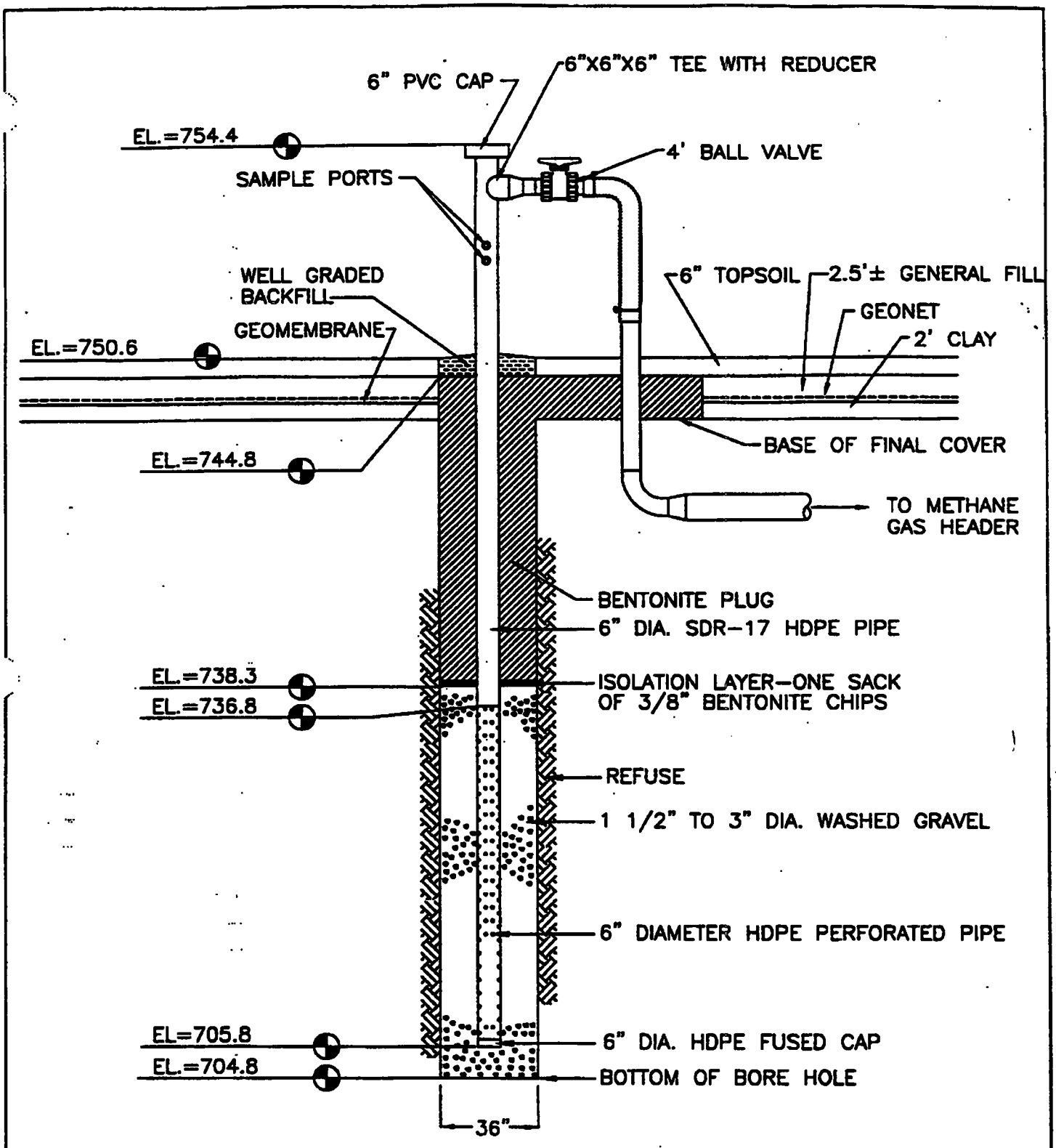
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1B	State:	Illinois
Well Number/Name:	EW-31	Surface Elevation:	746.4
Exact Location (Coordinates):	10806N 8302E	Total Depth:	42.9'
Installation Date:	2/12/97	Date Completed:	2/12/97
Bore Hole Size:	36"	Well Size:	6" HDPE
Length of Perforated Pipe:	28.0'	Length of Solid Pipe:	17.1'

Depth	Material Drilled	Comments
0-6	0-1.6' Clay	
7-13	Refuse (paper, plastic, and wood)	Dry
14-20		
21-27		
28-34		
35-41		
42-48	End of Borehole @ 42.9'	Dry
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-32

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 1B
Zion, Illinois

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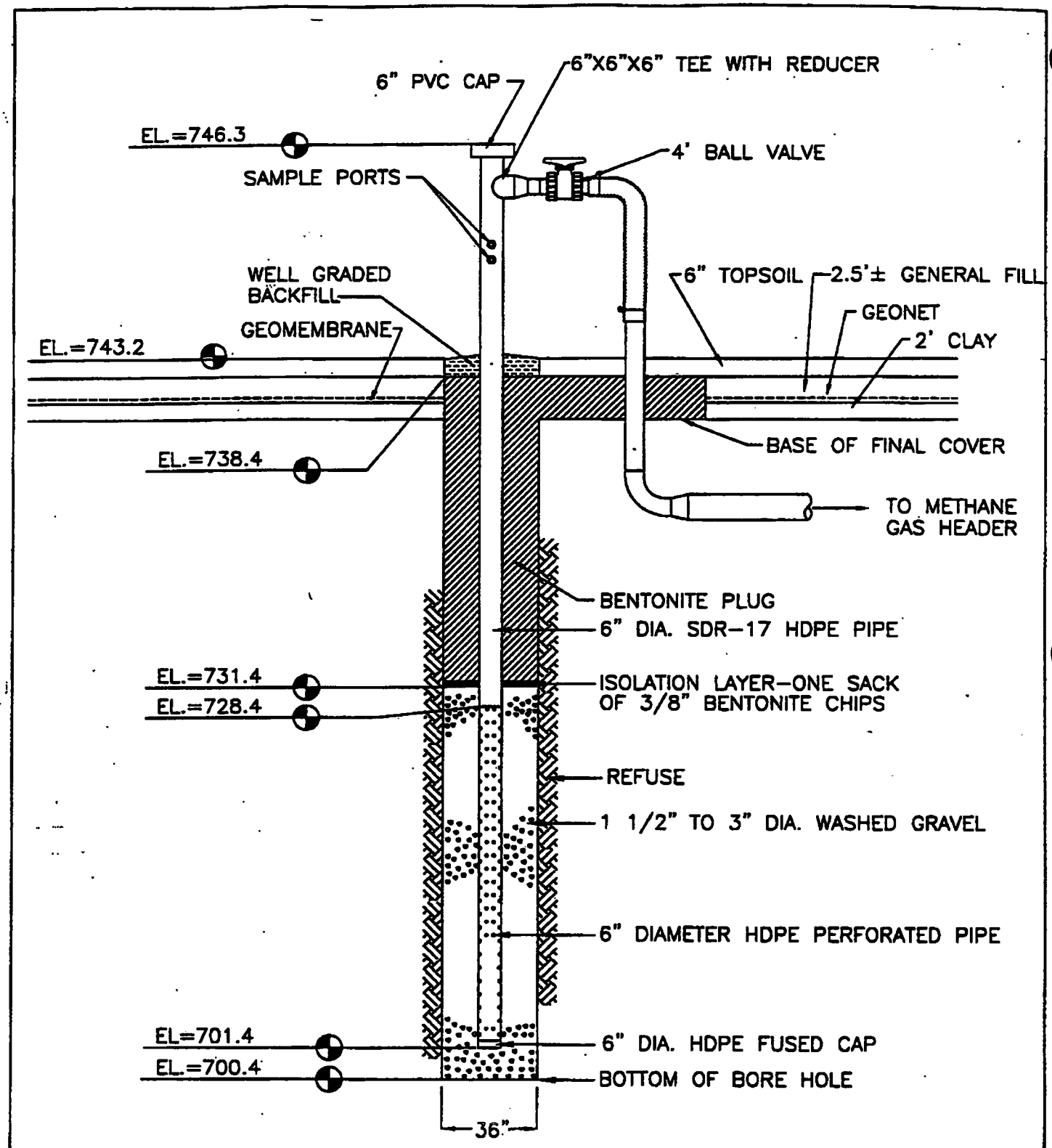
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1B	State:	Illinois
Well Number/Name:	EW-32	Surface Elevation:	750.6
Exact Location (Coordinates):	10813N 8517E	Total Depth:	45.8'
Installation Date:	2/12/97	Date Completed:	2/12/97
Bore Hole Size:	36"	Well Size:	6" HDPE
Length of Perforated Pipe:	31.0'	Length of Solid Pipe:	17.6'

Depth	Material Drilled	Comments
0-6	0-3' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48	End of Borehole @ 45.8'	Dry
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-33		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1B Zion, Illinois		
CQM, Inc.		67

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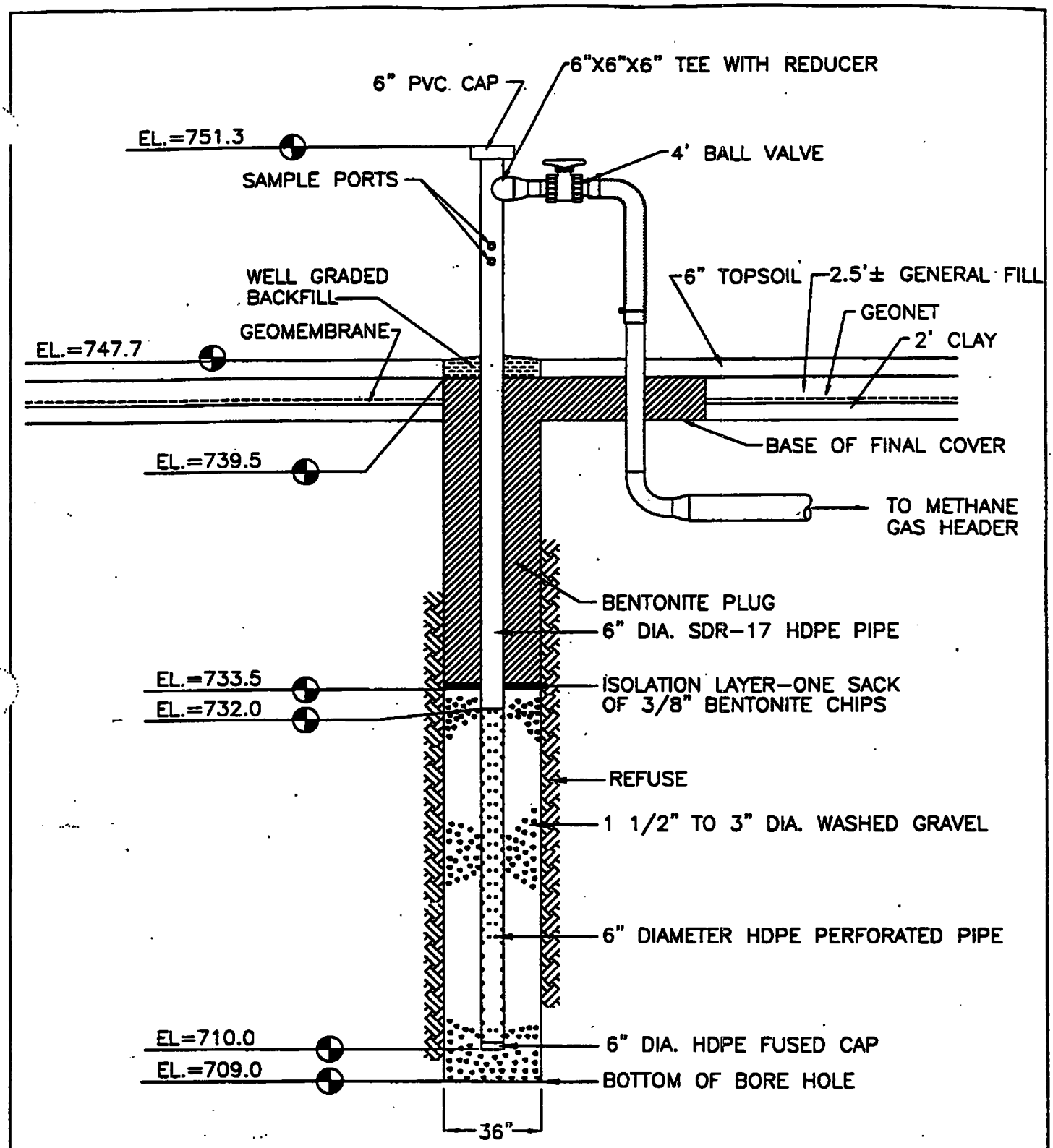
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1B	State:	Illinois
Well Number/Name:	EW-33	Surface Elevation:	743.2
Exact Location (Coordinates):	10505N 8312E	Total Depth:	42.8'
Installation Date:	2/13/97	Date Completed:	2/13/97
Bore Hole Size:	36"	Well Size:	6" HDPE
Length of Perforated Pipe:	27.0'	Length of Solid Pipe:	17.9'

Depth	Material Drilled	Comments
0-6	0-6' Clay/Refuse (not compacted)	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48	End of Borehole @ 42.8'	Dry
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-34		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1B Zion, Illinois		
CQM, Inc.		69

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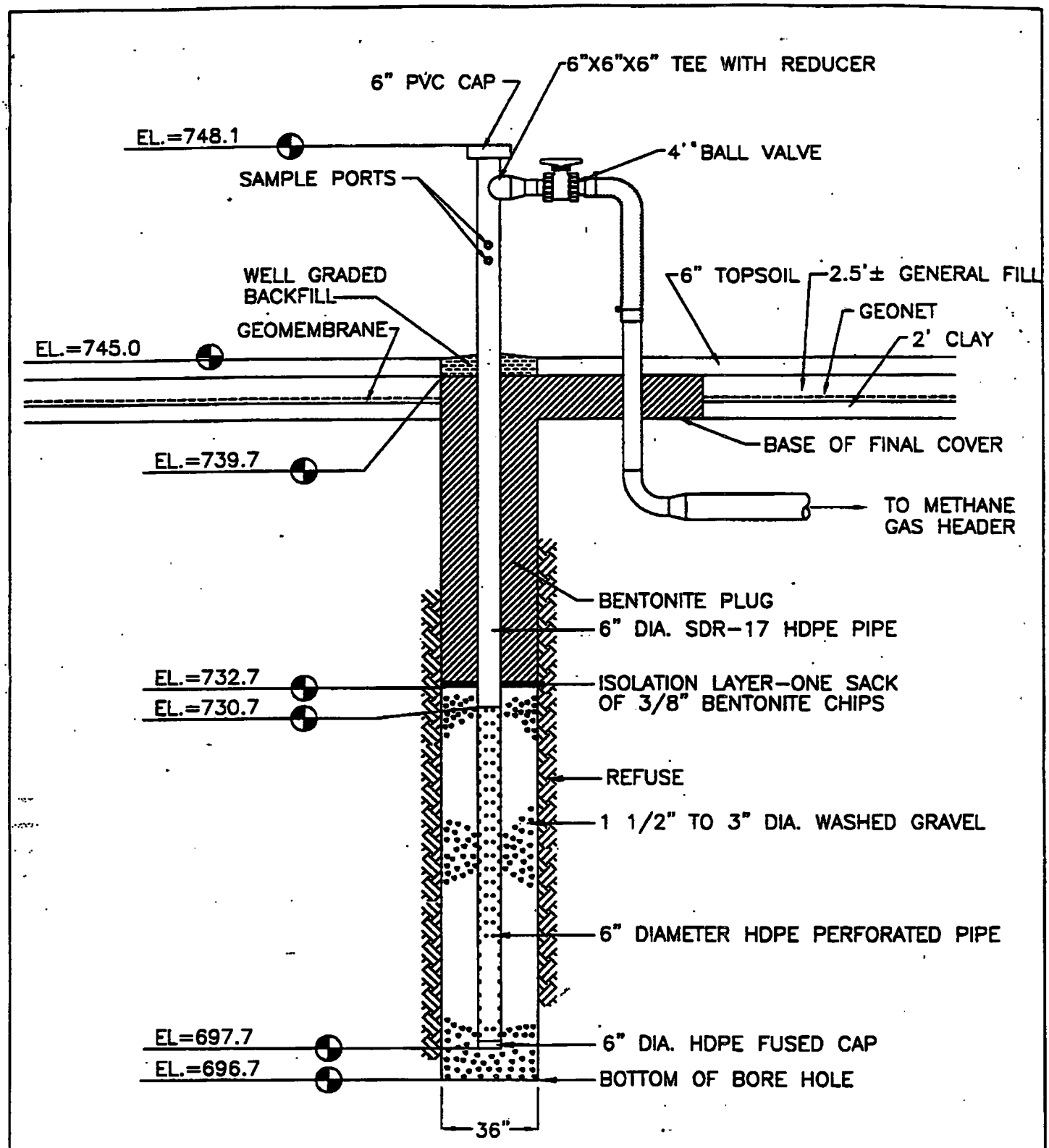
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1B	State:	Illinois
Well Number/Name:	EW-34	Surface Elevation:	747.7
Exact Location (Coordinates):	10477N 8539E	Total Depth:	38.7'
Installation Date:	2/12/97	Date Completed:	2/12/97
Bore Hole Size:	36"	Well Size:	6" HDPE
Length of Perforated Pipe:	22.0'	Length of Solid Pipe:	19.3'

Depth	Material Drilled	Comments
0-6	0-2.5' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41	End of Borehole @ 38.7'	Dry
42-48		
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-35

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 1B
Zion, Illinois

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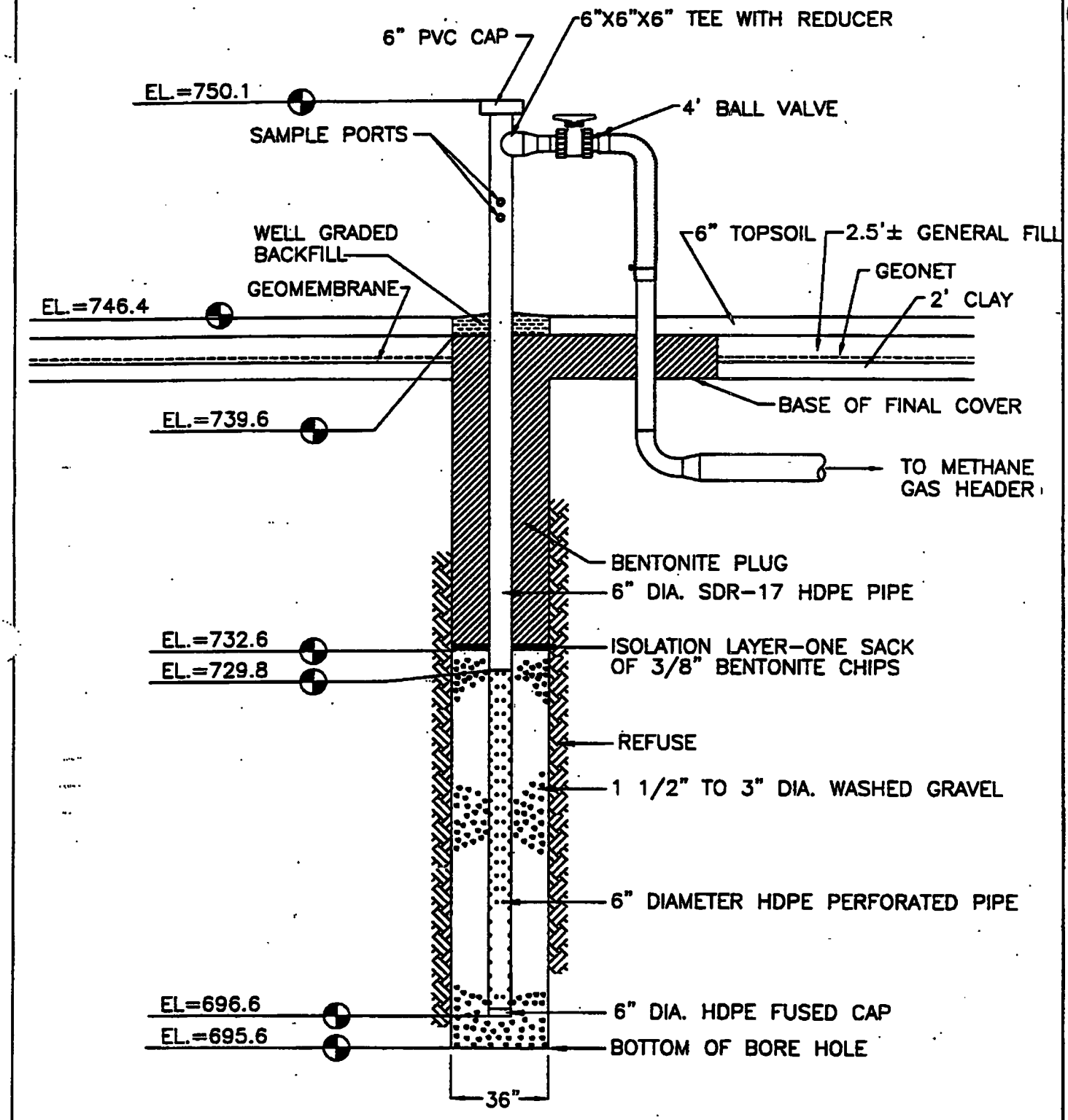
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1B	State:	Illinois
Well Number/Name:	EW-35	Surface Elevation:	745.0
Exact Location (Coordinates):	10295N 8330E	Total Depth:	48.3'
Installation Date:	2/13/97	Date Completed:	2/13/97
Bore Hole Size:	36"	Well Size:	6" HDPE
Length of Perforated Pipe:	33.0'	Length of Solid Pipe:	17.4'

Depth	Material Drilled	Comments
0-6	0-3' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 48.3'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-36		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 1B Zion, Illinois		
CQM, Inc.		73

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 1B	State:	Illinois
Well Number/Name:	EW-36	Surface Elevation:	746.4
Exact Location (Coordinates):	10278N 8516E	Total Depth:	50.8'
Installation Date:	2/13/97	Date Completed:	2/13/97
Bore Hole Size:	36"	Well Size:	6" HDPE
Length of Perforated Pipe:	33.2'	Length of Solid Pipe:	20.3'

Depth	Material Drilled	Comments
0-6	0-2.5' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of Borehole @ 50.8'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
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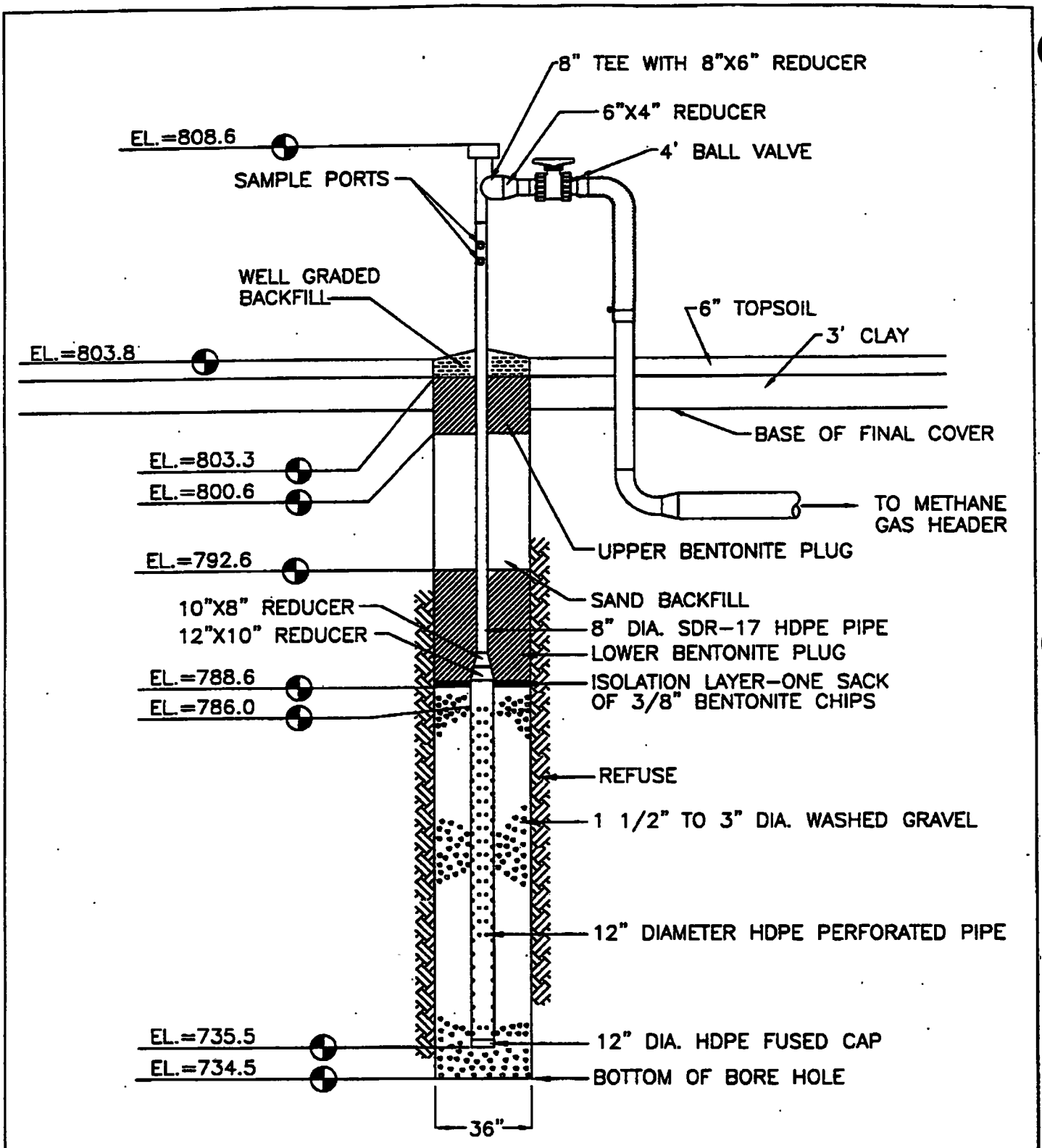
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-37		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill - Site 2 Zion, Illinois		
CQM, Inc.		77

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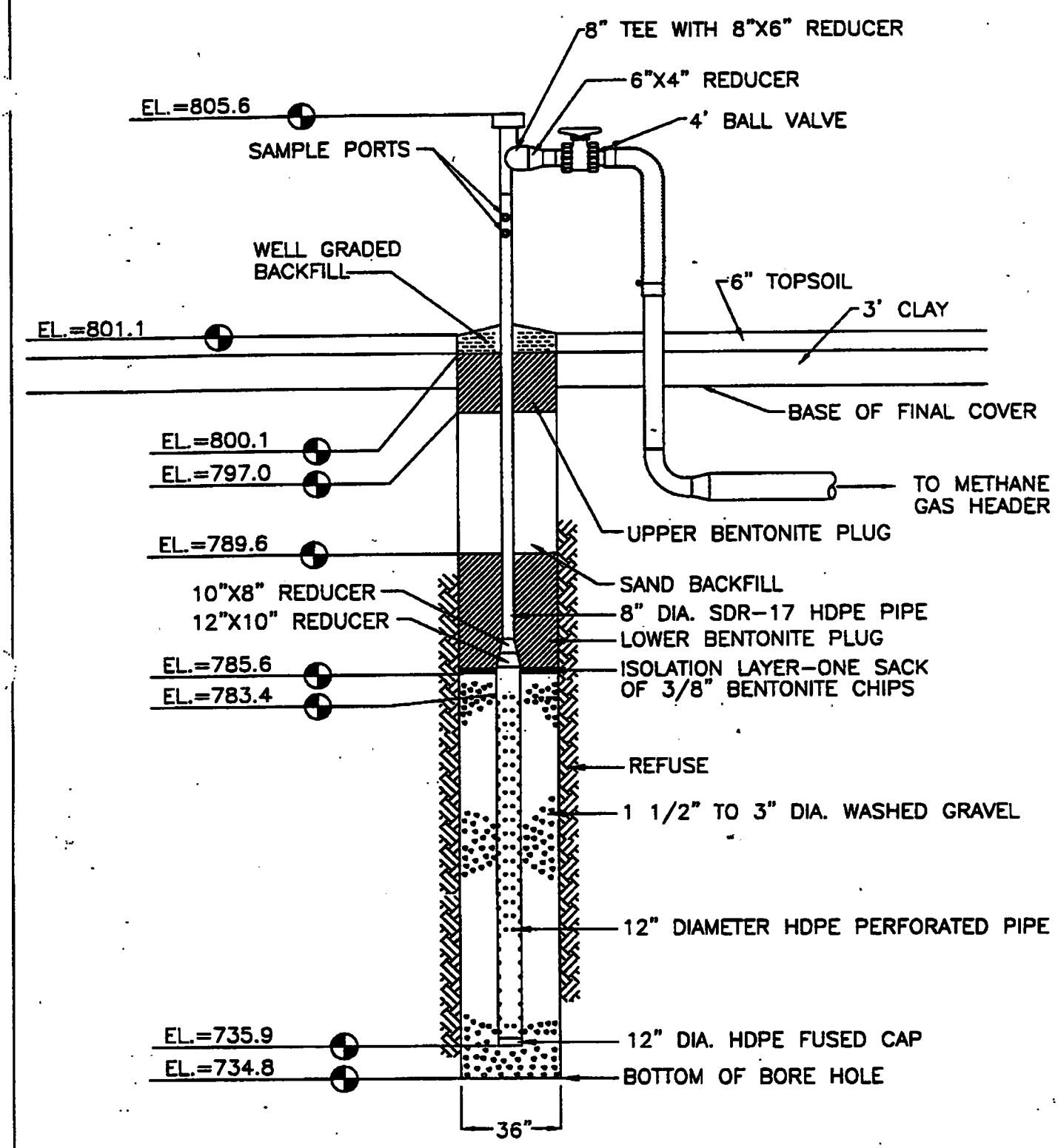
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-37	Surface Elevation:	803.8
Exact Location (Coordinates):	11508N 9544E	Total Depth:	69.3'
Installation Date:	1/30/97	Date Completed:	1/30/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	50.5'	Length of Solid Pipe:	22.6'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-6' Clay	
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20	Refuse with Clay	Damp/Partly decomposed
21-27		
28-34		115°F @ 30'
35-41		
42-48		
49-55		
56-62		
63-69		
70-76	End of borehole @ 69.3'	Wet
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-38		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
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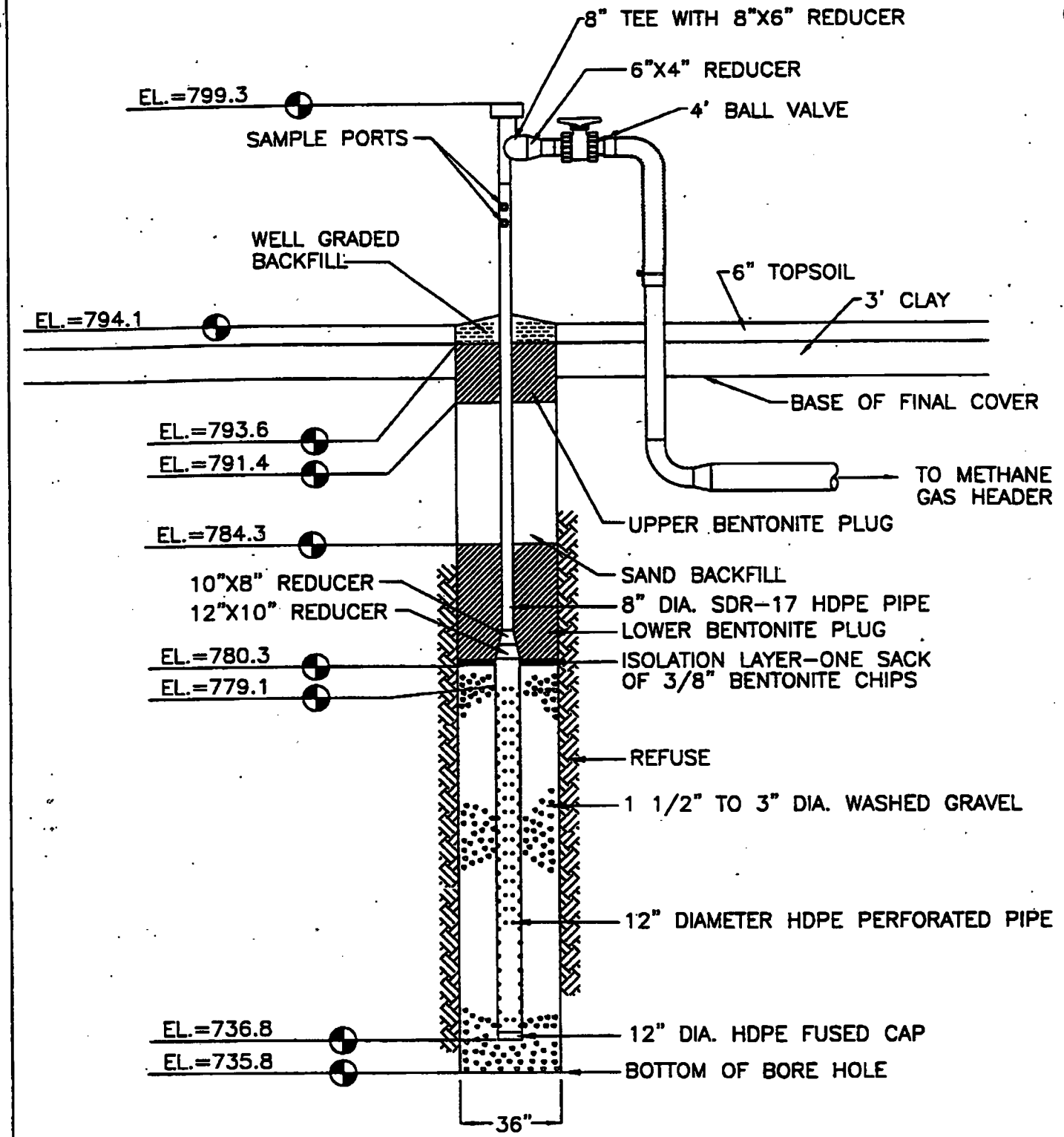
Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 2	State:	Illinois
Well Number/Name:	EW-38	Surface Elevation:	801.1
Exact Location (Coordinates):	11816N 9520E	Total Depth:	66.3'
Installation Date:	1/30/97	Date Completed:	1/30/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	47.5'	Length of Solid Pipe:	22.2'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-6.5' Clay	
7-13	Refuse (paper, plastic, and wood)	Dry
14-20		Damp/Partly Decomposed, Black in Color
21-27		
28-34		
35-41		
42-48		110°F @ 46'
49-55		Wet @ 50', dryer @ 55'
56-62		
63-69	End of Borehole @ 66.3'	Dry/Damp
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-39

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 2
Zion, Illinois

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 2	State:	Illinois
Well Number/Name:	EW-39	Surface Elevation:	794.1
Exact Location (Coordinates):	12138N 9522E	Total Depth:	58.3'
Installation Date:	1/13/97	Date Completed:	1/13/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	42.3'	Length of Solid Pipe:	20.2'

Depth	Material Drilled	Comments
0-6	0'-0.5' Topsoil, 2'-3' Clay	
7-13	Refuse/Clay	
14-20	Refuse	Black, Moist Refuse @ 18'
21-27		
28-34		
35-41	Refuse	Wet @ 40', and Temp. of 100°F
42-48		
49-55		
56-62	End of Borehole @ 58.3'	
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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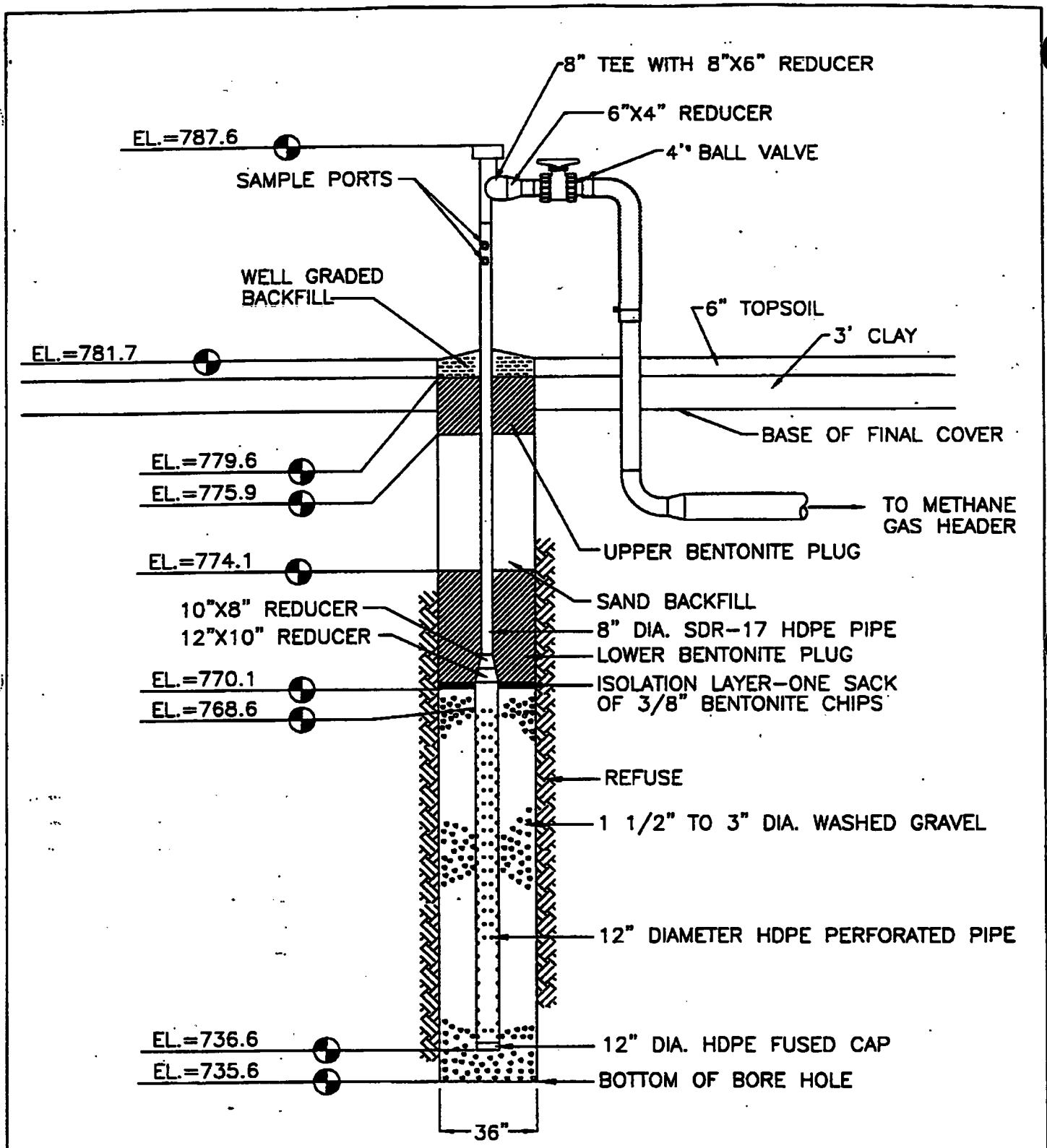
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-40		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		83

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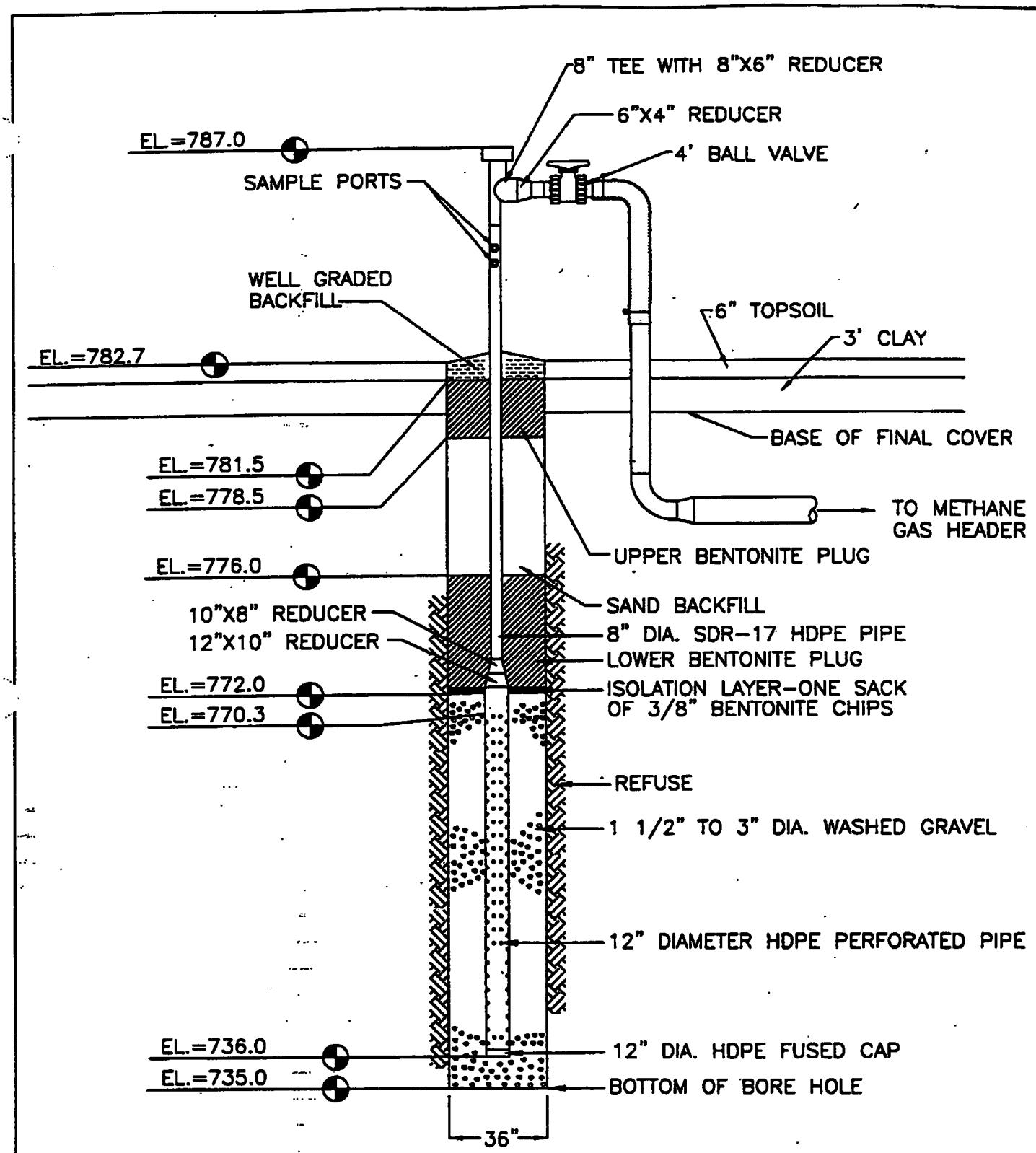
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 2	State:	Illinois
Well Number/Name:	EW-40	Surface Elevation:	781.7
Exact Location (Coordinates):	12423N 9570E	Total Depth:	46.1'
Installation Date:	1/31/97	Date Completed:	1/31/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	32.0'	Length of Solid Pipe:	19.0'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-6.5' Clay	
7-13	Refuse	Damp
14-20		Wet @ 15'
21-27		Damp @ 20', Damp
28-34		
35-41		Wet @ 35'
42-48	End of Borehole @ 46.1'	Wet
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-41		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		85

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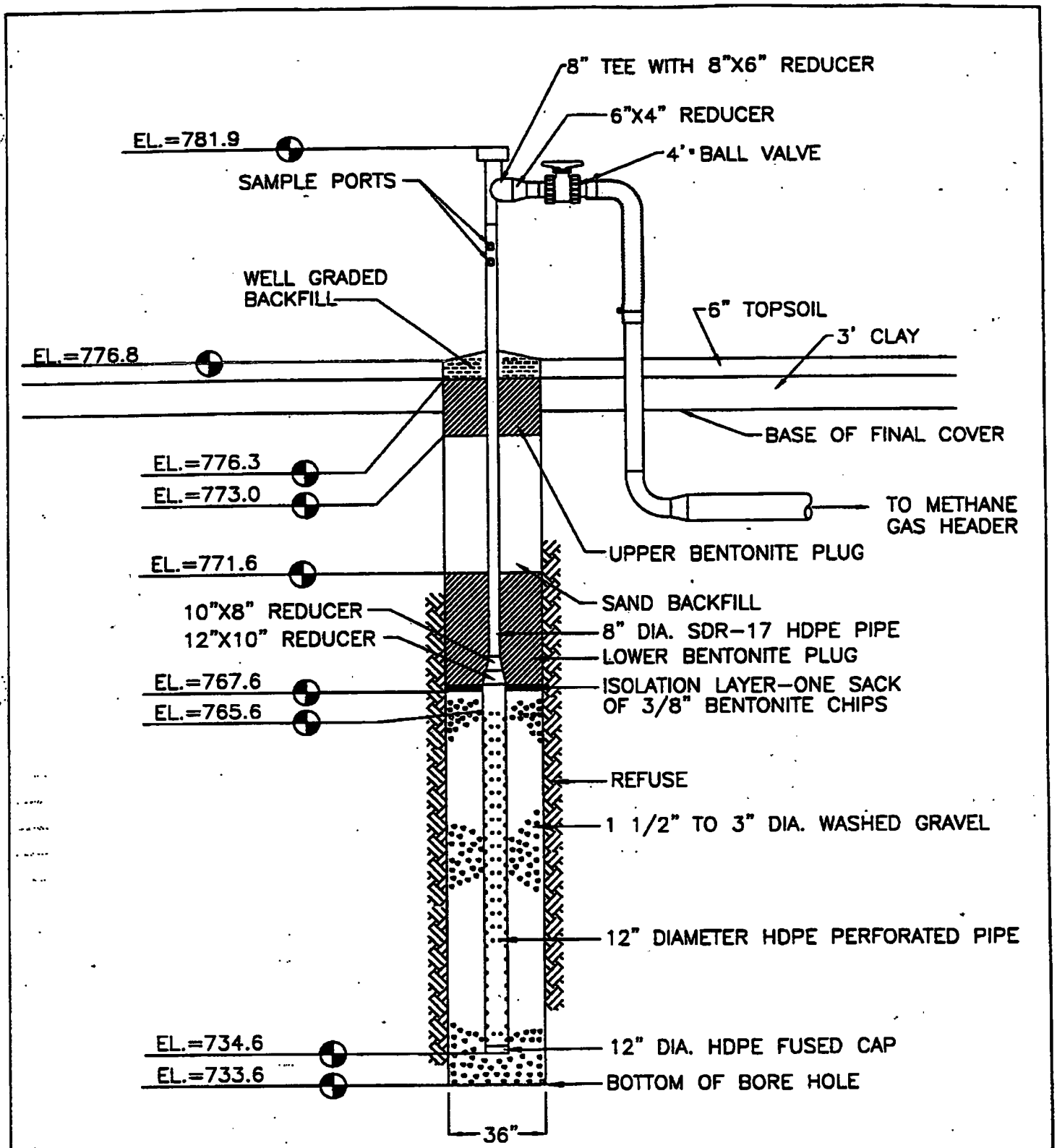
Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 2	State:	Illinois
Well Number/Name:	EW-41	Surface Elevation:	782.7
Exact Location (Coordinates):	12392N 9747E	Total Depth:	47.7'
Installation Date:	1/31/97	Date Completed:	1/31/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	34.3'	Length of Solid Pipe:	16.7'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-6.5' Clay	
7-13	Refuse	Dry/Partly Decomposed, Dark Brown Color
14-20		
21-27		90°F @ 24', Damp
28-34		
35-41		
42-48	End of Borehole @ 47.7'	Damp/Wet
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-42		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		87

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-42	Surface Elevation:	776.8
Exact Location (Coordinates):	12399N 9925E	Total Depth:	43.2'
Installation Date:	1/31/97	Date Completed:	1/31/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	31.0'	Length of Solid Pipe:	16.3'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-5' Clay	
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20		
21-27		90°F @ 25'
28-34		
35-41		
42-48	End of borehole @ 43.2'	Dry
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
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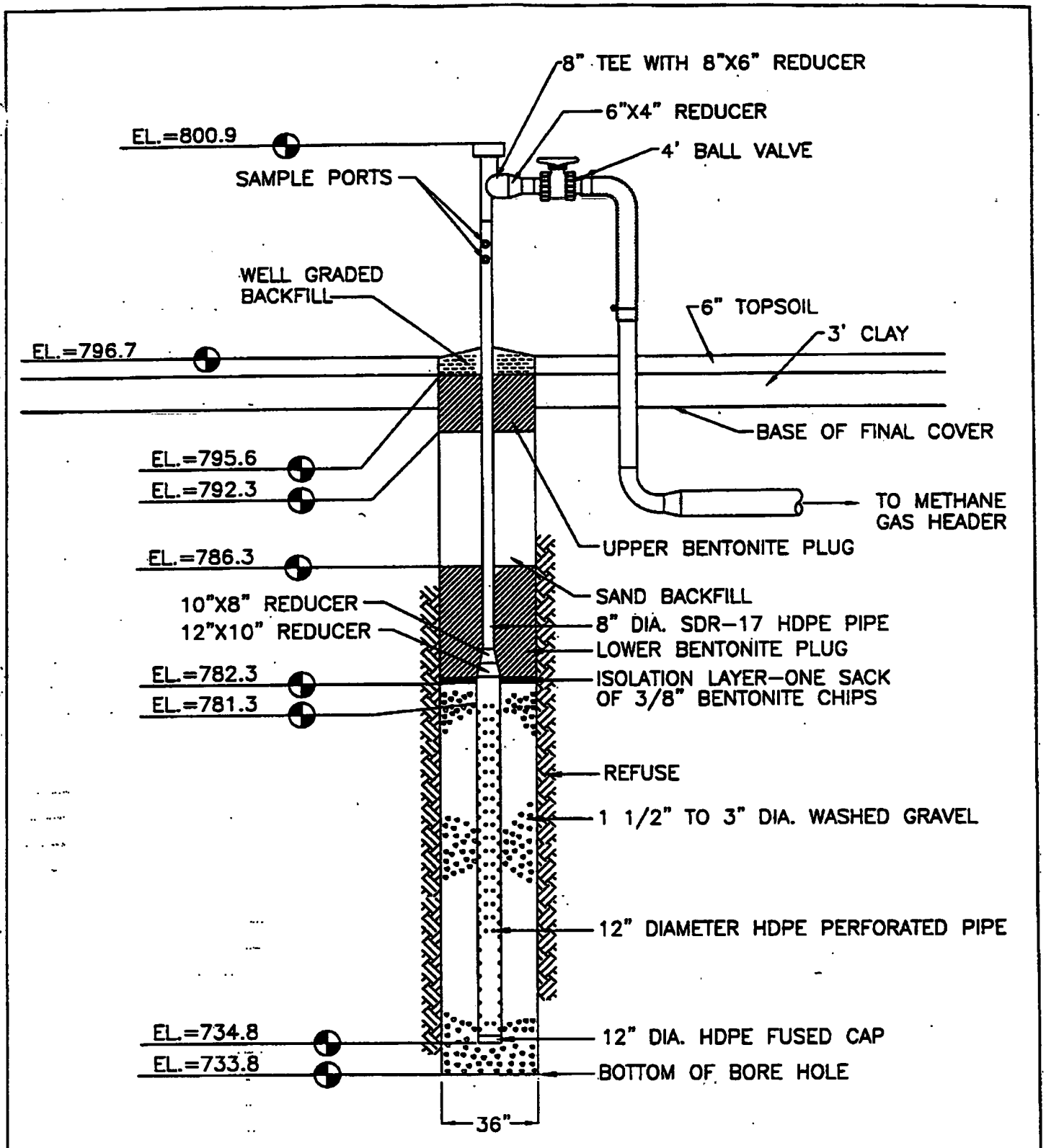
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-43

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 2
Zion, Illinois

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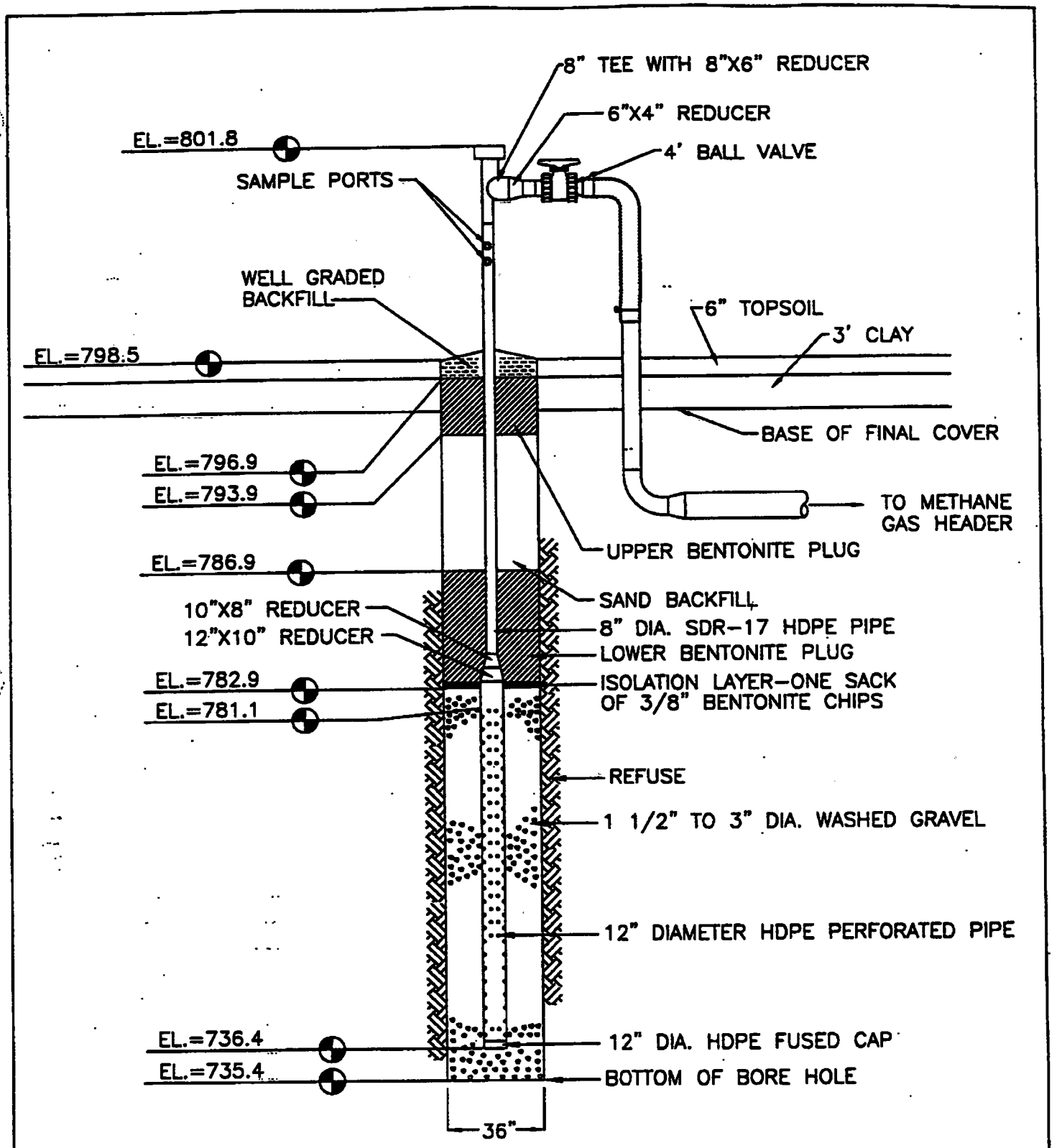
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-43	Surface Elevation:	796.7
Exact Location (Coordinates):	12121N 9817E	Total Depth:	62.9'
Installation Date:	1/27/97	Date Completed:	1/27/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	46.5'	Length of Solid Pipe:	19.6'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-5' Clay	
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20		
21-27		
28-34		
35-41		120°F @ 40'
42-48		
49-55		
56-62		
63-69	End of borehole @ 62.9	Dry
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-44		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		91

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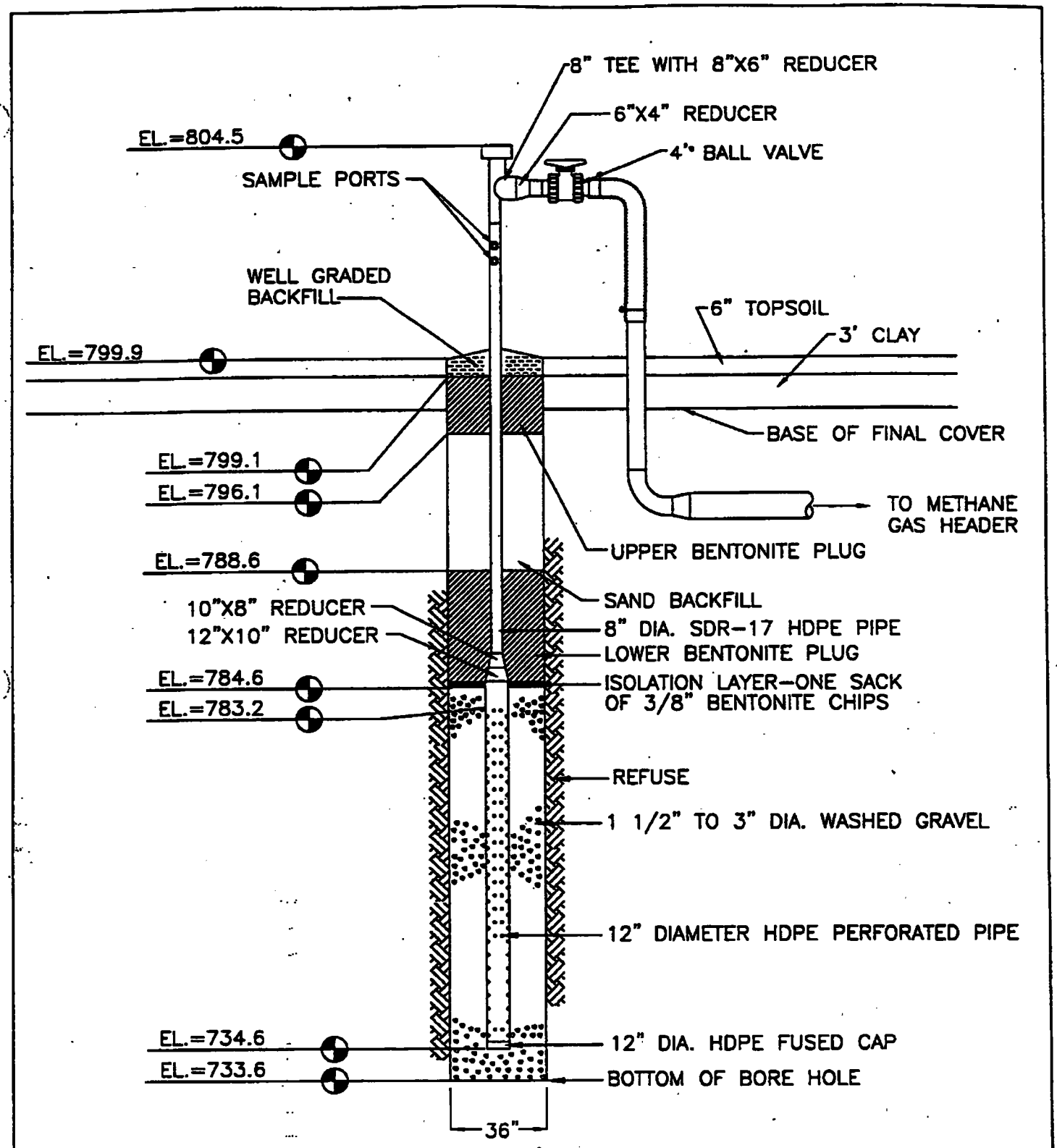
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-44	Surface Elevation:	798.5
Exact Location (Coordinates):	11827N 9827E	Total Depth:	63.1'
Installation Date:	1/27/97	Date Completed:	1/27/97
Bore Hole Size:	36"	Well.Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	44.7'	Length of Solid Pipe:	20.7'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-5' Clay	
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20		
21-27		Wet @ 24'
28-34		100°F @ 26'
35-41		Decomposing Refuse
42-48		
49-55		
56-62		
63-69	End of borehole @ 63.1'	Decomposing Refuse/Very damp
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-45

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 2
Zion, Illinois

CQM, Inc.

93

R 002647

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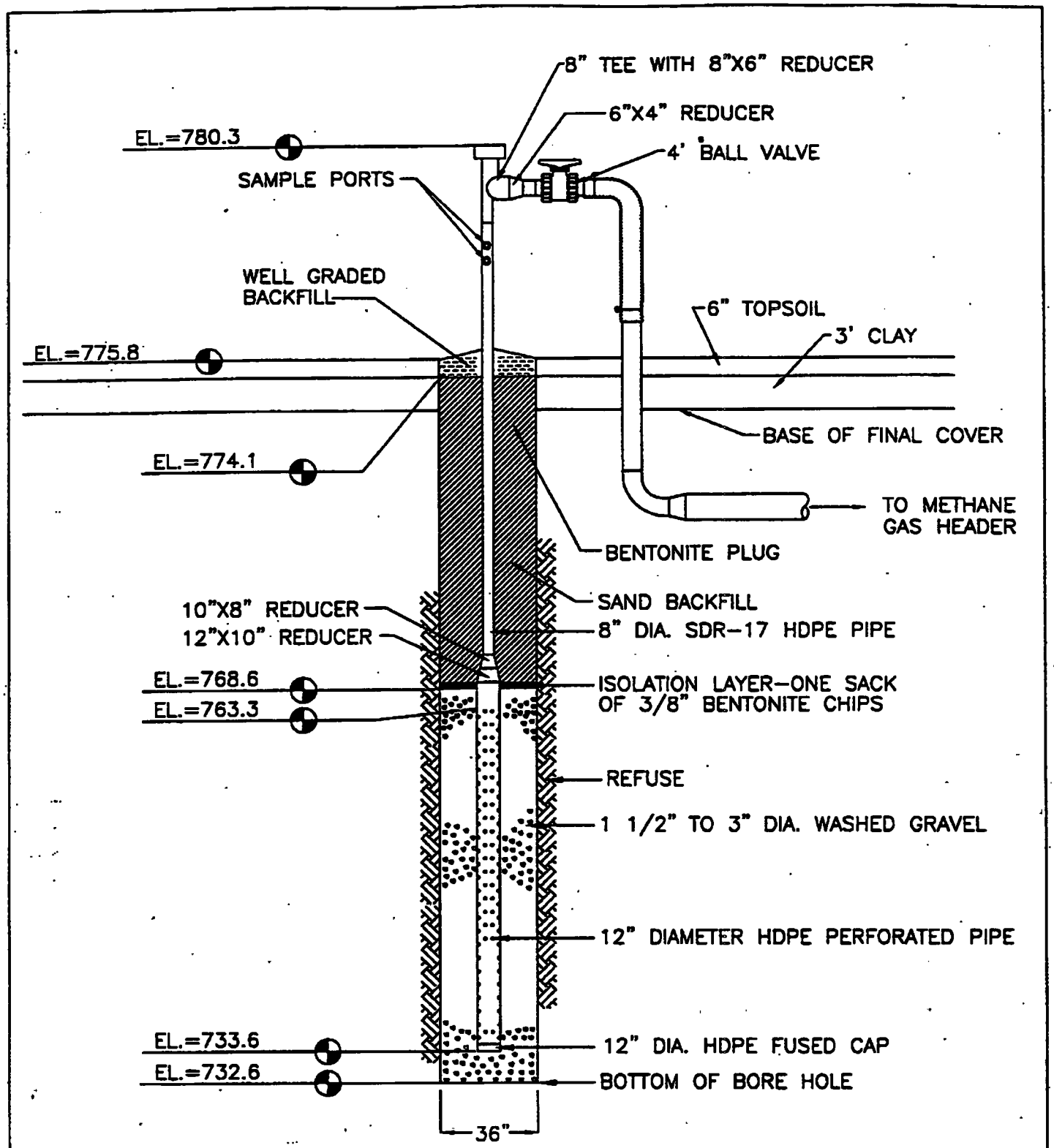
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-45	Surface Elevation:	799.9
Exact Location (Coordinates):	11513N 9858E	Total Depth:	66.3'
Installation Date:	1/27/97	Date Completed:	1/27/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	48.6'	Length of Solid Pipe:	21.3'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-5' Clay	
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20		Partly decomposed/Damp
21-27		
28-34		
35-41		
42-48		90°F @ 45'
49-55		
56-62		
63-69	End of borehole @ 66.3'	Damp/Demoposing
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-46		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		95

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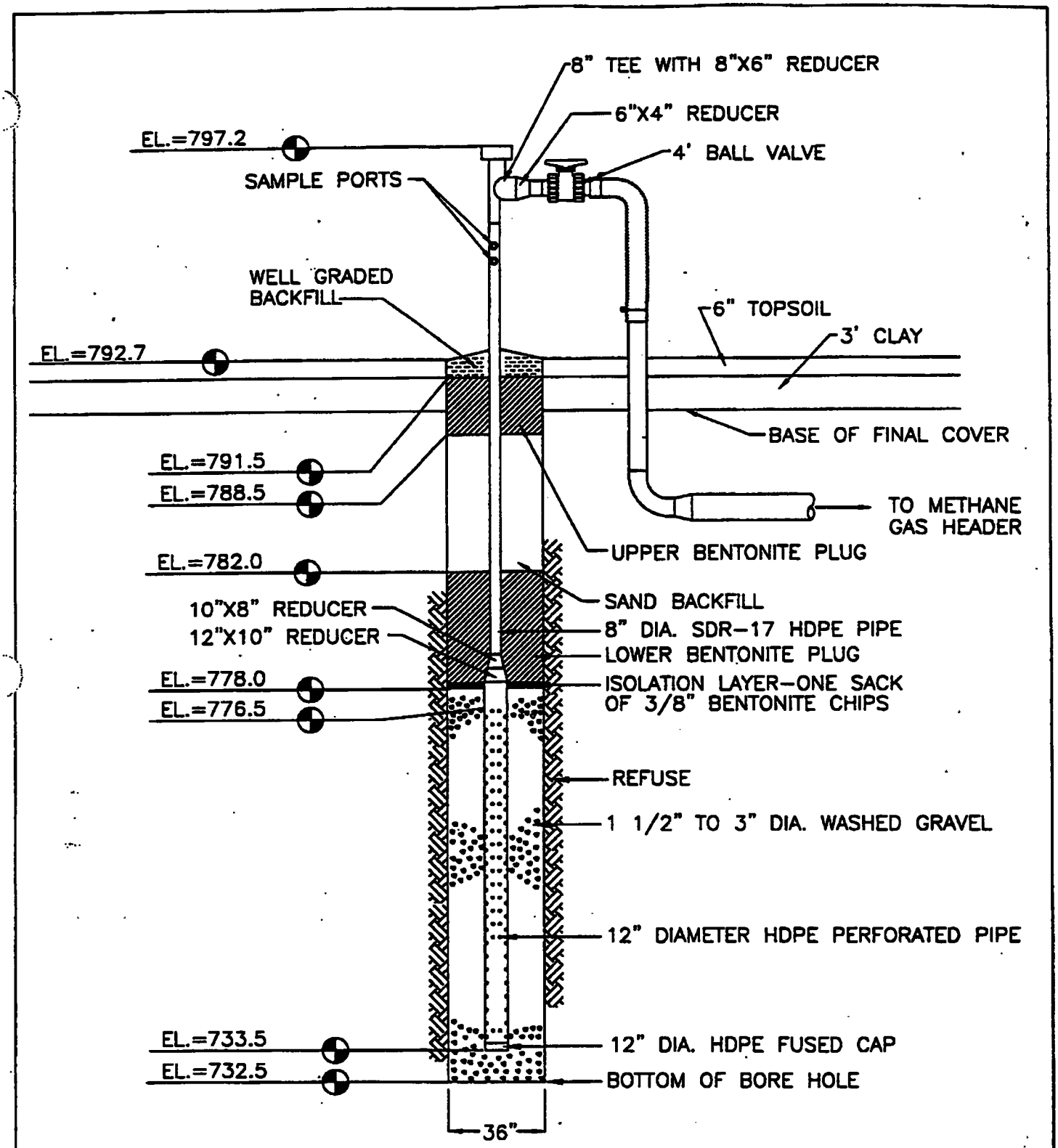
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-46	Surface Elevation:	775.8
Exact Location (Coordinates):	12398N 10082E	Total Depth:	43.2'
Installation Date:	1/24/97	Date Completed:	1/24/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	29.7'	Length of Solid Pipe:	17.0'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-4.5' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48	End of borehole @ 43.2'	Dry
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-47		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
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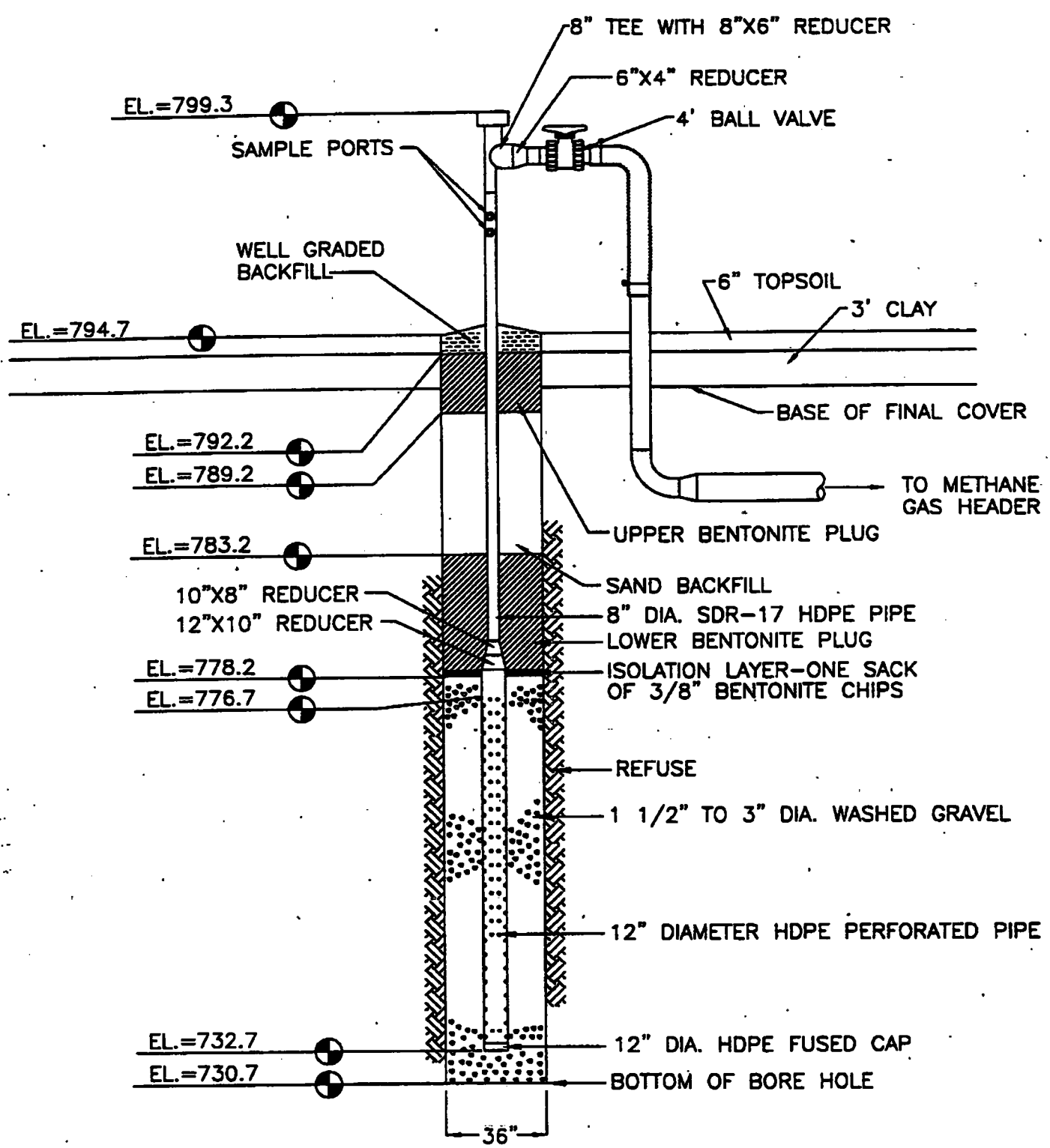
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-48	Surface Elevation:	794.7
Exact Location (Coordinates):	11822N 10183E	Total Depth:	63.5'
Installation Date:	1/13/97	Date Completed:	1/14/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	45.0'	Length of Solid Pipe:	21.5'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-3' Clay	
7-13	Refuse	Damp/Dry
14-20		
21-27		Dry
28-34		
35-41		
42-48		
49-55		85-90°F
56-62		
63-69	End of borehole @ 63.5'	Dry
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-49		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
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Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-49	Surface Elevation:	794.7
Exact Location (Coordinates):	11515N 10157E	Total Depth:	64.0'
Installation Date:	1/23/97	Date Completed:	1/23/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	44.0'	Length of Solid Pipe:	22.6'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-6.5' Clay	
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20		Black, decomposing muck/Wet
21-27		
28-34		
35-41		
42-48		
49-55		110°F @ 50'.
56-62		
63-69	End of borehole 64.0	Wet
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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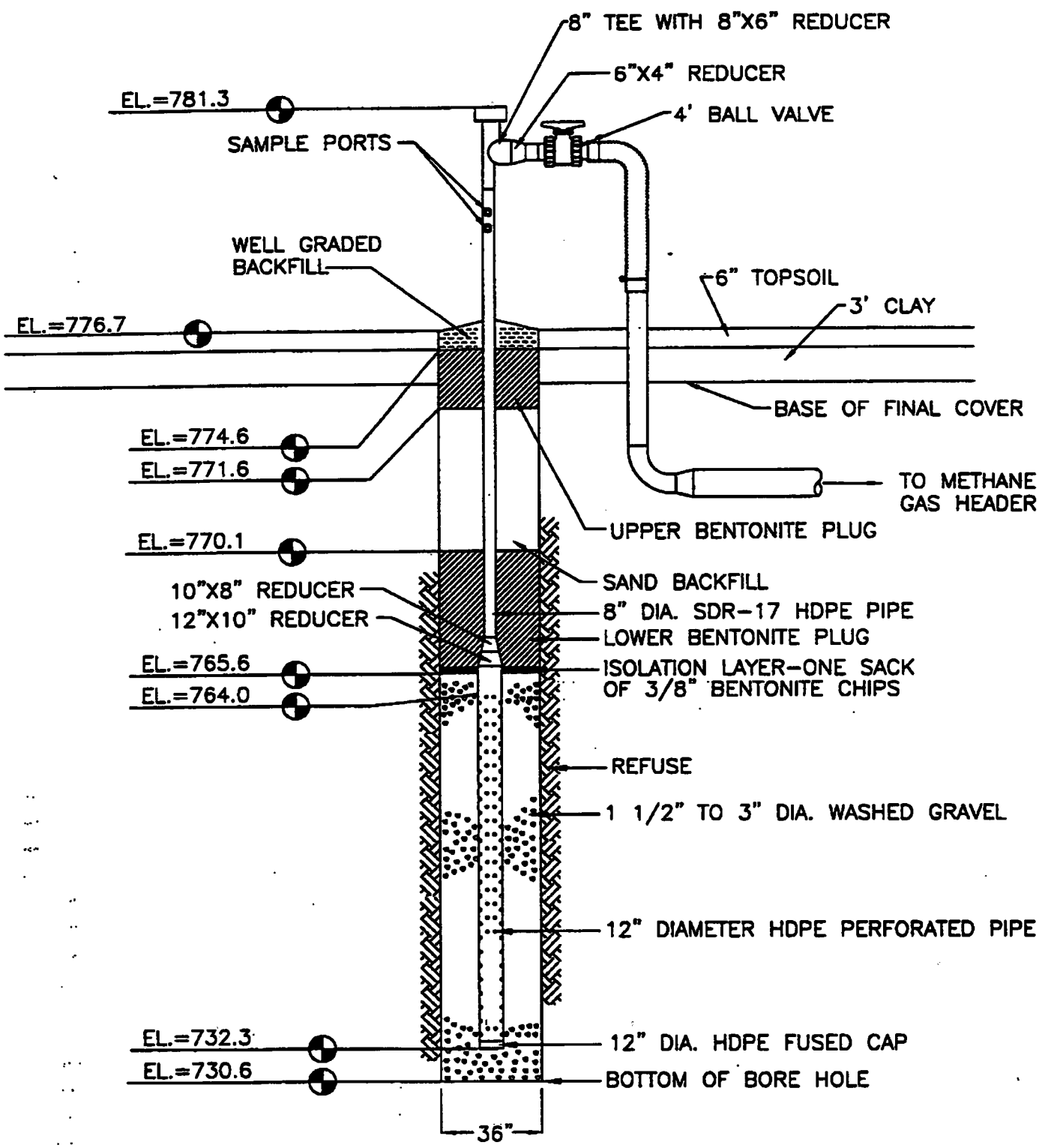
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-50		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
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Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-50	Surface Elevation:	776.7
Exact Location (Coordinates):	12396N 10262E	Total Depth:	46.1'
Installation Date:	1/24/97	Date Completed:	1/24/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	31.7	Length of Solid Pipe:	17.3'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-4' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		Wet
42-48	End of borehole @ 46.1'	Wet
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
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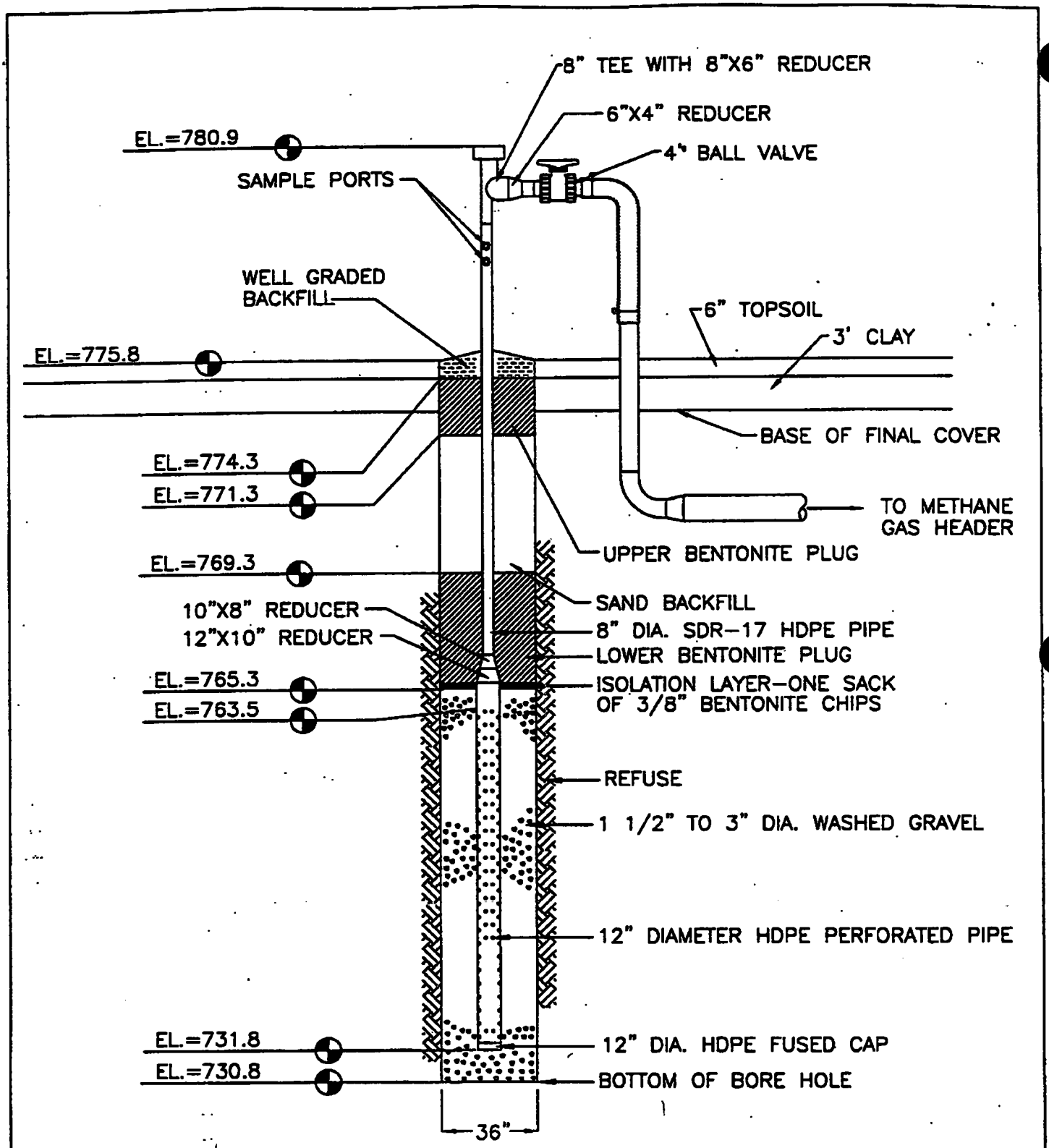
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-51		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-51	Surface Elevation:	775.8
Exact Location (Coordinates):	12403N 10433E	Total Depth:	45.0'
Installation Date:	1/24/97	Date Completed:	1/24/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	31.7	Length of Solid Pipe:	17.4'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-4' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		Wet refuse/ Clay @ 38'
42-48	End of borehole @ 45.0'	Wet
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
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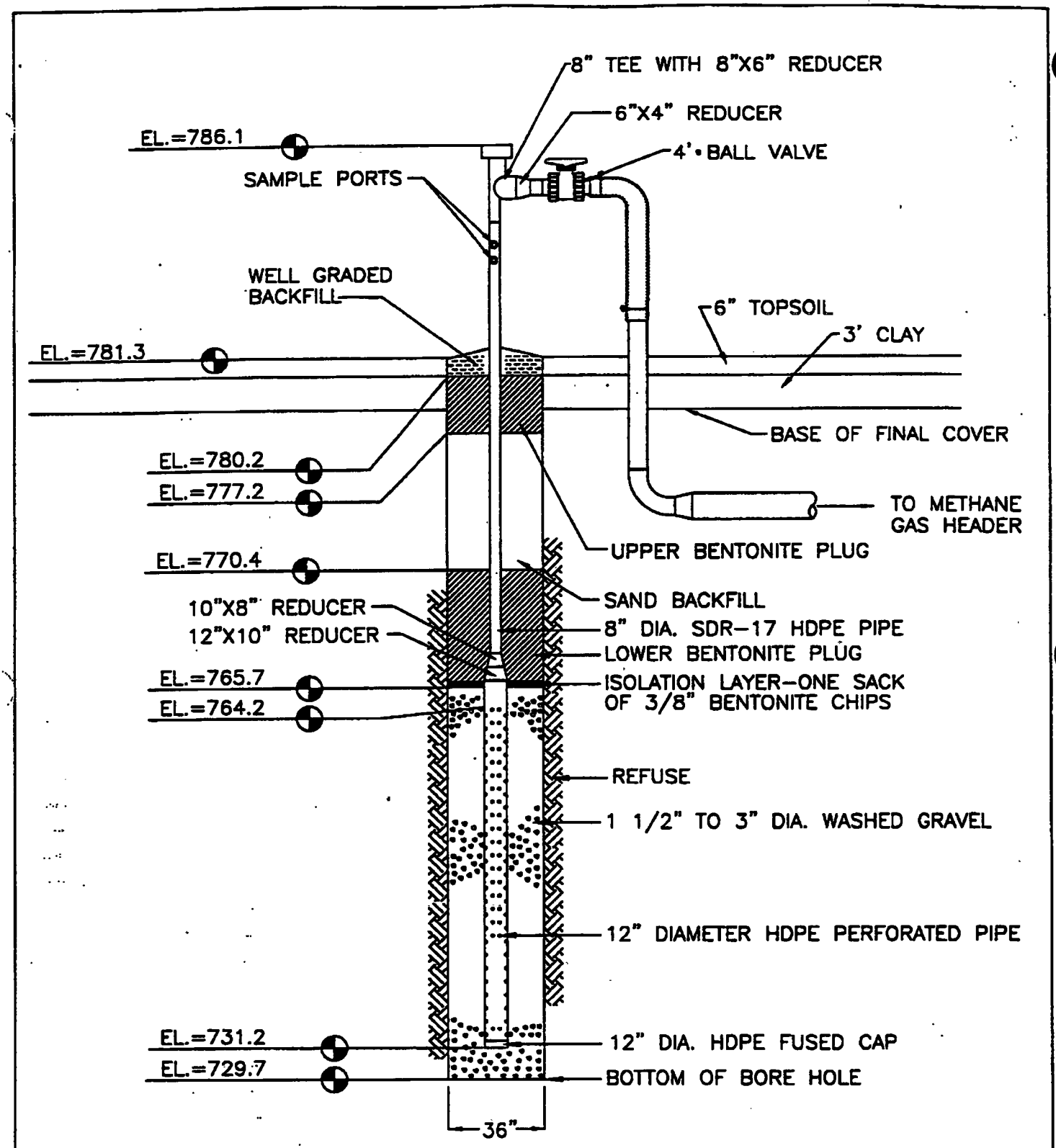

Extraction Well No. EW-52		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		107

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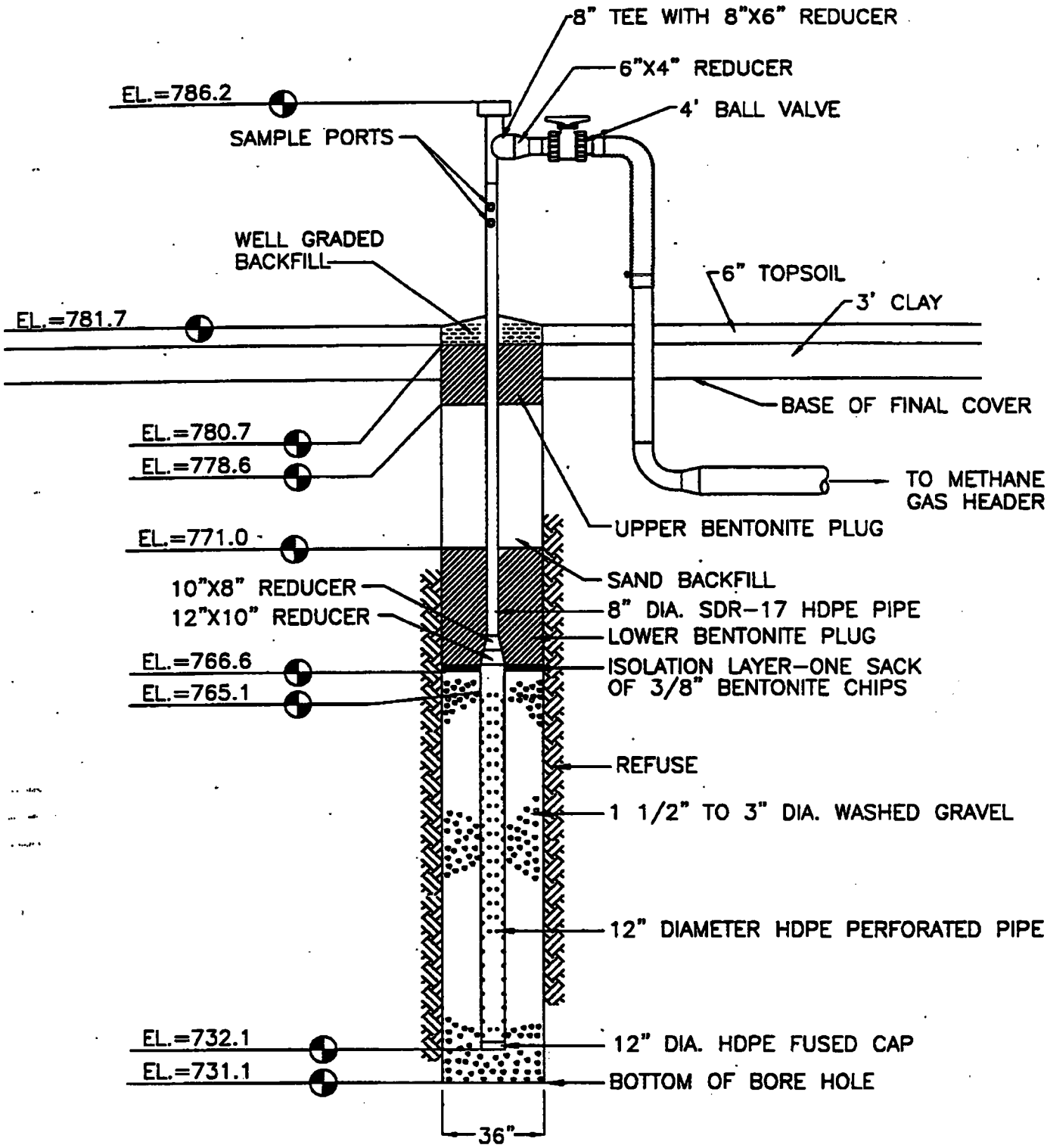
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-52	Surface Elevation:	781.3
Exact Location (Coordinates):	12226N 10450E	Total Depth:	51.6'
Installation Date:	1/14/97	Date Completed:	1/15/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	33.0'	Length of Solid Pipe:	21.9'

Depth	Material Drilled	Comments
0-6	0-0.8' Topsoil, 0.8'-5' Clay	
7-13	Refuse	Dry
14-20	Refuse with Clay	Damp
21-27		
28-34		
35-41		80°F @ 38'
42-48		
49-55	End of borehole @ 51.6'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-53

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 2
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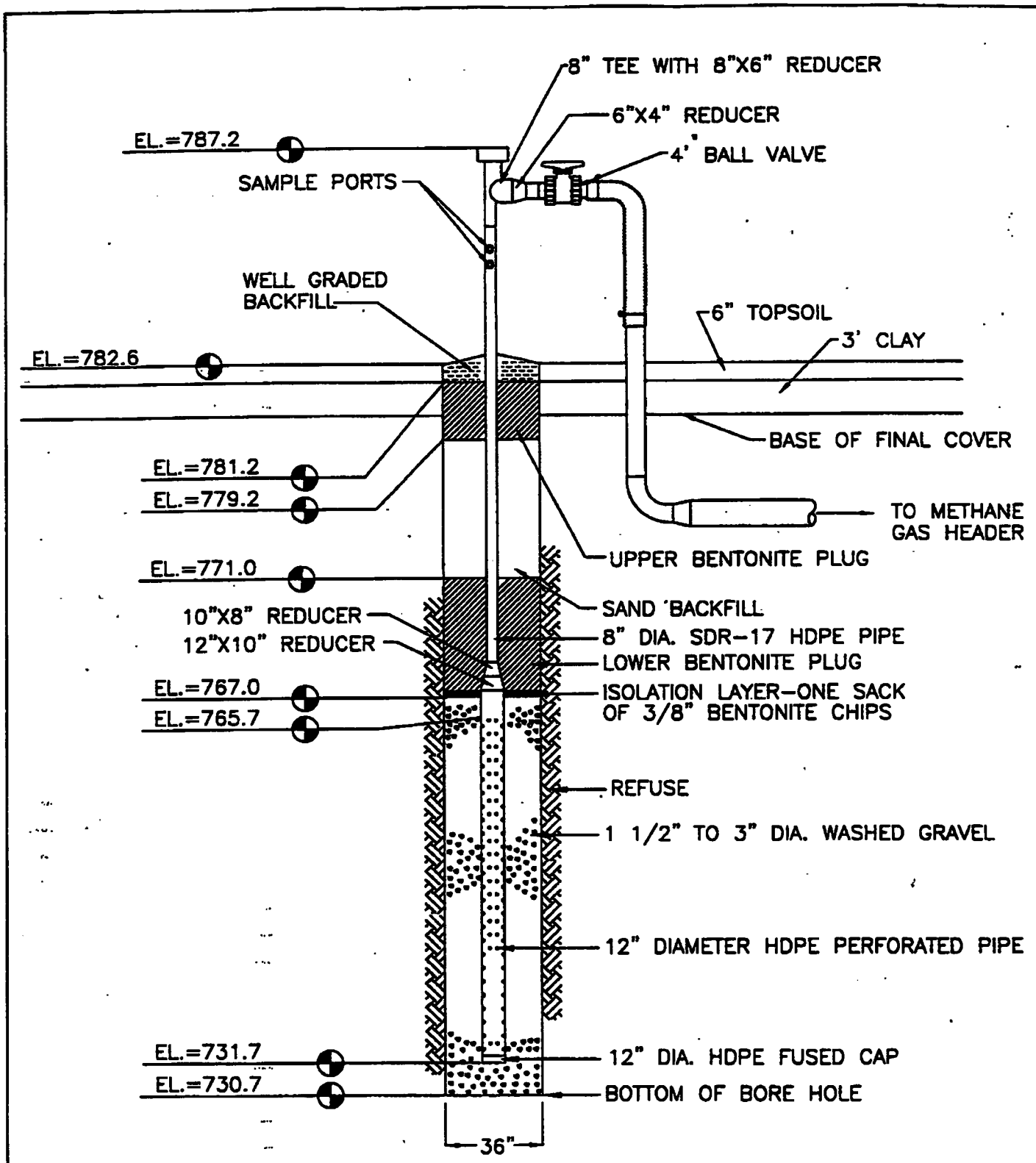
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-53	Surface Elevation:	781.7
Exact Location (Coordinates):	12052N 10448E	Total Depth:	50.6'
Installation Date:	1/14/97	Date Completed:	1/14/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	33.0'	Length of Solid Pipe:	21.1'

Depth	Material Drilled	Comments
0-6	0-0.3' Topsoil, 0.3'-4' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		75°F @ 35', Dry
42-48		
49-55	End of borehole @ 50.6'	Damp
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-54		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		11

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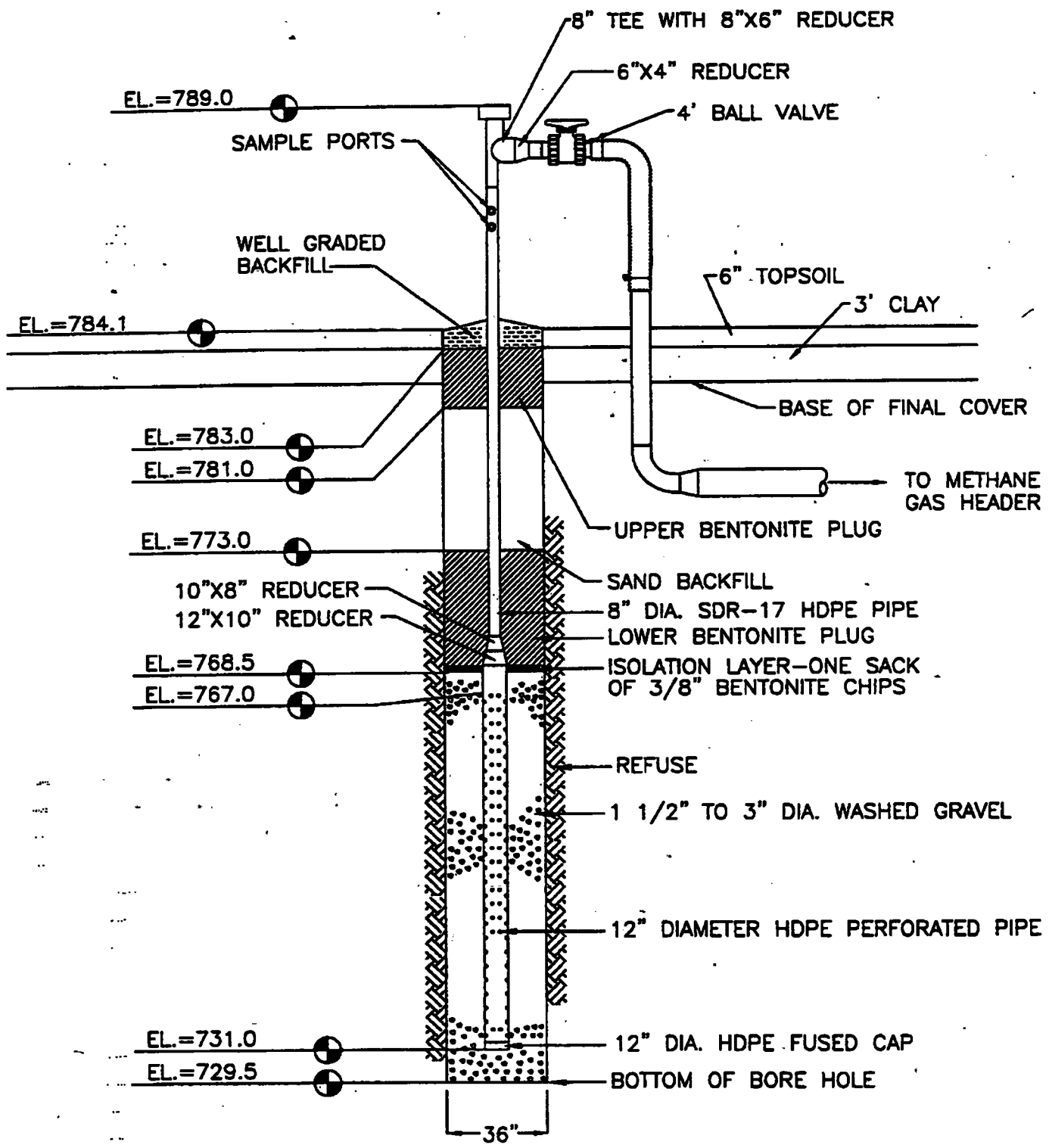
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-54	Surface Elevation:	782.6
Exact Location (Coordinates):	11875N 10448E	Total Depth:	51.9'
Installation Date:	1/14/97	Date Completed:	1/14/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	34.0'	Length of Solid Pipe:	21.5'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-5' Clay	
7-13	Refuse	Dry
14-20		Moist, black in color
21-27		75-80°F
28-34		
35-41		Wet @ 40'
42-48		
49-55	End of borehole @ 51.9'	Wet
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-55		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
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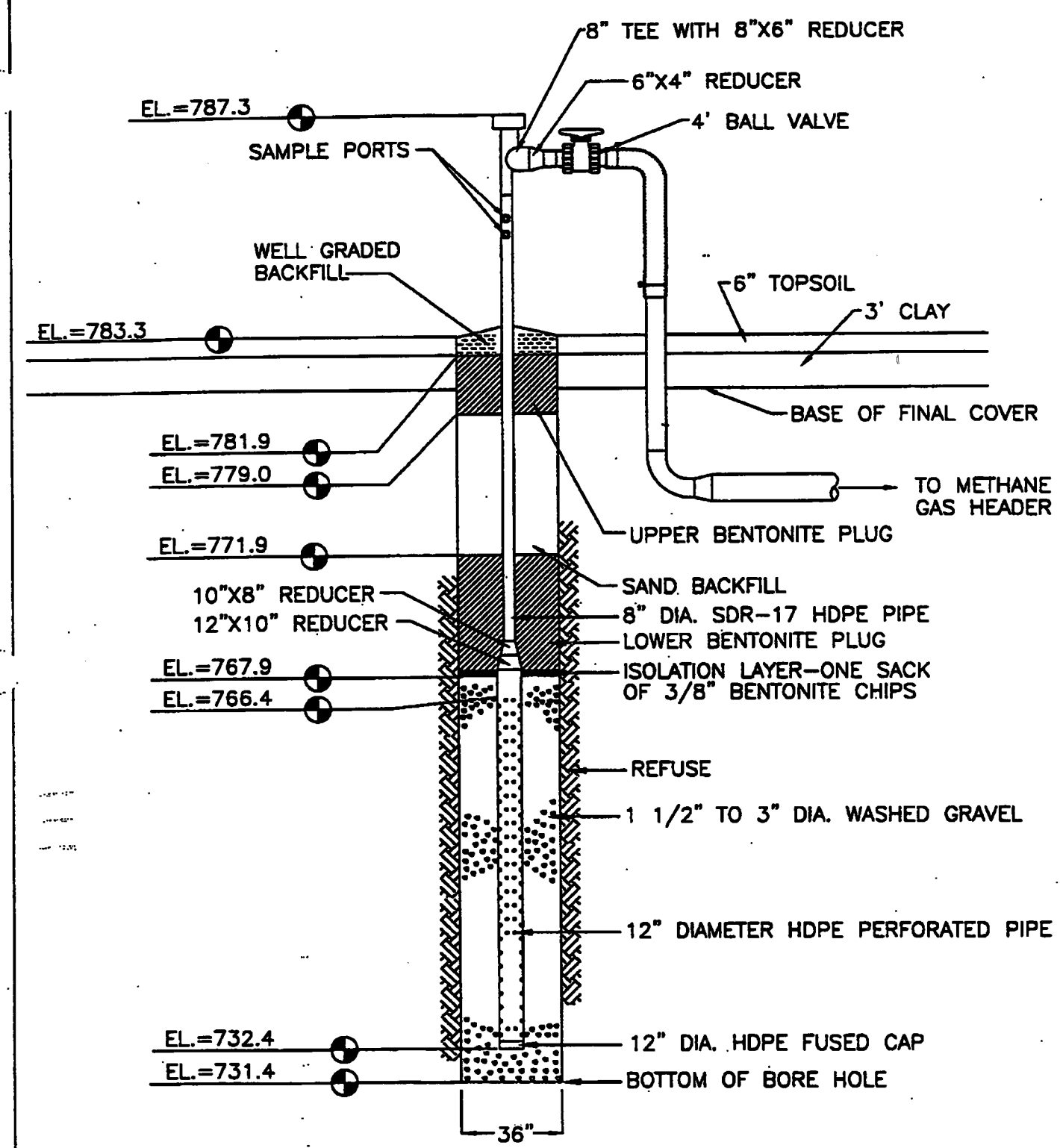
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-55	Surface Elevation:	784.1
Exact Location (Coordinates):	11709N 10439E	Total Depth:	54.6'
Installation Date:	1/14/97	Date Completed:	1/14/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	36.0'	Length of Solid Pipe:	22.0'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-3' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		75°F @ 40'
42-48		Damp, with some pockets of water
49-55	End of borehole @ 54.6'	Damp
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-56		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		115

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-56	Surface Elevation:	783.3
Exact Location (Coordinates):	11532N 10440E	Total Depth:	51.9'
Installation Date:	1/15/97	Date Completed:	1/15/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	34.0'	Length of Solid Pipe:	20.9'

Depth	Material Drilled	Comments
0-6	0-0.3' Topsoil, 0.3'-4' Clay	
7-13	Refuse (Paper and plastic)	Dry
14-20		
21-27		75°F
28-34	Yardwaste paper, and ect.	
35-41		
42-48		
49-55	End of borehole @ 51.9'	Wet @ 48'-51'
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
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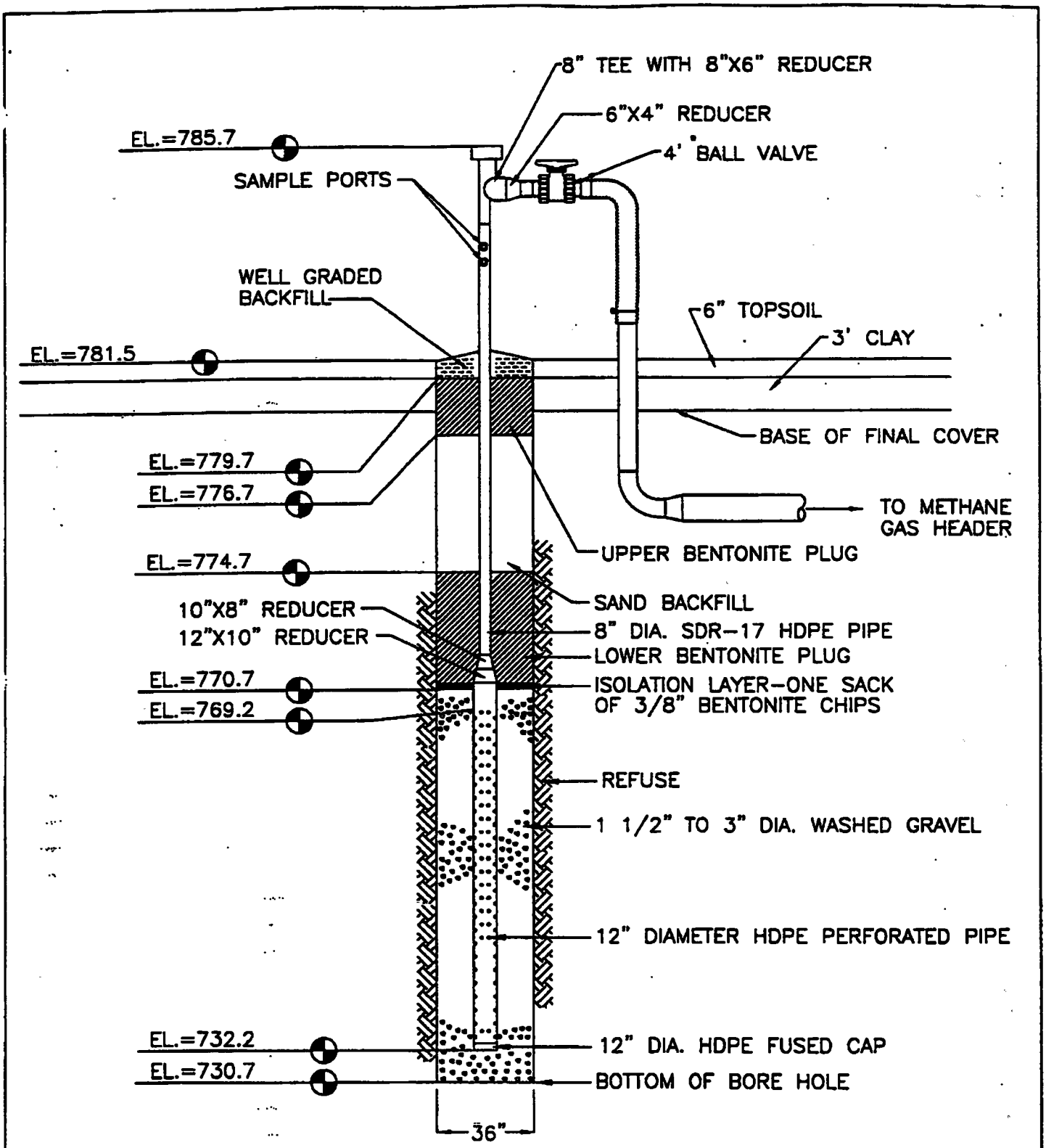
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-57		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		17

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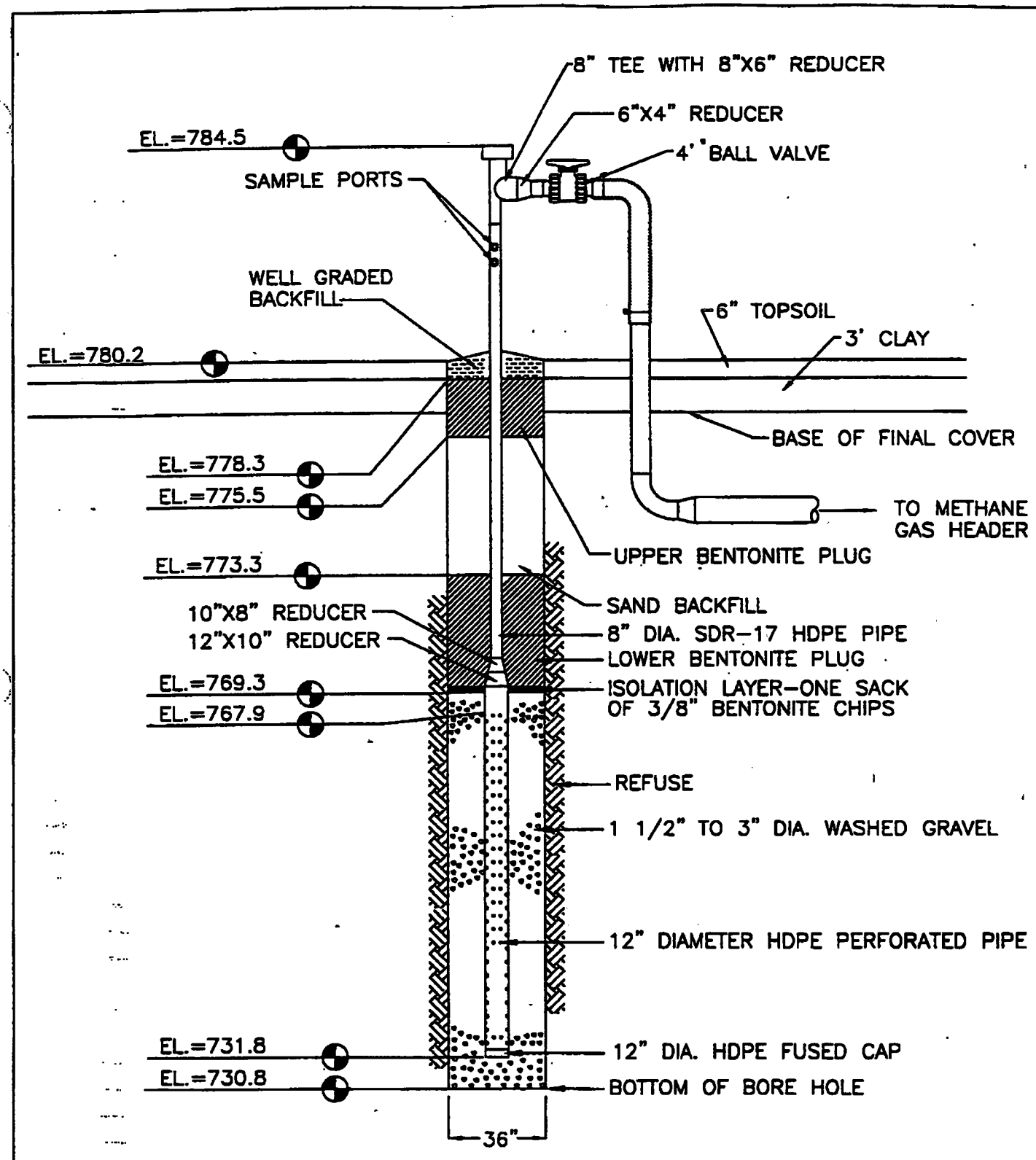
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-57	Surface Elevation:	781.5
Exact Location (Coordinates):	11365N 10442E	Total Depth:	50.8'
Installation Date:	1/15/97	Date Completed:	1/15/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	37.0'	Length of Solid Pipe:	16.5'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-5' Clay	
7-13	Refuse with clay (Paper, plastic, and ect.)	Dry
14-20		
21-27		
28-34		Dry
35-41		70°F @ 40'
42-48		
49-55	End of borehole @ 50.8'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-58

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 2
Zion, Illinois

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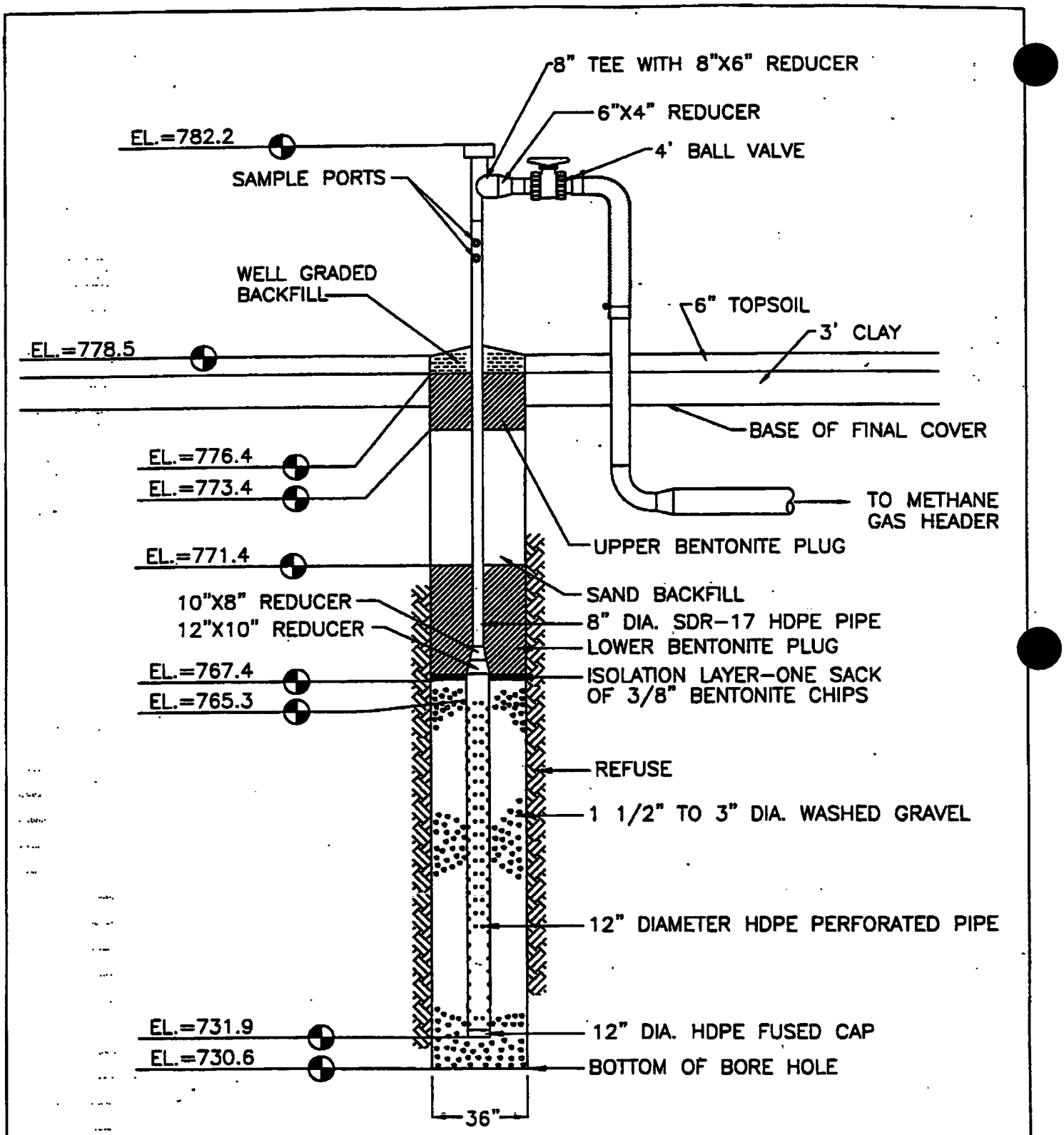
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-58	Surface Elevation:	780.2
Exact Location (Coordinates):	11181N 10438E	Total Depth:	49.4'
Installation Date:	1/15/97	Date Completed:	1/15/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	36.1'	Length of Solid Pipe:	16.6'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-5' Clay	
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20	Refuse/Clay with yardwaste	Refuse has a lot of soil(clay) mixed in it
21-27		
28-34	Refuse/Tires	70°F @ 35'
35-41		
42-48		
49-55	End of borehole @ 49.4'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-59		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		121

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-59	Surface Elevation:	778.5
Exact Location (Coordinates):	11008N 10440E	Total Depth:	47.9'
Installation Date:	1/15/97	Date Completed:	1/15/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	33.4	Length of Solid Pipe:	16.9'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-4.5' Clay	
7-13	Paper, plastic, and wood	Dry
14-20		
21-27		
28-34		70°F @ 30'
35-41		
42-48	End of borehole @ 47.9'	Dry
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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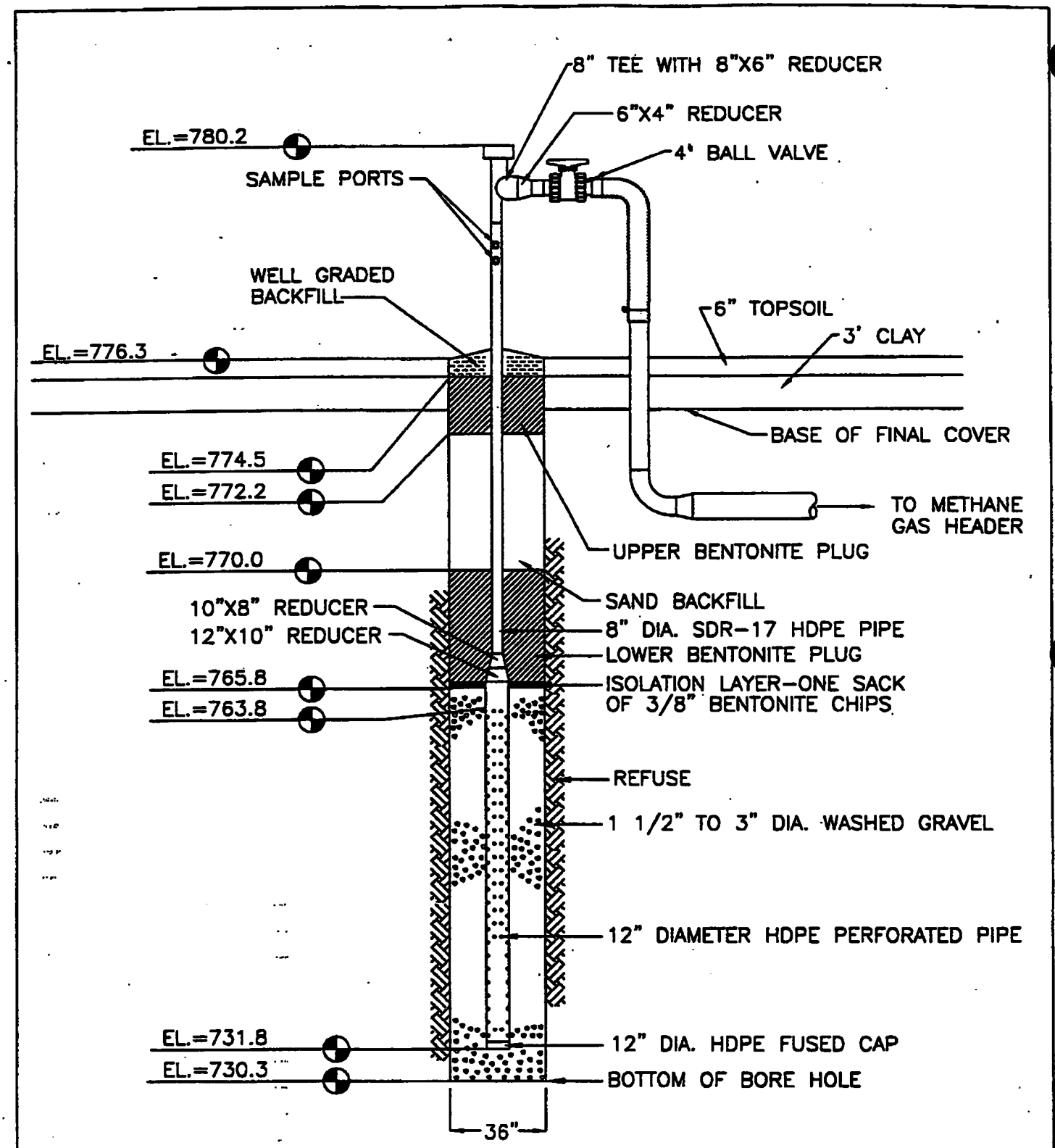
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-60		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		123

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-60	Surface Elevation:	776.3
Exact Location (Coordinates):	10837N 10445E	Total Depth:	46.0'
Installation Date:	1/16/97	Date Completed:	1/16/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	32.0'	Length of Solid Pipe:	16.4'

Depth	Material Drilled	Comments
0-6	0-0.3' Topsoil, 0.3'-4.7' Clay	
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20		
21-27		
28-34		
35-41		
42-48	End of borehole @ 46.0'	Dry
49-55		
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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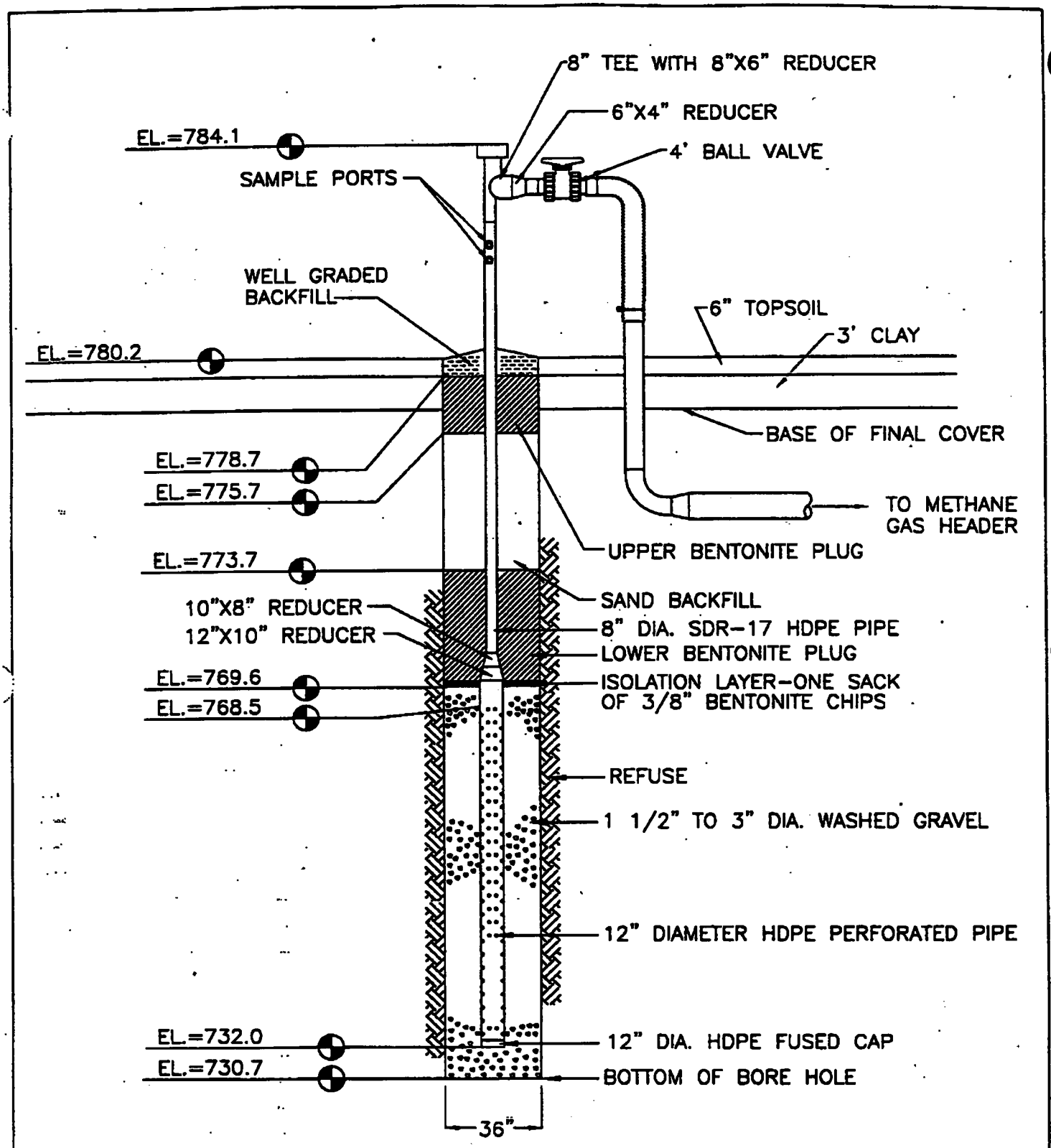
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-61

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 2
Zion, Illinois

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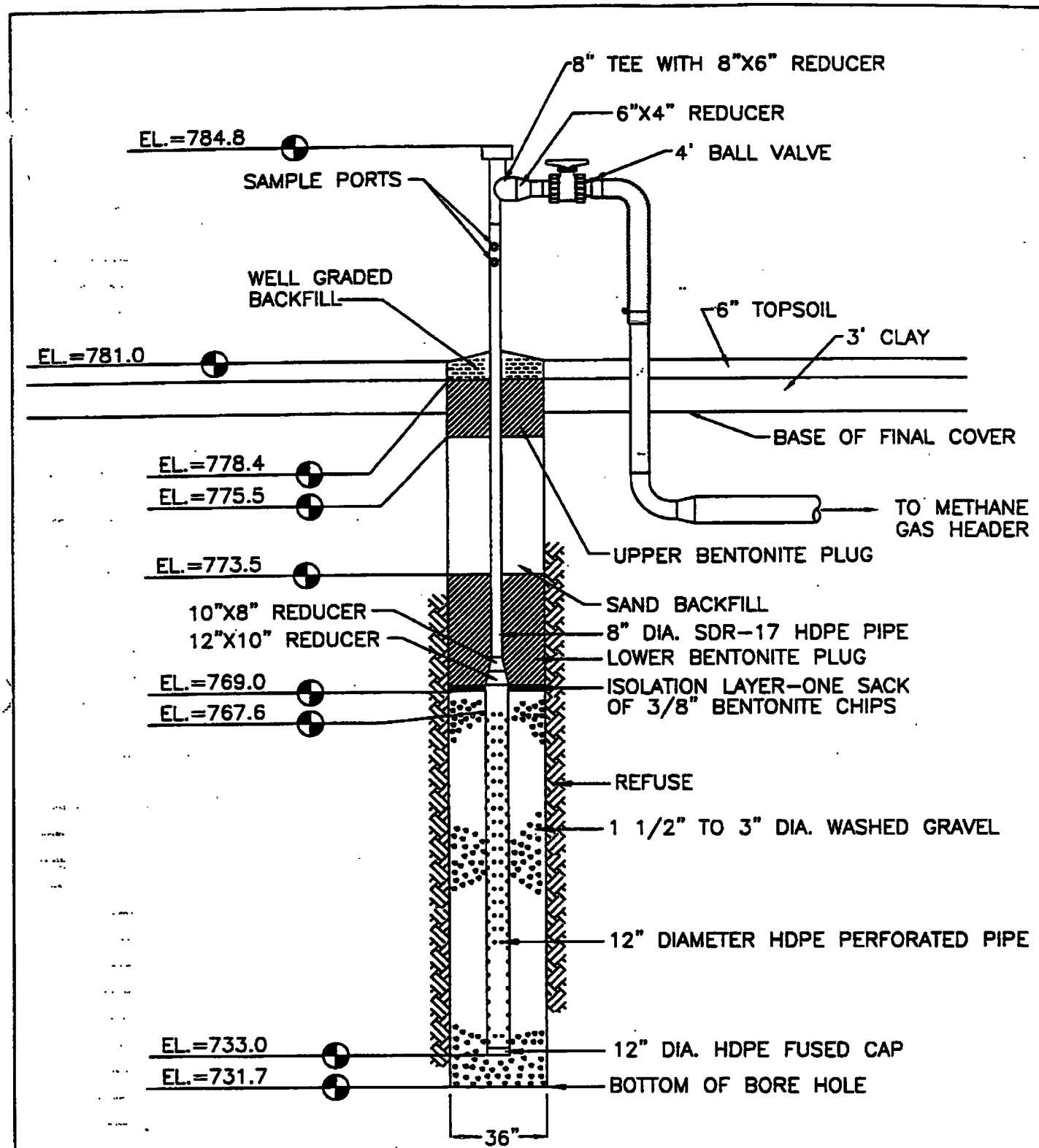
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-61	Surface Elevation:	780.2
Exact Location (Coordinates):	10693N 10354E	Total Depth:	49.5'
Installation Date:	1/16/97	Date Completed:	1/16/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	36.5'	Length of Solid Pipe:	15.6'

Depth	Material Drilled	Comments
0-6		
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of borehole @ 49.5'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-62		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		127

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-62	Surface Elevation:	781.0
Exact Location (Coordinates):	10612N 10224E	Total Depth:	49.3'
Installation Date:	1/23/97	Date Completed:	1/23/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	34.6'	Length of Solid Pipe:	17.2'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-5' Clay	
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20		Refuse has clay (daily cover) mixed in it
21-27		
28-34		
35-41		Dry
42-48		
49-55	End of borehole @ 49.3'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
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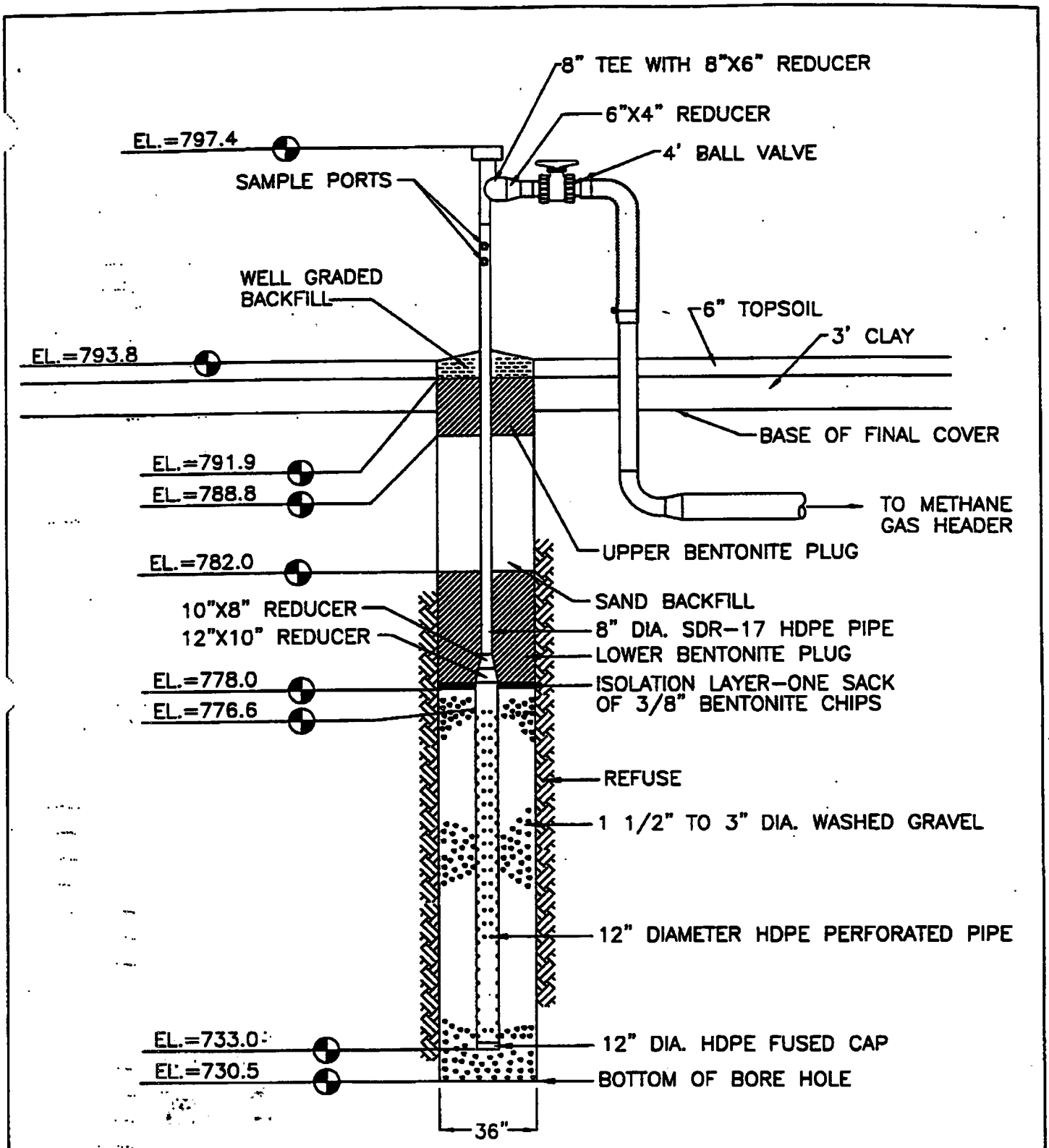
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-63

SCALE: N.T.S.	APPROVED BY:	DRAWN BY: TLS
DATE: Nov 1997	TJA	REVISED:

Zion Landfill – Site 2
Zion, Illinois

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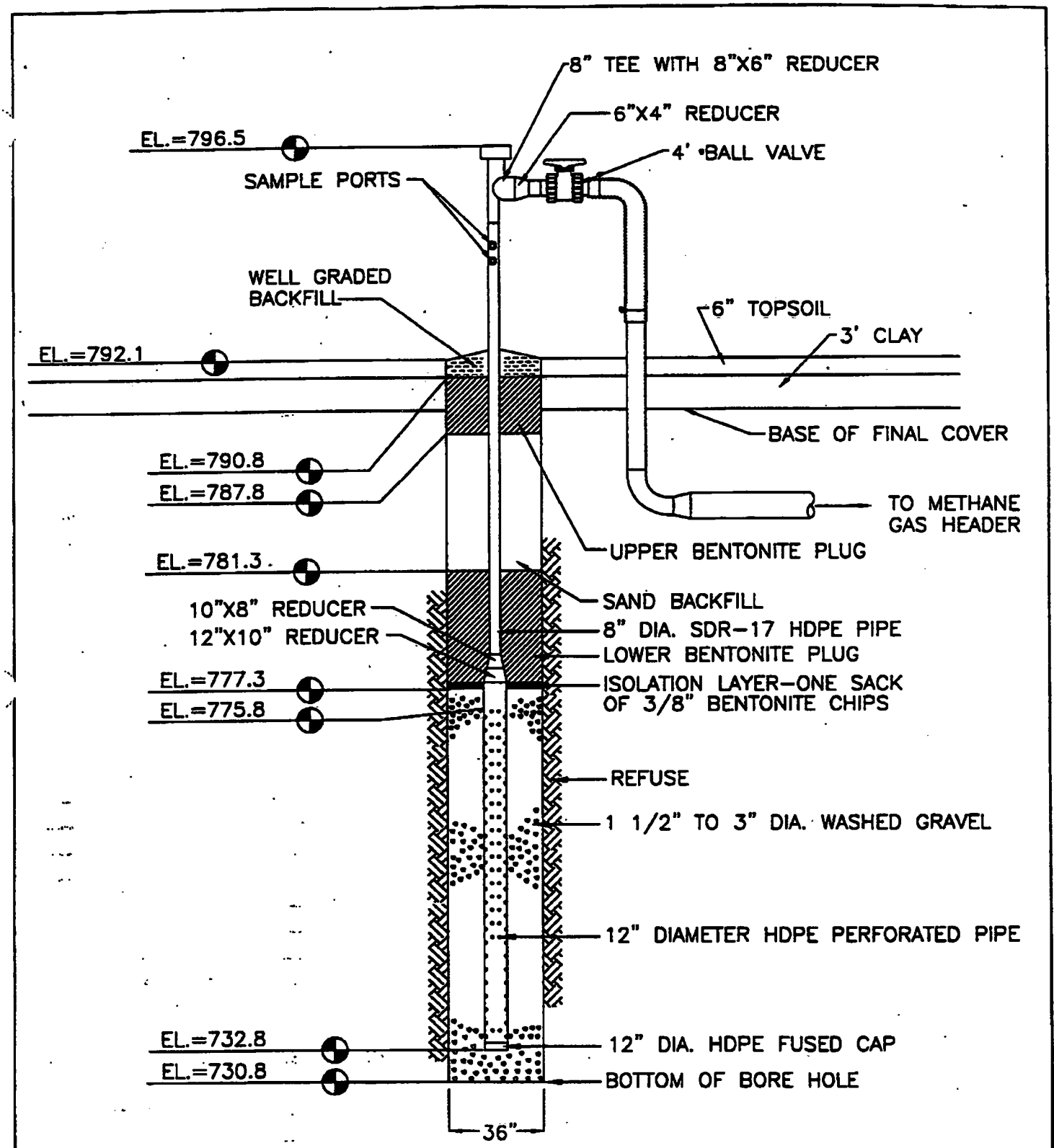
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-63	Surface Elevation:	793.8
Exact Location (Coordinates):	10937N 10146E	Total Depth:	63.3'
Installation Date:	1/23/97	Date Completed:	1/23/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	43.6'	Length of Solid Pipe:	20.8'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-6' Clay	
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20		
21-27		
28-34		
35-41		75°F @ 38'
42-48		
49-55		
56-62		
63-69	End of borehole @ 63.3'	Dry
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-64		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		13

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Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-64	Surface Elevation:	792.1
Exact Location (Coordinates):	11255N 10159E	Total Depth:	61.3'
Installation Date:	1/23/97	Date Completed:	1/23/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	43.0'	Length of Solid Pipe:	20.7'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-5.5' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		Wet @ 35'/black muck
42-48		
49-55		
56-62	End of borehole @ 61.3'	Wet, black muck
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
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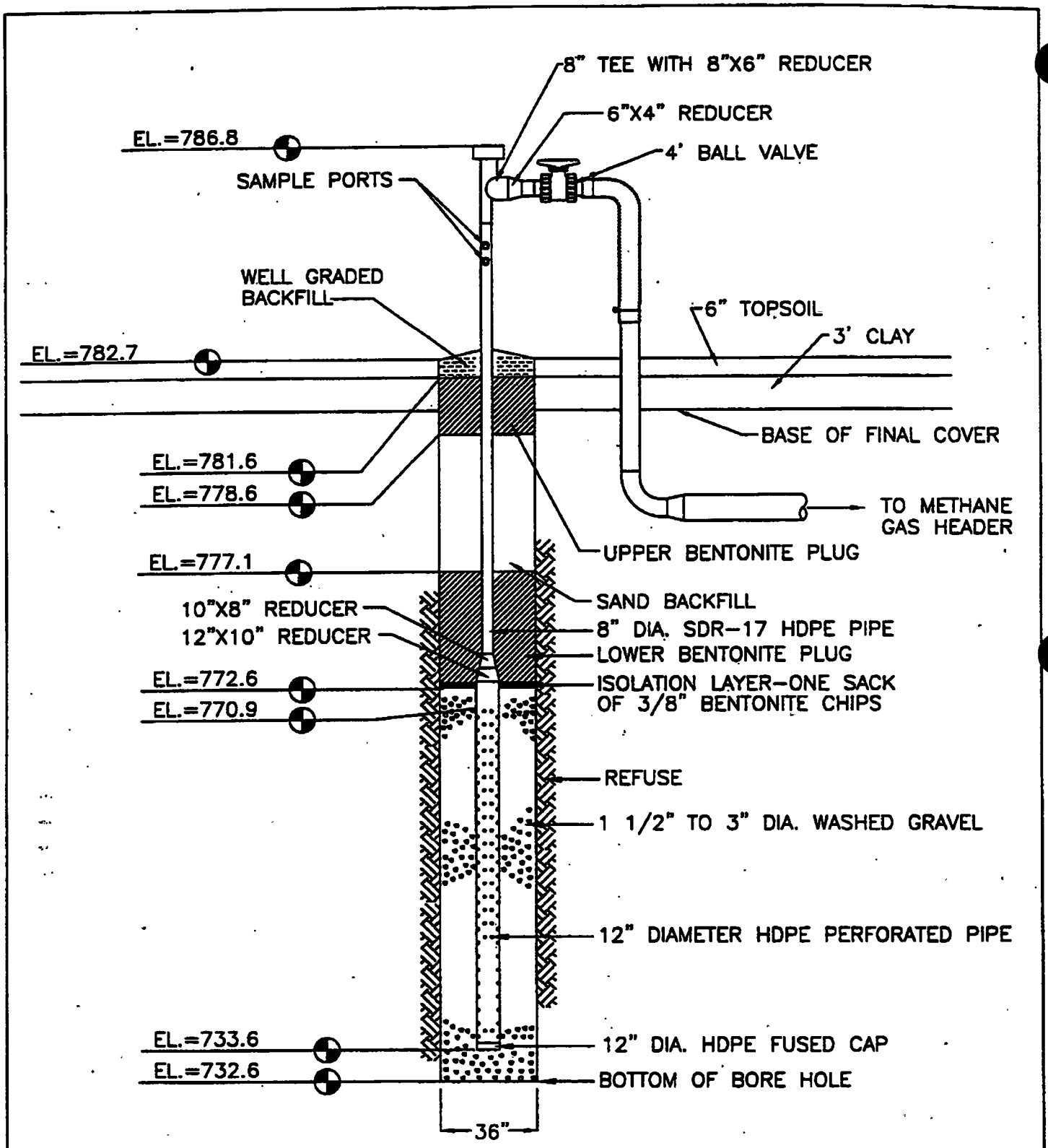
182-188		
189-200		



Extraction Well No. EW-65		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		133

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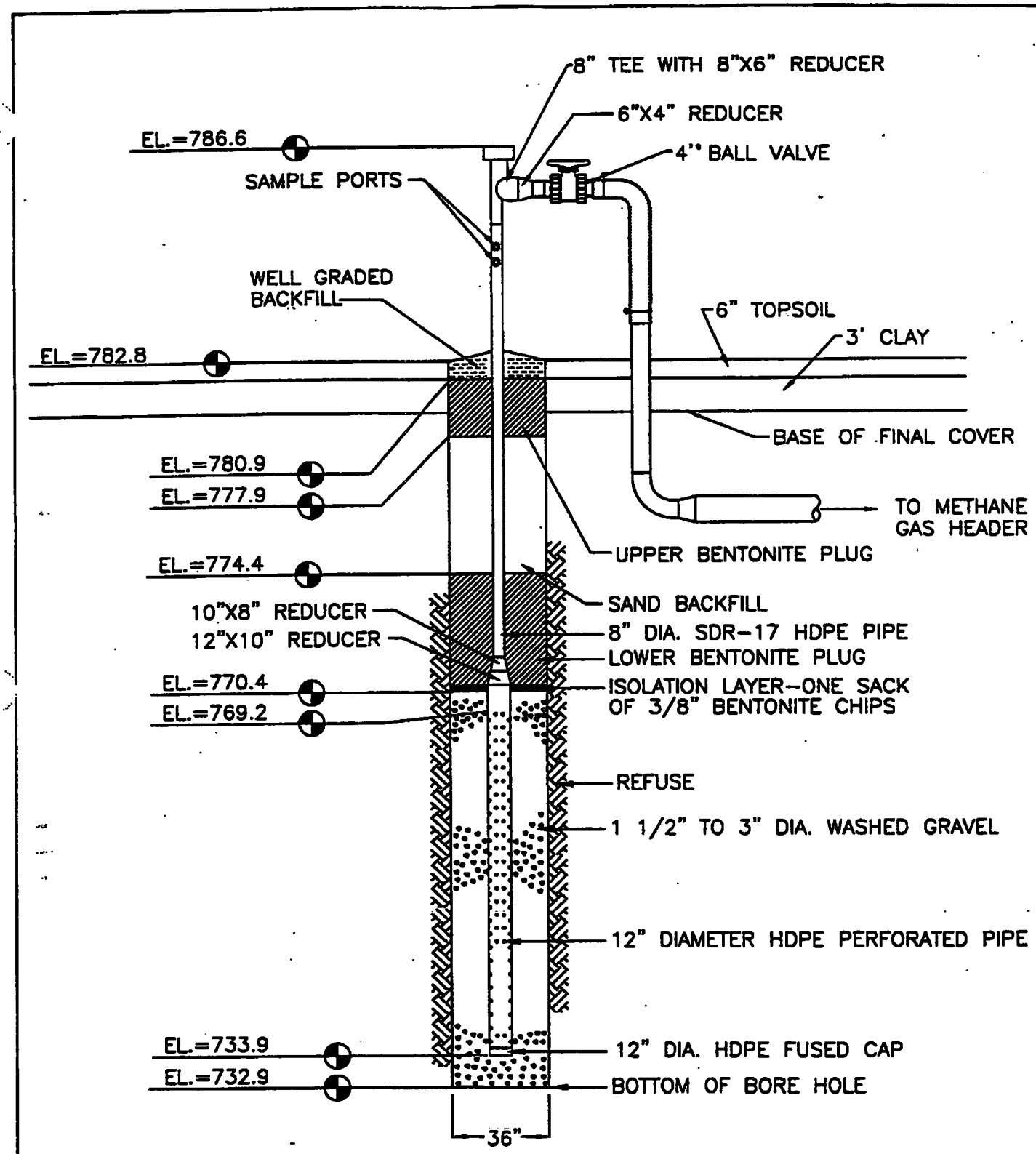
Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-65	Surface Elevation:	782.7
Exact Location (Coordinates):	10617N 10052E	Total Depth:	50.1'
Installation Date:	1/29/97	Date Completed:	1/29/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	37.3'	Length of Solid Pipe:	15.9'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-7' Clay	
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20		
21-27		90°F @ 22'
28-34		Dry
35-41		
42-48		
49-55	End of borehole @ 50.1'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-66		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		135

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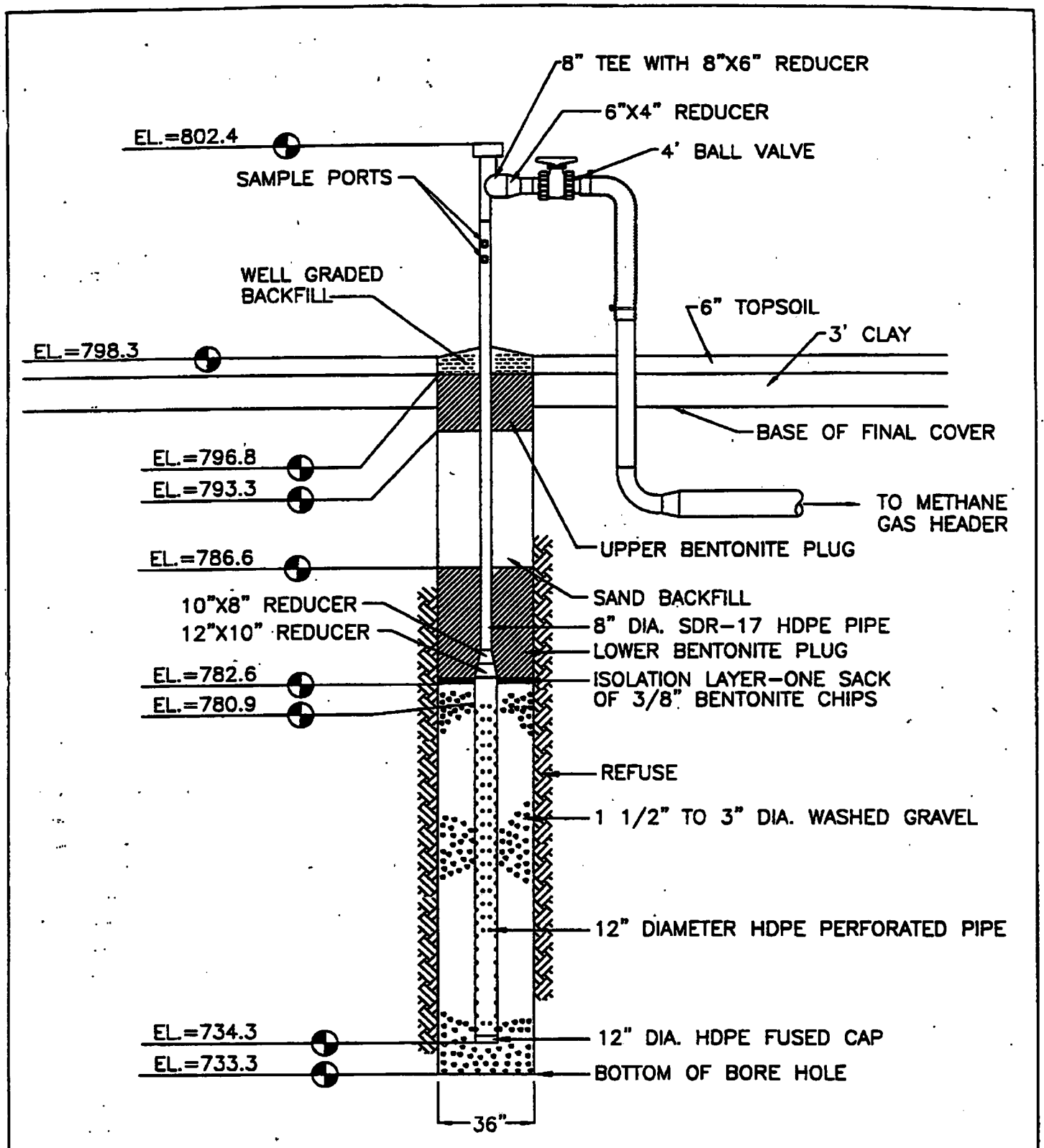
Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-66	Surface Elevation:	782.8
Exact Location (Coordinates):	10605N 9904E	Total Depth:	49.9'
Installation Date:	1/29/97	Date Completed:	1/29/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	35.3'	Length of Solid Pipe:	17.4'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-4.5' Clay	
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20		
21-27		
28-34		90°F @ 30'
35-41		
42-48		
49-55	End of borehole @ 49.9'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-67		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		137

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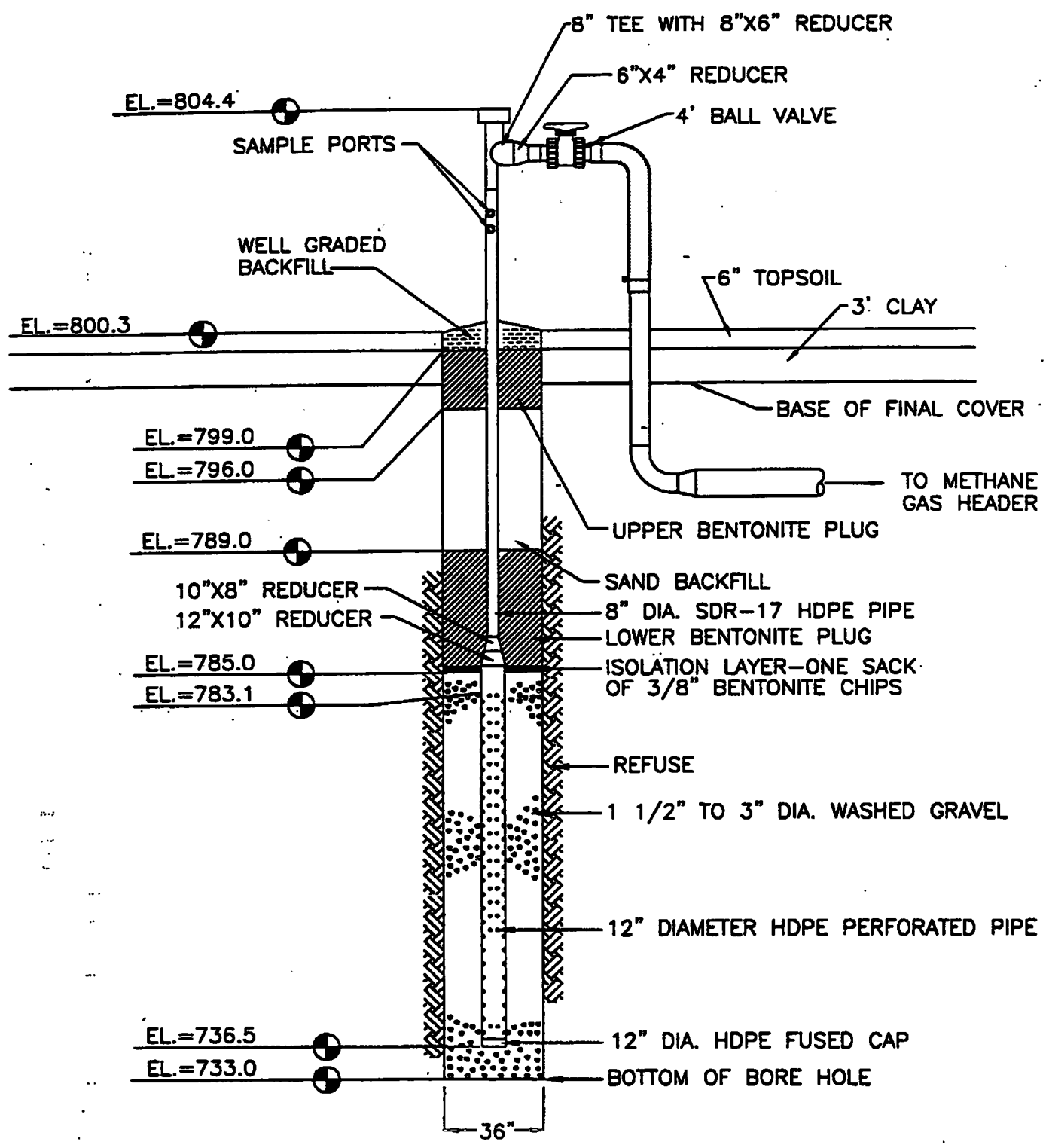
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-67	Surface Elevation:	798.3
Exact Location (Coordinates):	10937N 9886E	Total Depth:	65.0'
Installation Date:	1/28/97	Date Completed:	1/28/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	46.6'	Length of Solid Pipe:	19.8'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-5.5' Clay	
7-13	Refuse	Dry
14-20	Refuse with very little cover	
21-27		
28-34		Dry, 75°F @ 35'
35-41		
42-48		
49-55		
56-62		Wet @ 58'
63-69	End of borehole @ 65.0'	Very Wet
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-68		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		139

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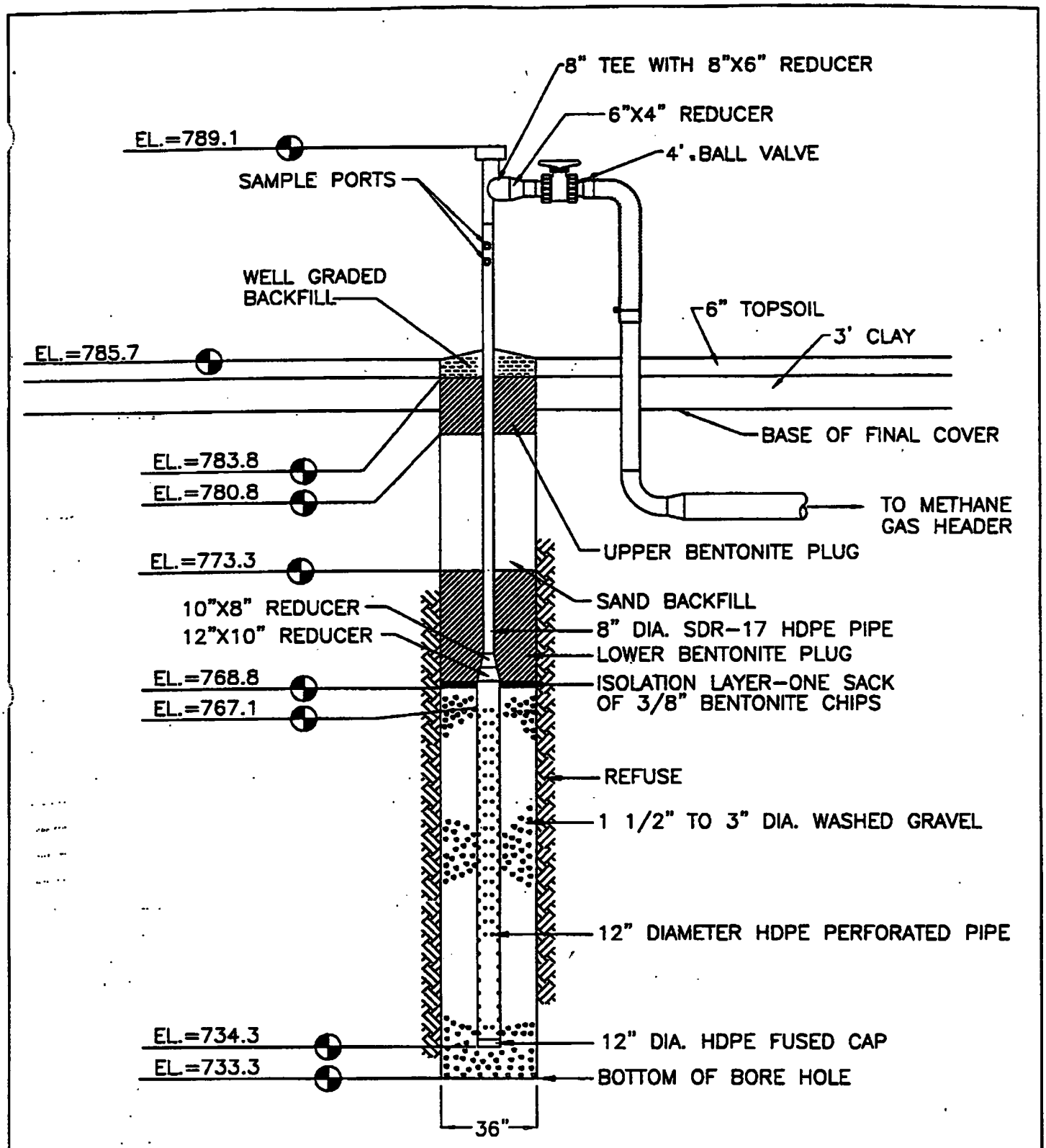
Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-68	Surface Elevation:	800.3
Exact Location (Coordinates):	11238N 9883E	Total Depth:	67.3'
Installation Date:	1/27/97	Date Completed:	1/27/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	46.6'	Length of Solid Pipe:	21.3'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-5' Clay	
7-13	Refuse	Wet refuse @ 10'
14-20		Dry @ 15'
21-27		Dry
28-34		
35-41		
42-48		Dry, 90°F @ 48'
49-55		
56-62		
63-69	End of borehole @ 67.3'	
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-69		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		

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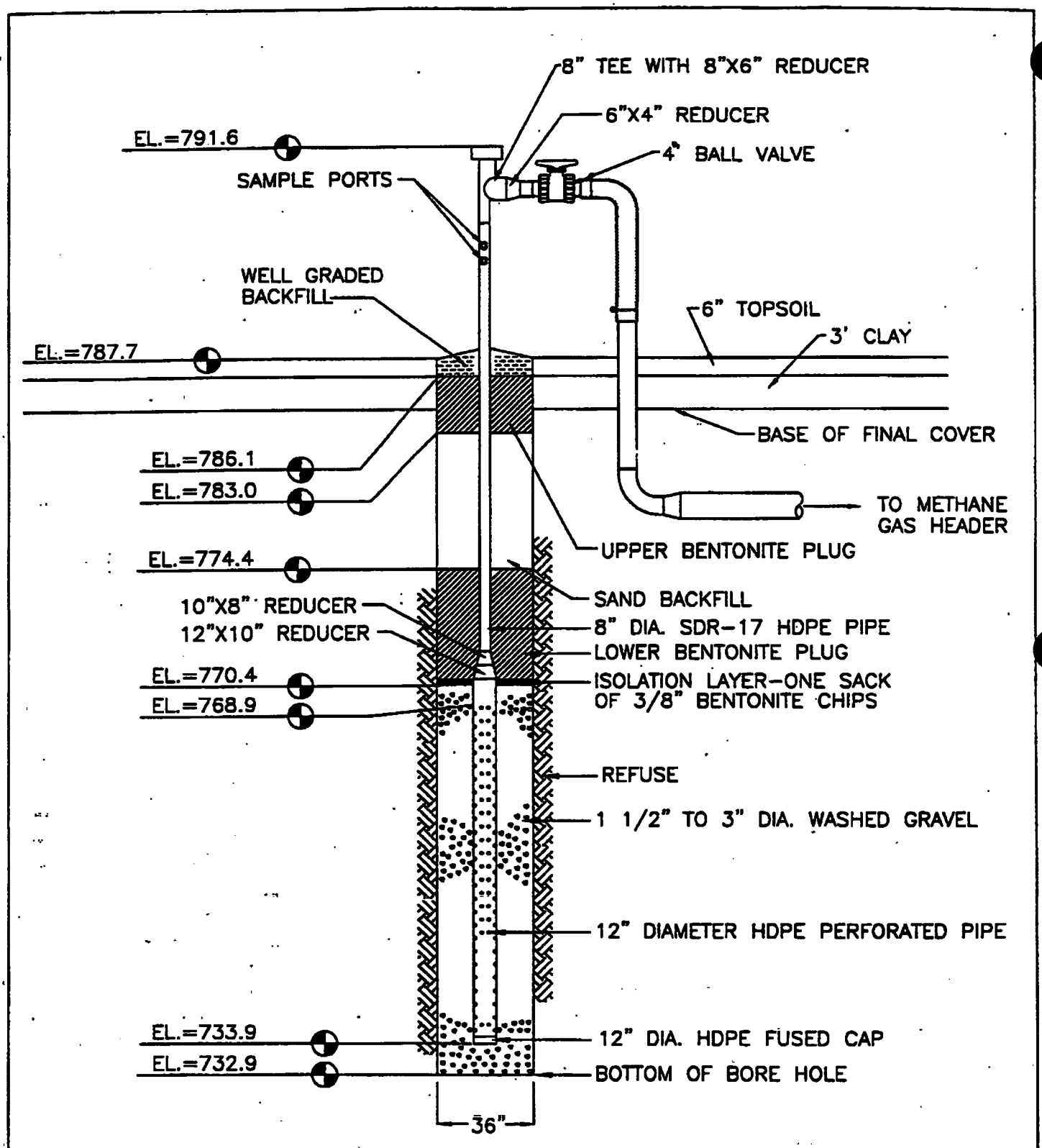
Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-69	Surface Elevation:	785.7
Exact Location (Coordinates):	10606N 9725E	Total Depth:	52.4'
Installation Date:	1/30/97	Date Completed:	1/30/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	32.8'	Length of Solid Pipe:	22.0'

Depth	Material Drilled	Comments
0-6	0-0.4' Topsoil, 0.4'-5.5' Clay	
7-13	Refuse	Dry
14-20		
21-27		Partly decomposed/80°F @ 25'
28-34		
35-41		
42-48		
49-55	End of borehole @ 52.4'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-70

SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:

Zion Landfill – Site 2
Zion, Illinois

CQM, Inc.

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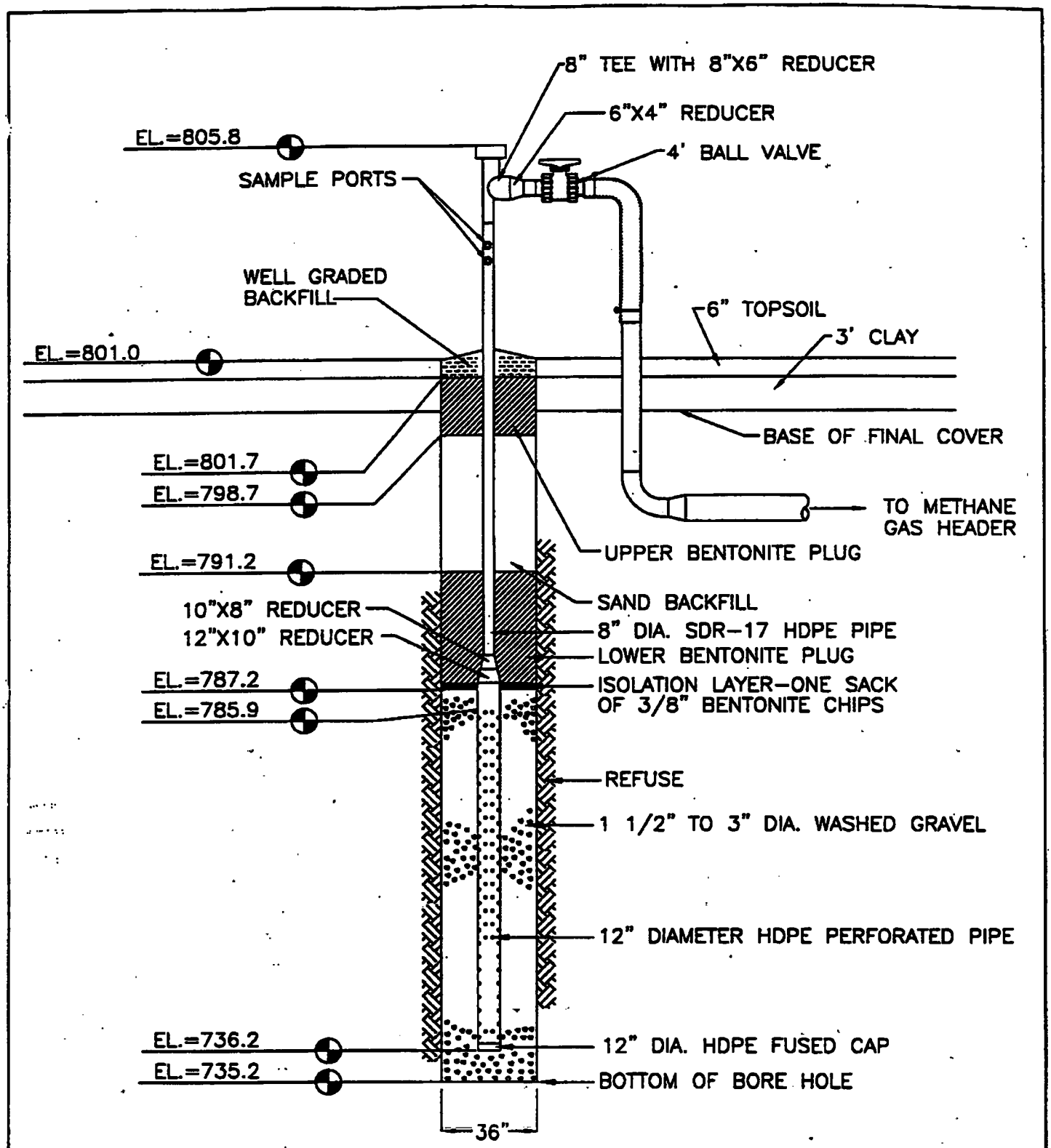
Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-70	Surface Elevation:	787.7
Exact Location (Coordinates):	10606N 9593E	Total Depth:	54.8'
Installation Date:	1/30/97	Date Completed:	1/30/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	35.0'	Length of Solid Pipe:	22.7'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-4.5' Clay	
7-13	Refuse	Dry
14-20		
21-27		
28-34		
35-41		
42-48		
49-55	End of borehole @ 54.8'	Dry
56-62		
63-69		
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-71		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc.		145

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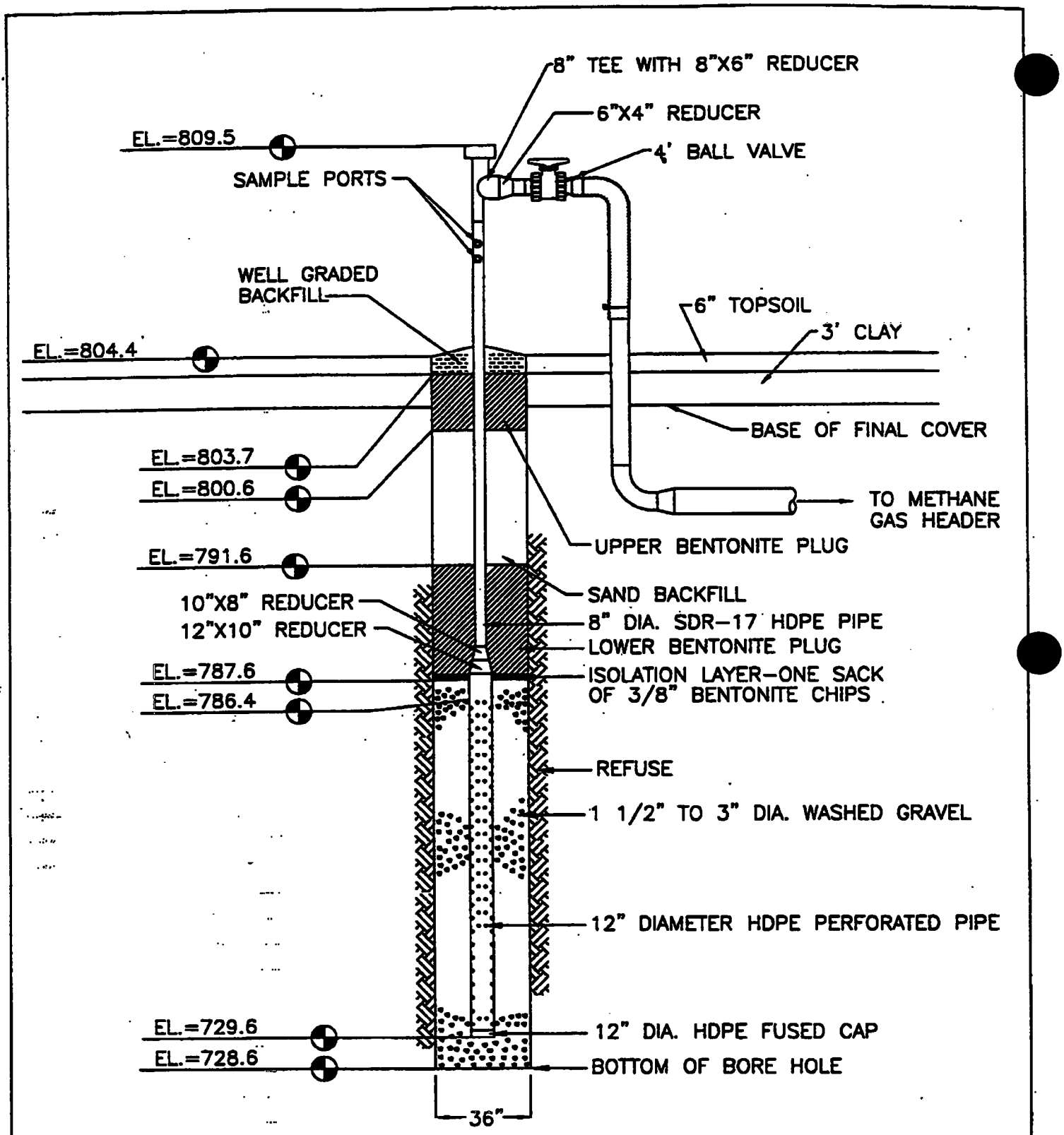
Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill Site 2	State:	Illinois
Well Number/Name:	EW-71	Surface Elevation:	801.0
Exact Location (Coordinates):	10927N 9584E	Total Depth:	65.8'
Installation Date:	1/28/97	Date Completed:	1/28/97
Bore Hole Size:	36"	Well Size:	12" Perf. 8" Solid
Length of Perforated Pipe:	49.7'	Length of Solid Pipe:	19.9'

Depth	Material Drilled	Comments
0-6	0-0.4' Topsoil, 0.4'-5.5' Clay	
7-13	Refuse (Paper, plastic, and wood)	Dry
14-20		80°F @ 18'
21-27		
28-34		
35-41		
42-48		
49-55		
56-62		
63-69	End of borehole @ 65.8'	Dry
70-76		
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		



Extraction Well No. EW-72		
SCALE: N.T.S.	APPROVED BY: TJA	DRAWN BY: TLS
DATE: Nov 1997		REVISED:
Zion Landfill – Site 2 Zion, Illinois		
CQM, Inc. 147		

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Browning-Ferris Gas Services, Inc.

Well Drilling/Completion Report

Landfill Site:	Zion Landfill - Site 2	State:	Illinois
Well Number/Name:	EW-72	Surface Elevation:	804.4
Exact Location (Coordinates):	11216N 9547E	Total Depth:	75.8'
Installation Date:	1/28/97	Date Completed:	1/29/97
Bore Hole Size:	36"	Well Size:	12" Perf. & 8" Solid HDPE
Length of Perforated Pipe:	56.8'	Length of Solid Pipe:	23.1'

Depth	Material Drilled	Comments
0-6	0-0.5' Topsoil, 0.5'-5.5' Clay	
7-13	Refuse (paper, plastic, and wood)	Dry
14-20		
21-27		Dry/Partly Decomposed
28-34		
35-41		
42-48		
49-55		
56-62		100°F @ 60'
63-69		
70-76	End of Borehole @ 75.8'	Dry
77-83		
84-90		
91-97		
98-104		
105-111		
112-118		
119-125		
126-132		
133-139		
140-146		
147-153		
154-160		
161-167		
168-174		
175-181		
182-188		
189-200		

TABLE 1

AS-BUILT GAS EXTRACTION WELL SCHEDULE

BFI-Zion Landfill

Sites 1A, 1B, 2 Leachate and Gas Extraction System Construction

Lake County, Illinois

Extraction Well Number		Northing (feet)	Easting (feet)	Surface Elevation (feet)	Base Elevation (feet)	Well Base Elevation (feet)	Drilling Depth (feet)	Perforated Pipe Length (feet)	Solid Wall Pipe Length (feet)
Site 1A									
EW	1	12,416	9,311	789.3	749.4	750.4	39.9	23.9	19.6
EW	2	12,031	9,350	802.5	747.4	748.4	55.1	32.8	24.9
EW	3	12,137	9,119	807.3	746.6	747.6	60.7	32.7	31.5
EW	4	12,426	9,097	789.0	749.9	750.9	39.1	22.8	19.2
EW	5	12,420	8,890	788.2	749.3	750.3	38.9	22.9	19.4
EW	6	12,245	8,894	797.3	747.3	749.3	50.0	31.9	20.5
EW	7	12,078	8,892	799.1	746.5	747.5	52.6	33.0	23.6
EW	8	11,913	8,884	798.0	746.8	747.8	51.2	37.0	18.1
EW	9	11,720	8,871	795.2	745.8	746.8	49.4	34.0	19.2
EW	10	11,726	9,245	812.4	746.2	747.2	66.2	41.0	29.3
EW	11	11,577	8,869	799.0	745.3	746.3	53.7	34.2	23.2
EW	12	11,430	8,851	797.1	745.5	746.5	51.6	37.1	18.3
EW	13	11,427	9,169	811.4	743.7	744.7	67.7	44.0	27.9
EW	14	11,225	8,837	795.0	743.8	744.8	51.2	35.2	19.5
EW	15	11,054	8,814	791.7	742.0	743.1	49.7	34.0	19.0
EW	16	11,171	9,075	809.0	743.8	745.0	65.2	42.5	26.1
EW	17	10,865	8,801	782.5	741.7	742.7	40.8	24.5	19.5
EW	18	10,825	9,077	801.2	740.8	741.8	60.4	38.0	26.4
EW	19	10,662	8,813	776.7	739.6	740.6	37.1	19.8	20.6
EW	20	10,466	8,823	771.6	738.9	739.9	32.7	14.0	22.2
EW	21	10,293	8,794	763.5	739.0	740.0	24.5	9.3	18.4
EW	22	10,281	8,992	767.8	738.3	739.3	29.5	11.1	21.5
EW	23	10,253	9,175	766.4	739.5	740.5	26.9	10.0	19.8
EW	24	10,446	9,176	777.7	739.0	740.0	38.7	22.0	20.6
EW	25	10,551	9,011	785.9	740.2	741.2	45.7	28.8	20.1
EW	26	10,580	9,312	783.2	738.4	739.4	44.8	28.8	20.4
EW	27	10,933	9,293	804.6	740.8	741.8	63.8	42.0	24.8
EW	28	11,226	9,357	809.7	743.5	744.5	66.2	44.5	24.8
					Site 1A Totals		1353.3	831.8	618.4
Site 1B									
EW	29	11,027	8,473	764.2	696.9	697.9	67.3	49.0	20.9
EW	30	10,996	8,272	751.9	710.1	711.1	41.8	26.0	17.9
EW	31	10,806	8,302	746.4	703.5	704.5	42.9	28.0	17.1
EW	32	10,813	8,517	750.6	704.8	705.8	45.8	31.0	17.6
EW	33	10,505	8,312	743.2	700.4	701.4	42.8	27.0	17.9
EW	34	10,477	8,539	747.7	709.0	710.0	38.7	22.0	19.3
EW	35	10,295	8,330	745.0	696.7	697.7	48.3	33.0	17.4
EW	36	10,278	8,516	746.4	695.6	696.6	50.8	33.2	20.3
					Site 1B Totals		378.4	249.2	148.4

TABLE 1
AS-BUILT GAS EXTRACTION WELL SCHEDULE
BFI-Zion Landfill
Sites 1A, 1B, 2 Leachate and Gas Extraction System Construction
Lake County, Illinois

Extraction Well Number		Northing (feet)	Easting (feet)	Surface Elevation (feet)	Base Elevation (feet)	Well Base Elevation (feet)	Drilling Depth (feet)	Perforated Pipe Length (feet)	Solid Wall Pipe Length (feet)
Site 2									
EW	37	11,508	9,544	803.8	734.5	735.5	69.3	50.5	22.6
EW	38	11,816	9,520	801.1	734.8	735.9	66.3	47.5	22.2
EW	39	12,138	9,522	794.1	735.8	736.8	58.3	42.3	20.2
EW	40	12,423	9,570	781.7	735.6	736.6	46.1	32.0	19.0
EW	41	12,392	9,747	782.7	735.0	736.0	47.7	34.3	16.7
EW	42	12,399	9,925	776.8	733.6	734.6	43.2	31.0	16.3
EW	43	12,121	9,817	796.7	733.8	734.8	62.9	46.5	19.6
EW	44	11,827	9,827	798.5	735.4	736.4	63.1	44.7	20.7
EW	45	11,513	9,858	799.9	733.6	734.6	66.3	48.6	21.3
EW	46	12,398	10,082	775.8	732.6	733.6	43.2	29.7	17.0
EW	47	12,123	10,176	792.7	732.5	733.5	60.2	43.0	20.7
EW	48	11,822	10,183	794.7	731.2	732.2	63.5	45.0	21.5
EW	49	11,515	10,157	794.7	730.7	732.7	64.0	44.0	22.6
EW	50	12,396	10,262	776.7	730.6	732.3	46.1	31.7	17.3
EW	51	12,403	10,433	775.8	730.8	731.8	45.0	31.7	17.4
EW	52	12,226	10,450	781.3	729.7	731.2	51.6	33.0	21.9
EW	53	12,052	10,448	781.7	731.1	732.1	50.6	33.0	21.1
EW	54	11,875	10,448	782.6	730.7	731.7	51.9	34.0	21.5
EW	55	11,709	10,439	784.1	729.5	731.0	54.6	36.0	22.0
EW	56	11,532	10,440	783.3	731.4	732.4	51.9	34.0	20.9
EW	57	11,365	10,442	781.5	730.7	732.2	50.8	37.0	16.5
EW	58	11,181	10,438	780.2	730.8	731.8	49.4	36.1	16.6
EW	59	11,008	10,440	778.5	730.6	731.9	47.9	33.4	16.9
EW	60	10,837	10,445	776.3	730.3	731.8	46.0	32.0	16.4
EW	61	10,693	10,354	780.2	730.7	732.0	49.5	36.5	15.6
EW	62	10,612	10,224	781.0	731.7	733.0	49.3	34.6	17.2
EW	63	10,937	10,146	793.8	730.5	733.0	63.3	43.6	20.8
EW	64	11,255	10,159	792.1	730.8	732.8	61.3	43.0	20.7
EW	65	10,617	10,052	782.7	732.6	733.6	50.1	37.3	15.9
EW	66	10,605	9,904	782.8	732.9	733.9	49.9	35.3	17.4
EW	67	10,937	9,886	798.3	733.3	734.3	65.0	46.6	19.8
EW	68	11,238	9,883	800.3	733.0	736.5	67.3	46.6	21.3
EW	69	10,606	9,725	785.7	733.3	734.3	52.4	32.8	22.0
EW	70	10,606	9,593	787.7	732.9	733.9	54.8	35.0	22.7
EW	71	10,927	9,584	801.0	735.2	736.2	65.8	49.7	19.9
EW	72	11,216	9,547	804.4	728.6	729.6	75.8	56.8	23.1
					Site 2 Totals		2004.4	1408.8	705.3

BY: ASP
CHECKED: MJT
PROJECT NO.: 3828
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DATE: 12/18/97

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TABLE 2

SUMMARY OF LABORATORY SOIL TESTS

BFI-Zion Landfill
Sites 1A, 1B, and 2 Gas and Leachate Extraction System Construction
Lake County, Illinois

Location	Lift #	Sample Date	P200 (%)	Clay Content (%)	Liquid Limit (%)	Plasticity Index (%)	Hydraulic Conductivity (cm/sec)	Shelby Tube		Unified Soil Classification	Std. Proctor	
								Dry Density	Moisture Content		Max. Density	Opt. Moisture
Site 2, Profile A, Sta. 7+50	3	2/13/97	-	-	-	-	-	-	-	-	115.0	15.7
Site 1A, Profile N, Sta. 6+50	-	4/10/97	77.2	47.1	37	19	4.50E-09	114.7	16.6	CL	-	-
Site 2, Profile A, Sta. 10+00	2	5/7/97	78.2	41.1	29	14	-	-	-	CL	-	-
Site 2, Profile A(Lat. to EW63), Sta. 1+50	3	6/19/97	81.7	45.5	34	15	6.40E-09	114.0	15.5	CL	-	-
Site 2, Profile A, Sta. 6+00	3	7/24/97	81.1	44.4	34	17	-	-	-	CL	-	-
Summary:												
Mean			79.6	44.5	34	16	5.5E-09					
Standard Deviation			2.2	2.5	3	2	1.3E-09					
Maximum			81.7	47.1	37	19	6.4E-09					
Minumum			77.2	41.1	29	14	4.5E-09					

BY: ASP

CHECKED: MJT

PROJECT NO.: 3828.03

FILE: p:\data\projects\3828\soil.xls

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Table 3

System Maintenance Schedule Summary

Maintenance Activity	Frequency
Wells/Probes	
1. Inspect for settling, weeds, leaks, water	Monthly
Extraction System Piping	
1. Inspect for settling, weeds, leaks, water	Monthly
2. Exercise header isolation valves	Quarterly
Condensate System	
1. Check storage tank volumes and condition	Weekly
2. Check isolation valve operation; inspect for leaks at fittings	Quarterly
3. Analyze condensate for pH, COD, TSS, and conductivity	Annually
4. Analyze condensate for priority pollutants	Annually
Blower Building	
1. Inspect piping, fittings, valves, seals for leaks or breakage	Weekly
2. Drain knock-out pot during changeover	Weekly
3. Check for belt condition, loose connections, vibration at blower	Weekly
4. Drain blower and header low points during changeover	Monthly
5. Inspect fire extinguishers	Quarterly
6. Lubricate blower motor bearings	Quarterly
7. Lubricate exhaust fan	Quarterly
8. Calibrate explosive gas sensor(s) and check alarm function	Semi-Annually
9. Lubricate blower bearings	Annually
10. Clean knock-out pot and demister	Annually
11. Check motor/blower alignment	Semi-Annually
12. LFG samples at blower discharge	Semi-Annually
Flare	
1. Drain flame arrestor	Semi-Annually
2. Inspect control panel for water damage	Weekly
3. Check propane level	Monthly
4. Replace charts	Weekly
5. Weed, debris removal	Monthly
6. Clean flame arrestor	Annually
7. Visually inspect refractory	Quarterly
8. Inspect gas solenoids	Annually
9. Clean/inspect flame scanner view and vent	Semi-Annually
10. Purge blower/motor lubrication	Semi-Annually

APPENDIX D

APPENDIX D - MONITORING AND RECORD FORMS

- Weekly Gas Monitoring Report
- Monthly Gas Monitoring Report
- Maintenance and Repair Log
- Weekly LFG Extraction System Report
- Instrument Calibration Record

Weekly Gas Monitoring Report

WEEKLY GAS MONITORING REPORT

BFI- ZION LANDFILL

WEEK OF _____ DATE _____

TECHNICIAN _____

GAS MONITORING PROBE NO.	% LEL	% METHANE	COMMENTS
GMP - 1			Site 1B
GMP - 2			Site 1A
GMP - 3			Site 1A
GMP - 4			Site 2
GMP - 5			Site 2
GMP - 6			Site 2
GMP - 7			Site 2
GMP - 8			Site 2
GMP - 9			Site 2
GMP - 10			Site 1A
GMP - 11			Site 1B (near blower)
GMP - 12			Site 1B (near blower)
GMP - 13			Site 1B
GMP - 14			Site 1B
GMP - 15			Site 1B
GMP - 16			Site 1B

Monthly Gas Monitoring Report

MONTHLY GAS MONITORING SUMMARY

BFI-ZION LANDFILL

WEEK OF _____ DATE _____

TECHNICIAN _____

GAS MONITORING PROBE NO.	% LEL	% METHANE	COMMENTS
GMP - 1			Site 1B
GMP - 2			Site 1A
GMP - 3			Site 1A
GMP - 4			Site 2
GMP - 5			Site 2
GMP - 6			Site 2
GMP - 7			Site 2
GMP - 8			Site 2
GMP - 9			Site 2
GMP - 10			Site 1A
GMP - 11			Site 1B (near blower)
GMP - 12			Site 1B (near blower)
GMP - 13			Site 1B
GMP - 14			Site 1B
GMP - 15			Site 1B
GMP - 16			Site 1B

Maintenance and Repair Log

MAINTENANCE AND REPAIR LOG

BFI-ZION LANDFILL GAS EXTRACTION SYSTEM

Date	Work Done	Signed

Weekly LFG Extraction System Report

WEEKLY LFG EXTRACTION SYSTEM REPORT
BFI-ZION LANDFILL
Week of _____

Technician(s): _____ Date:

_____ Time: (Start)_____ (Finish)

Total System Flowrate: _____ SCFM

Combustion Temperature: _____ °F

Inlet Gas Temperature: _____ °F

Inlet Gas Pressure: _____inches WC

% Methane (Flare Line): _____

Outlet Gas Temperature : _____ °F
(Flare Line)

Outlet Gas Pressure: _____inches WC

Blowers Operating: (Circle Two) BL-1 AMPS:_____ BL-2 AMPS:_____

Comments: _____

_____

EXTRACTION WELL DATA

EW-NO.	% METHANE	VACUUM (INITIAL) IN. W.C.	FLOW (INITIAL) CFM	VACUUM (SET) IN. W.C.	TEMP. °F	% O_2	COMMENTS
Site 1-A							
EW-1							
EW-2							
EW-3							
EW-4							
EW-5							
EW-6							
EW-7							
EW-8							

EXTRACTION WELL DATA

EW-NO.	% METHANE	VACUUM (INITIAL) IN. W.C.	FLOW (INITIAL) CFM	VACUUM (SET) IN. W.C.	TEMP. °F	O_2	COMMENTS
EW-9							
EW-10							
EW-11							
EW-12							
EW-13							
EW-14							
EW-15							
EW-16							
EW-17							
EW-18							
EW-19							
EW-20							
EW-21							
EW-22							
EW-23							
EW-24							
EW-25							
EW-26							
EW-27							
EW-28							
Site 1B							
EW-29							
EW-30							
EW-31							
EW-32							

EXTRACTION WELL DATA

EW-NO.	% METHANE	VACUUM (INITIAL) IN. W.C.	FLOW (INITIAL) CFM	VACUUM (SET) IN. W.C.	TEMP. °F	O_2	COMMENTS
EW-33							
EW-34							
EW-35							
EW-36							
Site 2							
EW-37							
EW-38							
EW-39							
EW-40							
EW-41							
EW-42							
EW-43							
EW-44							
EW-45							
EW-46							
EW-47							
EW-48							
EW-49							
EW-50							
EW-51							
EW-52							
EW-53							
EW-54							
EW-55							
EW-56							

Sheet 4 of 4

EXTRACTION WELL DATA

EW-NO.	% METHANE	VACUUM (INITIAL) IN. W.C.	FLOW (INITIAL) CFM	VACUUM (SET) IN. W.C.	TEMP. °F	O_2	COMMENTS
EW-57							
EW-58							
EW-59							
EW-60							
EW-61							
EW-62							
EW-63							
EW-64							
EW-65							
EW-66							
EW-67							
EW-68							
EW-69							
EW-70							
EW-71							
EW-72							

Instrument Calibration Record

INSTRUMENT CALIBRATION RECORD
BFI-ZION LANDFILL

INSTRUMENT USED

SERIAL NUMBER:

BRAND:

MODEL NUMBER:

CALIBRATION RECORD

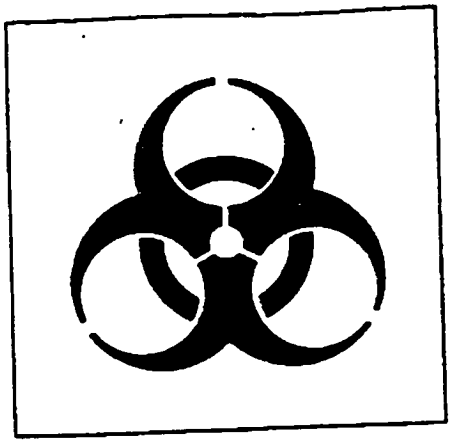
DATE/INITIALS	RESULTS:

APPENDIX E

APPENDIX E - OSHA REGULATIONS FOR PERMIT REQUIRED FOR CONFINED SPACE ENTRY

- 29CFR 1910.146 - Permit-Required Confined Spaces
- 29CFR 1910.147 - The Control of Hazardous Energy (lockout/tagout)

29CFR 1910.146 - Permit-Required Confined Spaces



Biological Hazard Symbol Configuration.

(9) *Other tags.* Other tags may be used in addition to those required by this paragraph (f), or in other situations where this paragraph (f) does not require tags, provided that they do not detract from the impact or visibility of the signal word and major message of any required tag.

APPENDICES TO § 1910.145(f). ACCIDENT PREVENTION TAGS

APPENDIX A TO § 1910.145(f)—RECOMMENDED COLOR CODING

While the standard does not specifically mandate colors to be used on accident prevention tags, the following color scheme is recommended by OSHA for meeting the requirements of this section:

"DANGER"—Red, or predominantly red, with lettering or symbols in a contrasting color.

"CAUTION"—Yellow, or predominantly yellow, with lettering or symbols in a contrasting color.

"WARNING"—Orange, or predominantly orange, with lettering or symbols in a contrasting color.

"BIOLOGICAL HAZARD"—Fluorescent orange or orange-red, or predominantly so, with lettering or symbols in a contrasting color.

APPENDIX B TO § 1910.145(f)—REFERENCES FOR FURTHER INFORMATION

The following references provide information which can be helpful in understanding the requirements contained in various sections of the standard:

1. Bresnahan, Thomas F., and Bryk, Joseph. "The Hazard Association Values of Accident Prevention Signs". *Journal of American Society of Safety Engineers;* January 1975.

2. Dreyfuss, H., *Symbol Sourcebook*, McGraw Hill; New York, NY, 1972.

3. Glass, R.A. and others. *Some Criteria for Colors and Signs in Workplaces*, National Bureau of Standards, Washington DC, 1983.

4. *Graphic Symbols for Public Areas and Occupational Environments*, Treasury Board of Canada, Ottawa, Canada, July 1980.

5. Howett, G.L., *Size of Letters Required for Visibility as a Function of Viewing Distance and Observer Acuity*, National Bureau of Standards, Washington DC, July 1983.

6. Lerner, N.D. and Collins, B.L., *The Assessment of Safety Symbol Understandability by Different Testing Methods*, National Bureau of Standards, Washington DC, 1980.

7. Lerner, N.D. and Collins, B.L., *Workplace Safety Symbols*, National Bureau of Standards, Washington DC, 1980.

8. Modley, R. and Meyers, W.R., *Handbook of Pictorial Symbols*, Dover Publication, New York, NY, 1976.

9. *Product Safety Signs and Labels*, FMC Corporation, Santa Clara, CA, 1978.

10. *Safety Color Coding for Marking Physical Hazards*, Z53.1, American National Standards Institute, New York, NY, 1979.

11. *Signs and Symbols for the Occupational Environment, Can. 3–Z–321–77*, Canadian Standards Association, Ottawa, September 1977.

12. *Symbols for Industrial Safety*, National Bureau of Standards, Washington DC, April 1982.

13. *Symbol Signs*, U.S. Department of Transportation, Washington DC, November 1974.

[39 FR 23502, June 27, 1974, as amended at 43 FR 49749, Oct. 24, 1978; 43 FR 51759, Nov. 7, 1978; 49 FR 5322, Feb. 10, 1984; 51 FR 33280, Sept. 19, 1986; 61 FR 9239, Mar. 7, 1996]

§ 1910.146 Permit-required confined spaces.

(a) *Scope and application.* This section contains requirements for practices and procedures to protect employees in general industry from the hazards of entry into permit-required confined spaces. This section does not apply to agriculture, to construction, or to shipyard employment (Parts 1928, 1926, and 1915 of this chapter, respectively).

(b) *Definitions.*

Acceptable entry conditions means the conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.

Attendant means an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program.

Authorized entrant means an employee who is authorized by the employer to enter a permit space.

Blanking or blinding means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Confined space means a space that:

(1) Is large enough and so configured that an employee can bodily enter and perform assigned work; and

(2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and

(3) Is not designed for continuous employee occupancy.

Double block and bleed means the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

Emergency means any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

Engulfment means the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry permit (permit) means the written or printed document that is provided by the employer to allow and control entry into a permit space and that contains the information specified in paragraph (f) of this section.

Entry supervisor means the person (such as the employer, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section.

NOTE: An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required by this section for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

Hazardous atmosphere means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

(1) Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);

(2) Airborne combustible dust at a concentration that meets or exceeds its LFL;

NOTE: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.

(3) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;

(4) Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, *Occupational Health and Environmental Control*, or in Subpart Z, *Toxic and Hazardous Substances*, of this part and which could result in employee exposure in excess of its dose or permissible exposure limit;

NOTE: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.

(5) Any other atmospheric condition that is immediately dangerous to life or health.

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NOTE: For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communication Standard, §1910.1200 of this part, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

Hot work permit means the employer's written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

Immediately dangerous to life or health (IDLH) means any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

NOTE: Some materials—hydrogen fluoride gas and cadmium vapor, for example—may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12–72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

Inerting means the displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

NOTE: This procedure produces an IDLH oxygen-deficient atmosphere.

Isolation means the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

Line breaking means the intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

Non-permit confined space means a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Oxygen deficient atmosphere means an atmosphere containing less than 19.5 percent oxygen by volume.

Oxygen enriched atmosphere means an atmosphere containing more than 23.5 percent oxygen by volume.

Permit-required confined space (permit space) means a confined space that has one or more of the following characteristics:

(1) Contains or has a potential to contain a hazardous atmosphere;

(2) Contains a material that has the potential for engulfing an entrant;

(3) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross- section; or

(4) Contains any other recognized serious safety or health hazard.

Permit-required confined space program (permit space program) means the employer's overall program for controlling, and, where appropriate, for protecting employees from, permit space hazards and for regulating employee entry into permit spaces.

Permit system means the employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

Prohibited condition means any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

Rescue service means the personnel designated to rescue employees from permit spaces.

Retrieval system means the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.

Testing means the process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

NOTE: Testing enables employers both to devise and implement adequate control

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measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.

(c) *General requirements.* (1) The employer shall evaluate the workplace to determine if any spaces are permit-required confined spaces.

NOTE: Proper application of the decision flow chart in appendix A to §1910.146 would facilitate compliance with this requirement.

(2) If the workplace contains permit spaces, the employer shall inform exposed employees, by posting danger signs or by any other equally effective means, of the existence and location of and the danger posed by the permit spaces.

NOTE: A sign reading "DANGER—PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" or using other similar language would satisfy the requirement for a sign.

(3) If the employer decides that its employees will not enter permit spaces, the employer shall take effective measures to prevent its employees from entering the permit spaces and shall comply with paragraphs (c)(1), (c)(2), (c)(6), and (c)(8) of this section.

(4) If the employer decides that its employees will enter permit spaces, the employer shall develop and implement a written permit space program that complies with this section. The written program shall be available for inspection by employees and their authorized representatives.

(5) An employer may use the alternate procedures specified in paragraph (c)(5)(ii) of this section for entering a permit space under the conditions set forth in paragraph (c)(5)(i) of this section.

(i) An employer whose employees enter a permit space need not comply with paragraphs (d) through (f) and (h) through (k) of this section, provided that:

(A) The employer can demonstrate that the only hazard posed by the permit space is an actual or potential hazardous atmosphere;

(B) The employer can demonstrate that continuous forced air ventilation alone is sufficient to maintain that permit space safe for entry;

(C) The employer develops monitoring and inspection data that supports the demonstrations required by paragraphs (c)(5)(i)(A) and (c)(5)(i)(B) of this section;

(D) If an initial entry of the permit space is necessary to obtain the data required by paragraph (c)(5)(i)(C) of this section, the entry is performed in compliance with paragraphs (d) through (k) of this section;

(E) The determinations and supporting data required by paragraphs (c)(5)(i)(A), (c)(5)(i)(B), and (c)(5)(i)(C) of this section are documented by the employer and are made available to each employee who enters the permit space under the terms of paragraph (c)(5) of this section; and

(F) Entry into the permit space under the terms of paragraph (c)(5)(i) of this section is performed in accordance with the requirements of paragraph (c)(5)(ii) of this section.

NOTE: See paragraph (c)(7) of this section for reclassification of a permit space after all hazards within the space have been eliminated.

(ii) The following requirements apply to entry into permit spaces that meet the conditions set forth in paragraph (c)(5)(i) of this section.

(A) Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed.

(B) When entrance covers are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.

(C) Before an employee enters the space, the internal atmosphere shall be tested, with a calibrated direct-reading instrument, for the following conditions in the order given:

(*1*) Oxygen content,

(*2*) Flammable gases and vapors, and

(*3*) Potential toxic air contaminants.

(D) There may be no hazardous atmosphere within the space whenever any employee is inside the space.

(E) Continuous forced air ventilation shall be used, as follows:

(*1*) An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere;

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(2) The forced air ventilation shall be so directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space;

(3) The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space.

(F) The atmosphere within the space shall be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere.

(G) If a hazardous atmosphere is detected during entry:

(1) Each employee shall leave the space immediately;

(2) The space shall be evaluated to determine how the hazardous atmosphere developed; and

(3) Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

(H) The employer shall verify that the space is safe for entry and that the pre-entry measures required by paragraph (c)(5)(ii) of this section have been taken, through a written certification that contains the date, the location of the space, and the signature of the person providing the certification. The certification shall be made before entry and shall be made available to each employee entering the space.

(6) When there are changes in the use or configuration of a non-permit confined space that might increase the hazards to entrants, the employer shall reevaluate that space and, if necessary, reclassify it as a permit-required confined space.

(7) A space classified by the employer as a permit-required confined space may be reclassified as a non-permit confined space under the following procedures:

(i) If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated.

(ii) If it is necessary to enter the permit space to eliminate hazards, such entry shall be performed under paragraphs (d) through (k) of this section. If testing and inspection during that entry demonstrate that the hazards within the permit space have been eliminated, the permit space may be reclassified as a non-permit confined space for as long as the hazards remain eliminated.

NOTE: Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards. Paragraph (c)(5) covers permit space entry where the employer can demonstrate that forced air ventilation alone will control all hazards in the space.

(iii) The employer shall document the basis for determining that all hazards in a permit space have been eliminated, through a certification that contains the date, the location of the space, and the signature of the person making the determination. The certification shall be made available to each employee entering the space.

(iv) If hazards arise within a permit space that has been declassified to a non-permit space under paragraph (c)(7) of this section, each employee in the space shall exit the space. The employer shall then reevaluate the space and determine whether it must be reclassified as a permit space, in accordance with other applicable provisions of this section.

(8) When an employer (host employer) arranges to have employees of another employer (contractor) perform work that involves permit space entry, the host employer shall:

(i) Inform the contractor that the workplace contains permit spaces and that permit space entry is allowed only through compliance with a permit space program meeting the requirements of this section;

(ii) Apprise the contractor of the elements, including the hazards identified and the host employer's experience with the space, that make the space in question a permit space;

(iii) Apprise the contractor of any precautions or procedures that the host employer has implemented for the protection of employees in or near permit spaces where contractor personnel will be working;

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(iv) Coordinate entry operations with the contractor, when both host employer personnel and contractor personnel will be working in or near permit spaces, as required by paragraph (d)(11) of this section; and

(v) Debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in permit spaces during entry operations.

(9) In addition to complying with the permit space requirements that apply to all employers, each contractor who is retained to perform permit space entry operations shall:

(i) Obtain any available information regarding permit space hazards and entry operations from the host employer;

(ii) Coordinate entry operations with the host employer, when both host employer personnel and contractor personnel will be working in or near permit spaces, as required by paragraph (d)(11) of this section; and

(iii) Inform the host employer of the permit space program that the contractor will follow and of any hazards confronted or created in permit spaces, either through a debriefing or during the entry operation.

(d) *Permit-required confined space program* (permit space program). Under the permit space program required by paragraph (c)(4) of this section, the employer shall:

(1) Implement the measures necessary to prevent unauthorized entry;

(2) Identify and evaluate the hazards of permit spaces before employees enter them;

(3) Develop and implement the means, procedures, and practices necessary for safe permit space entry operations, including, but not limited to, the following:

(i) Specifying acceptable entry conditions;

(ii) Isolating the permit space;

(iii) Purging, inerting, flushing, or ventilating the permit space as necessary to eliminate or control atmospheric hazards;

(iv) Providing pedestrian, vehicle, or other barriers as necessary to protect entrants from external hazards; and

(v) Verifying that conditions in the permit space are acceptable for entry throughout the duration of an authorized entry.

(4) Provide the following equipment (specified in paragraphs (d)(4)(i) through (d)(4)(ix) of this section) at no cost to employees, maintain that equipment properly, and ensure that employees use that equipment properly:

(i) Testing and monitoring equipment needed to comply with paragraph (d)(5) of this section;

(ii) Ventilating equipment needed to obtain acceptable entry conditions;

(iii) Communications equipment necessary for compliance with paragraphs (h)(3) and (i)(5) of this section;

(iv) Personal protective equipment insofar as feasible engineering and work practice controls do not adequately protect employees;

(v) Lighting equipment needed to enable employees to see well enough to work safely and to exit the space quickly in an emergency;

(vi) Barriers and shields as required by paragraph (d)(3)(iv) of this section;

(vii) Equipment, such as ladders, needed for safe ingress and egress by authorized entrants;

(viii) Rescue and emergency equipment needed to comply with paragraph (d)(9) of this section, except to the extent that the equipment is provided by rescue services; and

(ix) Any other equipment necessary for safe entry into and rescue from permit spaces.

(5) Evaluate permit space conditions as follows when entry operations are conducted:

(i) Test conditions in the permit space to determine if acceptable entry conditions exist before entry is authorized to begin, except that, if isolation of the space is infeasible because the space is large or is part of a continuous system (such as a sewer), pre-entry testing shall be performed to the extent feasible before entry is authorized and, if entry is authorized, entry conditions shall be continuously monitored in the areas where authorized entrants are working;

(ii) Test or monitor the permit space as necessary to determine if acceptable entry conditions are being maintained

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during the course of entry operations; and

(iii) When testing for atmospheric hazards, test first for oxygen, then for combustible gases and vapors, and then for toxic gases and vapors.

NOTE: Atmospheric testing conducted in accordance with appendix B to §1910.146 would be considered as satisfying the requirements of this paragraph. For permit space operations in sewers, atmospheric testing conducted in accordance with appendix B, as supplemented by appendix E to §1910.146, would be considered as satisfying the requirements of this paragraph.

(6) Provide at least one attendant outside the permit space into which entry is authorized for the duration of entry operations;

NOTE: Attendants may be assigned to monitor more than one permit space provided the duties described in paragraph (i) of this section can be effectively performed for each permit space that is monitored. Likewise, attendants may be stationed at any location outside the permit space to be monitored as long as the duties described in paragraph (i) of this section can be effectively performed for each permit space that is monitored.

(7) If multiple spaces are to be monitored by a single attendant, include in the permit program the means and procedures to enable the attendant to respond to an emergency affecting one or more of the permit spaces being monitored without distraction from the attendant's responsibilities under paragraph (i) of this section;

(8) Designate the persons who are to have active roles (as, for example, authorized entrants, attendants, entry supervisors, or persons who test or monitor the atmosphere in a permit space) in entry operations, identify the duties of each such employee, and provide each such employee with the training required by paragraph (g) of this section;

(9) Develop and implement procedures for summoning rescue and emergency services, for rescuing entrants from permit spaces, for providing necessary emergency services to rescued employees, and for preventing unauthorized personnel from attempting a rescue;

(10) Develop and implement a system for the preparation, issuance, use, and cancellation of entry permits as required by this section;

(11) Develop and implement procedures to coordinate entry operations when employees of more than one employer are working simultaneously as authorized entrants in a permit space, so that employees of one employer do not endanger the employees of any other employer;

(12) Develop and implement procedures (such as closing off a permit space and canceling the permit) necessary for concluding the entry after entry operations have been completed;

(13) Review entry operations when the employer has reason to believe that the measures taken under the permit space program may not protect employees and revise the program to correct deficiencies found to exist before subsequent entries are authorized; and

NOTE: Examples of circumstances requiring the review of the permit space program are: any unauthorized entry of a permit space, the detection of a permit space hazard not covered by the permit, the detection of a condition prohibited by the permit, the occurrence of an injury or near-miss during entry, a change in the use or configuration of a permit space, and employee complaints about the effectiveness of the program.

(14) Review the permit space program, using the canceled permits retained under paragraph (e)(6) of this section within 1 year after each entry and revise the program as necessary, to ensure that employees participating in entry operations are protected from permit space hazards.

NOTE: Employers may perform a single annual review covering all entries performed during a 12-month period. If no entry is performed during a 12-month period, no review is necessary.

Appendix C to §1910.146 presents examples of permit space programs that are considered to comply with the requirements of paragraph (d) of this section.

(e) *Permit system.* (1) Before entry is authorized, the employer shall document the completion of measures required by paragraph (d)(3) of this section by preparing an entry permit.

NOTE: Appendix D to §1910.146 presents examples of permits whose elements are considered to comply with the requirements of this section.

(2) Before entry begins, the entry supervisor identified on the permit shall sign the entry permit to authorize entry.

(3) The completed permit shall be made available at the time of entry to all authorized entrants, by posting it at the entry portal or by any other equally effective means, so that the entrants can confirm that pre-entry preparations have been completed.

(4) The duration of the permit may not exceed the time required to complete the assigned task or job identified on the permit in accordance with paragraph (f)(2) of this section.

(5) The entry supervisor shall terminate entry and cancel the entry permit when:

(i) The entry operations covered by the entry permit have been completed; or

(ii) A condition that is not allowed under the entry permit arises in or near the permit space.

(6) The employer shall retain each canceled entry permit for at least 1 year to facilitate the review of the permit-required confined space program required by paragraph (d)(14) of this section. Any problems encountered during an entry operation shall be noted on the pertinent permit so that appropriate revisions to the permit space program can be made.

(f) *Entry permit.* The entry permit that documents compliance with this section and authorizes entry to a permit space shall identify:

(1) The permit space to be entered;

(2) The purpose of the entry;

(3) The date and the authorized duration of the entry permit;

(4) The authorized entrants within the permit space, by name or by such other means (for example, through the use of rosters or tracking systems) as will enable the attendant to determine quickly and accurately, for the duration of the permit, which authorized entrants are inside the permit space;

NOTE: This requirement may be met by inserting a reference on the entry permit as to the means used, such as a roster or tracking system, to keep track of the authorized entrants within the permit space.

(5) The personnel, by name, currently serving as attendants;

(6) The individual, by name, currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized entry;

(7) The hazards of the permit space to be entered;

(8) The measures used to isolate the permit space and to eliminate or control permit space hazards before entry;

NOTE: Those measures can include the lockout or tagging of equipment and procedures for purging, inerting, ventilating, and flushing permit spaces.

(9) The acceptable entry conditions;

(10) The results of initial and periodic tests performed under paragraph (d)(5) of this section, accompanied by the names or initials of the testers and by an indication of when the tests were performed;

(11) The rescue and emergency services that can be summoned and the means (such as the equipment to use and the numbers to call) for summoning those services;

(12) The communication procedures used by authorized entrants and attendants to maintain contact during the entry;

(13) Equipment, such as personal protective equipment, testing equipment, communications equipment, alarm systems, and rescue equipment, to be provided for compliance with this section;

(14) Any other information whose inclusion is necessary, given the circumstances of the particular confined space, in order to ensure employee safety; and

(15) Any additional permits, such as for hot work, that have been issued to authorize work in the permit space.

(g) *Training.* (1) The employer shall provide training so that all employees whose work is regulated by this section acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under this section.

(2) Training shall be provided to each affected employee:

(i) Before the employee is first assigned duties under this section;

(ii) Before there is a change in assigned duties;

(iii) Whenever there is a change in permit space operations that presents a

hazard about which an employee has not previously been trained;

(iv) Whenever the employer has reason to believe either that there are deviations from the permit space entry procedures required by paragraph (d)(3) of this section or that there are inadequacies in the employee's knowledge or use of these procedures.

(3) The training shall establish employee proficiency in the duties required by this section and shall introduce new or revised procedures, as necessary, for compliance with this section.

(4) The employer shall certify that the training required by paragraphs (g)(1) through (g)(3) of this section has been accomplished. The certification shall contain each employee's name, the signatures or initials of the trainers, and the dates of training. The certification shall be available for inspection by employees and their authorized representatives.

(h) *Duties of authorized entrants.* The employer shall ensure that all authorized entrants:

(1) Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;

(2) Properly use equipment as required by paragraph (d)(4) of this section;

(3) Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space as required by paragraph (i)(6) of this section;

(4) Alert the attendant whenever:

(i) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or

(ii) The entrant detects a prohibited condition; and

(5) Exit from the permit space as quickly as possible whenever:

(i) An order to evacuate is given by the attendant or the entry supervisor,

(ii) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation,

(iii) The entrant detects a prohibited condition, or

(iv) An evacuation alarm is activated.

(i) *Duties of attendants.* The employer shall ensure that each attendant:

(1) Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;

(2) Is aware of possible behavioral effects of hazard exposure in authorized entrants;

(3) Continuously maintains an accurate count of authorized entrants in the permit space and ensures that the means used to identify authorized entrants under paragraph (f)(4) of this section accurately identifies who is in the permit space;

(4) Remains outside the permit space during entry operations until relieved by another attendant;

NOTE: When the employer's permit entry program allows attendant entry for rescue, attendants may enter a permit space to attempt a rescue if they have been trained and equipped for rescue operations as required by paragraph (k)(1) of this section and if they have been relieved as required by paragraph (i)(4) of this section.

(5) Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space under paragraph (i)(6) of this section;

(6) Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions;

(i) If the attendant detects a prohibited condition;

(ii) If the attendant detects the behavioral effects of hazard exposure in an authorized entrant;

(iii) If the attendant detects a situation outside the space that could endanger the authorized entrants; or

(iv) If the attendant cannot effectively and safely perform all the duties required under paragraph (i) of this section;

(7) Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards;

(8) Takes the following actions when unauthorized persons approach or enter a permit space while entry is underway:

(i) Warn the unauthorized persons that they must stay away from the permit space;

(ii) Advise the unauthorized persons that they must exit immediately if they have entered the permit space; and

(iii) Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space;

(9) Performs non-entry rescues as specified by the employer's rescue procedure; and

(10) Performs no duties that might interfere with the attendant's primary ...ty to monitor and protect the au...rized entrants.

...) *Duties of entry supervisors.* The employer shall ensure that each entry supervisor:

(1) Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;

(2) Verifies, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin;

(3) Terminates the entry and cancels the permit as required by paragraph (e)(5) of this section;

(4) Verifies that rescue services are available and that the means for summoning them are operable;

(5) Removes unauthorized individuals who enter or who attempt to enter the permit space during entry operations; and

(6) Determines, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

(k) *Rescue and emergency services.* (1) ...he following requirements apply to ...ployers who have employees enter ...ermit spaces to perform rescue services.

(i) The employer shall ensure that each member of the rescue service is provided with, and is trained to use properly, the personal protective equipment and rescue equipment necessary for making rescues from permit spaces.

(ii) Each member of the rescue service shall be trained to perform the assigned rescue duties. Each member of the rescue service shall also receive the training required of authorized entrants under paragraph (g) of this section.

(iii) Each member of the rescue service shall practice making permit space rescues at least once every 12 months, by means of simulated rescue operations in which they remove dummies, manikins, or actual persons from the actual permit spaces or from representative permit spaces. Representative permit spaces shall, with respect to opening size, configuration, and accessibility, simulate the types of permit spaces from which rescue is to be performed.

(iv) Each member of the rescue service shall be trained in basic first-aid and in cardiopulmonary resuscitation (CPR). At least one member of the rescue service holding current certification in first aid and in CPR shall be available.

(2) When an employer (host employer) arranges to have persons other than the host employer's employees perform permit space rescue, the host employer shall:

(i) Inform the rescue service of the hazards they may confront when called on to perform rescue at the host employer's facility, and

(ii) Provide the rescue service with access to all permit spaces from which rescue may be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations.

(3) To facilitate non-entry rescue, retrieval systems or methods shall be used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. Retrieval systems shall meet the following requirements.

(i) Each authorized entrant shall use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level,

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or above the entrant's head. Wristlets may be used in lieu of the chest or full body harness if the employer can demonstrate that the use of a chest or full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.

(ii) The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary. A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet (1.52 m) deep.

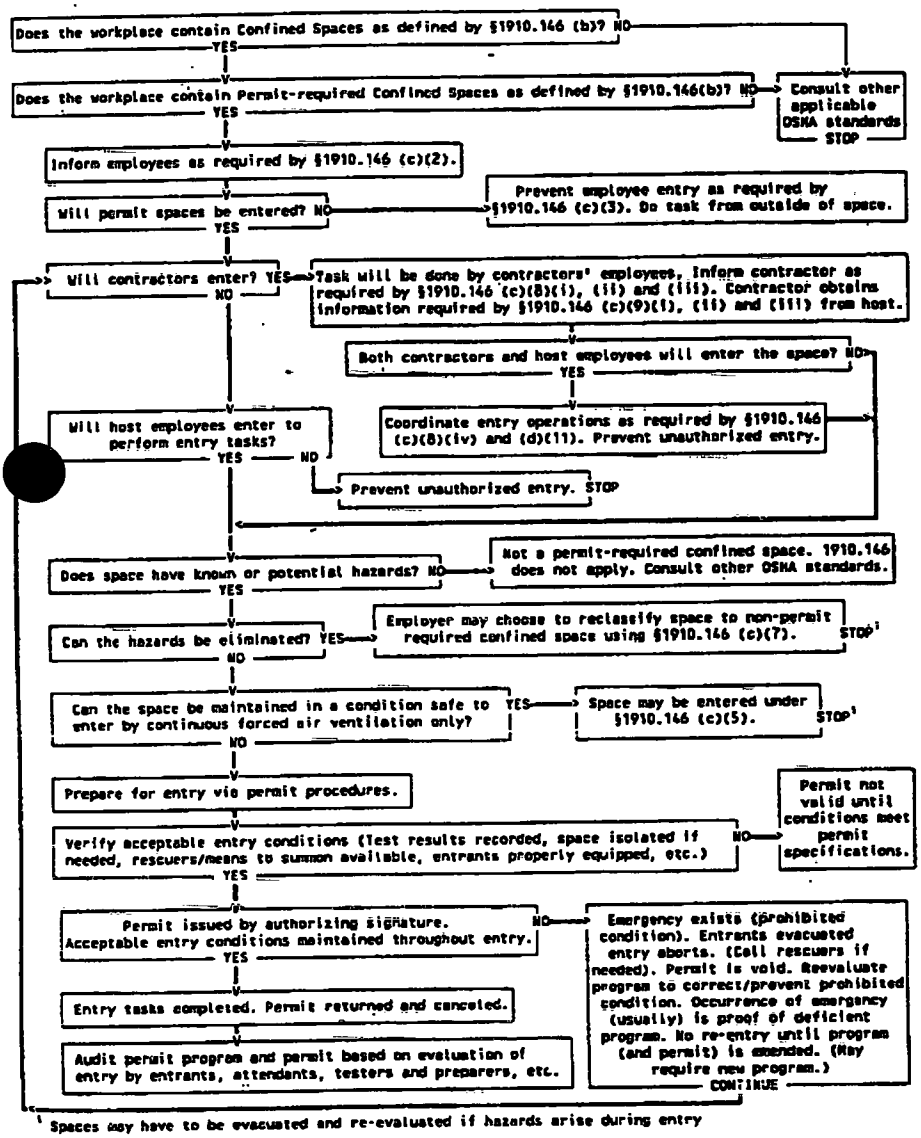
(4) If an injured entrant is exposed to a substance for which a Material Safety Data Sheet (MSDS) or other similar written information is required to be kept at the worksite, that MSDS or written information shall be made available to the medical facility treating the exposed entrant.

[58 FR 4549, Jan. 14, 1993; 58 FR 34885, June 29, 1993, as amended at 59 FR 26114, May 19, 1994]

APPENDICES TO § 1910.146—PERMIT-REQUIRED CONFINED SPACES

NOTE: Appendices A through E serve to provide information and non-mandatory guidelines to assist employers and employees in complying with the appropriate requirements of this section.

APPENDIX A TO §1910.146—PERMIT-REQUIRED CONFINED SPACE DECISION FLOW CHART



[1] Spaces may have to be evacuated and re-evaluated if hazards arise during entry

[58 FR 4549, Jan. 14, 1993; 58 FR 34846, June 29, 1993]

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APPENDIX B TO § 1910.146—PROCEDURES FOR ATMOSPHERIC TESTING

Atmospheric testing is required for two distinct purposes: evaluation of the hazards of the permit space and verification that acceptable entry conditions for entry into that space exist.

(1) *Evaluation testing.* The atmosphere of a confined space should be analyzed using equipment of sufficient sensitivity and specificity to identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space. Evaluation and interpretation of these data, and development of the entry procedure, should be done by, or reviewed by, a technically qualified professional (e.g., OSHA consultation service, or certified industrial hygienist, registered safety engineer, certified safety professional, certified marine chemist, etc.) based on evaluation of all serious hazards.

(2) *Verification testing.* The atmosphere of a permit space which may contain a hazardous atmosphere should be tested for residues of all contaminants identified by evaluation testing using permit specified equipment to determine that residual concentrations at the time of testing and entry are within the range of acceptable entry conditions. Results of testing (i.e., actual concentration, etc.) should be recorded on the permit in the space provided adjacent to the stipulated acceptable entry condition.

(3) *Duration of testing.* Measurement of values for each atmospheric parameter should be made for at least the minimum response time of the test instrument specified by the manufacturer.

(4) *Testing stratified atmospheres.* When monitoring for entries involving a descent into atmospheres that may be stratified, the atmospheric envelope should be tested a distance of approximately 4 feet (1.22 m) in the direction of travel and to each side. If a sampling probe is used, the entrant's rate of progress should be slowed to accommodate the sampling speed and detector response.

(5) *Order of testing.* A test for oxygen is performed first because most combustible gas meters are oxygen dependent and will not provide reliable readings in an oxygen deficient atmosphere. Combustible gasses are tested for next because the threat of fire or explosion is both more immediate and more life threatening, in most cases, than exposure to toxic gasses and vapors. If tests for toxic gasses and vapors are necessary, they are performed last.

APPENDIX C TO § 1910.146—EXAMPLES OF PERMIT-REQUIRED CONFINED SPACE PROGRAMS

Example 1.

Workplace. Sewer entry.

Potential hazards. The employees could be exposed to the following:

Engulfment.

Presence of toxic gases. Equal to or more than 10 ppm hydrogen sulfide measured as an 8-hour time-weighted average. If the presence of other toxic contaminants is suspected, specific monitoring programs will be developed.

Presence of explosive/flammable gases. Equal to or greater than 10% of the lower flammable limit (LFL).

Oxygen Deficiency. A concentration of oxygen in the atmosphere equal to or less than 19.5% by volume.

A. *Entry Without Permit/Attendant*

Certification. Confined spaces may be entered without the need for a written permit or attendant provided that the space can be maintained in a safe condition for entry by mechanical ventilation alone, as provided by §1910.146(c)(5). All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. Any employee required or permitted to precheck or enter an enclosed/confined space shall have successfully completed, -as a minimum, the training as required by the following sections of these procedures. *A written copy of operating and rescue procedures as required by these procedures shall be at the work site for the duration of the job.* The Confined Space Pre-Entry Check List must be completed by the LEAD WORKER before entry into a confined space. This list verifies completion of items listed below. This check list shall be kept at the job site for duration of the job. If circumstances dictate an interruption in the work, the permit space must be re-evaluated and a new check list must be completed.

Control of atmospheric and engulfment hazards.

Pumps and Lines. All pumps and lines which may reasonably cause contaminants to flow into the space shall be disconnected, blinded and locked out, or effectively isolated by other means to prevent development of dangerous air contamination or engulfment. Not all laterals to sewers or storm drains require blocking. However, where experience or knowledge of industrial use indicates there is a reasonable potential for contamination of air or engulfment into an occupied sewer, then all affected laterals shall be blocked. If blocking and/or isolation requires entry into the space the provisions for entry into a permit- required confined space must be implemented.

Surveillance. The surrounding area shall be surveyed to avoid hazards such as drifting vapors from the tanks, piping, or sewers.

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Testing. The atmosphere within the space will be tested to determine whether dangerous air contamination and/or oxygen deficiency exists. Detector tubes, alarm only gas monitors and explosion meters are examples of monitoring equipment that may be used to test permit space atmospheres. Testing shall be performed by the LEAD WORKER who has successfully completed the Gas Detector training for the monitor he will use. The minimum parameters to be monitored are oxygen deficiency, LFL, and hydrogen sulfide concentration. A written record of the pre-entry test results shall be made and kept at the work site for the duration of the job. The supervisor will certify in writing, based upon the results of the pre-entry testing, that all hazards have been eliminated. Affected employees shall be able to review the testing results. The most hazardous conditions shall govern when work is being performed in two adjoining, connecting spaces.

Entry Procedures. If there are no non-atmospheric hazards present and if the pre-entry tests show there is no dangerous air contamination and/or oxygen deficiency within the space and there is no reason to believe that any is likely to develop, entry into and work within may proceed. Continuous testing of the atmosphere in the immediate vicinity of the workers within the space shall be accomplished. The workers will immediately leave the permit space when any of the gas monitor alarm set points are reached as defined. Workers will not return to the area until a SUPERVISOR who has completed the gas detector training has used a direct reading gas detector to evaluate the situation and has determined that it is safe to enter.

Rescue. Arrangements for rescue services are not required where there is no attendant. See the rescue portion of section B., below, for instructions regarding rescue planning where an entry permit is required.

B. *Entry Permit Required*

Permits. Confined Space Entry Permit. All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. Any employee required or permitted to pre-check or enter a permit-required confined space shall have successfully completed, as a minimum, the training as required by the following sections of these procedures. *A written copy of operating and rescue procedures as required by these procedures shall be at the work site for the duration of the job.* The Confined Space Entry Permit must be completed before approval can be given to enter a permit-required confined space. This permit verifies completion of items listed below. This permit shall be kept at the job site for the duration of the job. If circumstances cause an interruption of the work or a change in the alarm conditions for which entry was approved, a new Confined Space Entry Permit must be completed.

Control of atmospheric and engulfment hazards.

Surveillance. The surrounding area shall be surveyed to avoid hazards such as drifting vapors from tanks, piping or sewers.

Testing. The confined space atmosphere shall be tested to determine whether dangerous air contamination and/or oxygen deficiency exists. A direct reading gas monitor shall be used. Testing shall be performed by the SUPERVISOR who has successfully completed the gas detector training for the monitor he will use. The minimum parameters to be monitored are oxygen deficiency, LFL and hydrogen sulfide concentration. A written record of the pre- entry test results shall be made and kept at the work site for the duration of the job. Affected employees shall be able to review the testing results. The most hazardous conditions shall govern when work is being performed in two adjoining, connected spaces.

Space Ventilation. Mechanical ventilation systems, where applicable, shall be set at 100% outside air. Where possible, open additional manholes to increase air circulation. Use portable blowers to augment natural circulation if needed. After a suitable ventilating period, repeat the testing. Entry may not begin until testing has demonstrated that the hazardous atmosphere has been eliminated.

Entry Procedures. The following procedure shall be observed under any of the following conditions: 1.) Testing demonstrates the existence of dangerous or deficient conditions and additional ventilation cannot reduce concentrations to safe levels; 2.) The atmosphere tests as safe but unsafe conditions can reasonably be expected to develop; 3.) It is not feasible to provide for ready exit from spaces equipped with automatic fire suppression systems and it is not practical or safe to deactivate such systems; or 4.) An emergency exists and it is not feasible to wait for pre-entry procedures to take effect.

All personnel must be trained. A self contained breathing apparatus shall be worn by any person entering the space. At least one worker shall stand by the outside of the space ready to give assistance in case of emergency. The standby worker shall have a self contained breathing apparatus available for immediate use. There shall be at least one additional worker within sight or call of the standby worker. Continuous powered communications shall be maintained between the worker within the confined space and standby personnel.

If at any time there is any questionable action or non- movement by the worker inside, a verbal check will be made. If there is no response, the worker will be moved immediately. *Exception:* If the worker is disabled due to falling or impact, he/she shall not be

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removed from the confined space unless there is immediate danger to his/her life. Local fire department rescue personnel shall be notified immediately. The standby worker may only enter the confined space in case of an emergency (wearing the self contained breathing apparatus) and only after being relieved by another worker. Safety belt or harness with attached lifeline shall be used by all workers entering the space with the free end of the line secured outside the entry opening. The standby worker shall attempt to remove a disabled worker via his lifeline before entering the space.

When practical, these spaces shall be entered through side openings—those within 3 1/2 feet (1.07 m) of the bottom. When entry must be through a top opening, the safety belt shall be of the harness type that suspends a person upright and a hoisting device or similar apparatus shall be available for lifting workers out of the space.

In any situation where their use may endanger the worker, use of a hoisting device or safety belt and attached lifeline may be discontinued.

When dangerous air contamination is attributable to flammable and/or explosive substances, lighting and electrical equipment shall be Class 1, Division 1 rated per National Electrical Code and no ignition sources shall be introduced into the area.

Continuous gas monitoring shall be performed during all confined space operations. If alarm conditions change adversely, entry personnel shall exit the confined space and a new confined space permit issued.

Rescue. Call the fire department services for rescue. Where immediate hazards to injured personnel are present, workers at the site shall implement emergency procedures to fit the situation.

Example 2.

Workplace. Meat and poultry rendering plants.

Cookers and dryers are either batch or continuous in their operation. Multiple batch cookers are operated in parallel. When one unit of a multiple set is shut down for repairs, means are available to isolate that unit from the others which remain in operation.

Cookers and dryers are horizontal, cylindrical vessels equipped with a center, rotating shaft and agitator paddles or discs. If the inner shell is jacketed, it is usually heated with steam at pressures up to 150 psig (1034.25 kPa). The rotating shaft assembly of the continuous cooker or dryer is also steam heated.

Potential Hazards. The recognized hazards associated with cookers and dryers are the risk that employees could be:

1. Struck or caught by rotating agitator;
2. Engulfed in raw material or hot, recycled fat;
3. Burned by steam from leaks into the cooker/dryer steam jacket or the condenser duct system if steam valves are not properly closed and locked out;
4. Burned by contact with hot metal surfaces, such as the agitator shaft assembly, or inner shell of the cooker/dryer;
5. Heat stress caused by warm atmosphere inside cooker/dryer;
6. Slipping and falling on grease in the cooker/dryer;
7. Electrically shocked by faulty equipment taken into the cooker/dryer;
8. Burned or overcome by fire or products of combustion; or
9. Overcome by fumes generated by welding or cutting done on grease covered surfaces.

Permits. The supervisor in this case is always present at the cooker/dryer or other permit entry confined space when entry is made. The supervisor must follow the pre-entry isolation procedures described in the entry permit in preparing for entry, and ensure that the protective clothing, ventilating equipment and any other equipment required by the permit are at the entry site.

Control of hazards. Mechanical. Lock out main power switch to agitator motor at main power panel. Affix tag to the lock to inform others that a permit entry confined space entry is in progress.

Engulfment. Close all valves in the raw material blow line. Secure each valve in its closed position using chain and lock. Attach a tag to the valve and chain warning that a permit entry confined space entry is in progress. The same procedure shall be used for securing the fat recycle valve.

Burns and heat stress. Close steam supply valves to jacket and secure with chains and tags. Insert solid blank at flange in cooker vent line to condenser manifold duct system. Vent cooker/dryer by opening access door at discharge end and top-center door to allow natural ventilation throughout the entry. If faster cooling is needed, use an portable ventilation fan to increase ventilation. Cooling water may be circulated through the jacket to reduce both outer and inner surface temperatures of cooker/dryers faster. Check air and inner surface temperatures in cooker/dryer to assure they are within acceptable limits before entering, or use proper protective clothing.

Fire and fume hazards. Careful site preparation, such as cleaning the area within inches (10.16 cm) of all welding or torch cutting operations, and proper ventilation are the preferred controls. All welding and cutting operations shall be done in accordance with the requirements of 29 CFR Part 1910, Subpart Q, OSHA's welding standard. Proper ventilation may be achieved by local exhaust

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ventilation, or the use of portable ventilation fans, or a combination of the two practices.

Electrical shock. Electrical equipment used in cooker/dryers shall be in serviceable condition.

Slips and falls. Remove residual grease before entering cooker/dryer.

Attendant. The supervisor shall be the attendant for employees entering cooker/dryers.

Permit. The permit shall specify how isolation shall be done and any other preparations needed before making entry. This is especially important in parallel arrangements of cooker/dryers so that the entire operation need not be shut down to allow safe entry into one unit.

Rescue. When necessary, the attendant shall call the fire department as previously arranged.

Example 3.

Workplace. Workplaces where tank cars, trucks, and trailers, dry bulk tanks and trailers, railroad tank cars, and similar portable tanks are fabricated or serviced.

A. *During fabrication.* These tanks and dry-bulk carriers are entered repeatedly throughout the fabrication process. These products are not configured identically, but the manufacturing processes by which they are made are very similar.

Sources of hazards. In addition to the mechanical hazards arising from the risks that an entrant would be injured due to contact with components of the tank or the tools being used, there is also the risk that a worker could be injured by breathing fumes from welding materials or mists or vapors from materials used to coat the tank interior. In addition, many of these vapors and mists are flammable, so the failure to properly ventilate a tank could lead to a fire or explosion.

Control of hazards.

Welding. Local exhaust ventilation shall be used to remove welding fumes once the tank or carrier is completed to the point that workers may enter and exit only through a manhole. (Follow the requirements of 29 CFR 1910, Subpart Q, OSHA's welding standard, at all times.) Welding gas tanks may never be brought into a tank or carrier that is a permit entry confined space.

Application of interior coatings/linings. Atmospheric hazards shall be controlled by forced air ventilation sufficient to keep the atmospheric concentration of flammable materials below 10% of the lower flammable limit (LFL) (or lower explosive limit (LEL), whichever term is used locally). The appropriate respirators are provided and shall be used in addition to providing forced ventilation if the forced ventilation does not maintain acceptable respiratory conditions.

Permits. Because of the repetitive nature of the entries in these operations, an "Area Entry Permit" will be issued for a 1 month period to cover those production areas where tanks are fabricated to the point that entry and exit are made using manholes.

Authorization. Only the area supervisor may authorize an employee to enter a tank within the permit area. The area supervisor must determine that conditions in the tank trailer, dry bulk trailer or truck, etc. meet permit requirements before authorizing entry.

Attendant. The area supervisor shall designate an employee to maintain communication by employer specified means with employees working in tanks to ensure their safety. The attendant may not enter any permit entry confined space to rescue an entrant or for any other reason, unless authorized by the rescue procedure and, and even then, only after calling the rescue team and being relieved by as attendant by another worker.

Communications and observation. Communications between attendant and entrant(s) shall be maintained throughout entry. Methods of communication that may be specified by the permit include voice, voice powered radio, tapping or rapping codes on tank walls, signalling tugs on a rope, and the attendant's observation that work activities such as chipping, grinding, welding, spraying, etc., which require deliberate operator control continue normally. These activities often generate so much noise that the necessary hearing protection makes communication by voice difficult.

Rescue procedures. Acceptable rescue procedures include entry by a team of employee-rescuers, use of public emergency services, and procedures for breaching the tank. The area permit specifies which procedures are available, but the area supervisor makes the final decision based on circumstances. (Certain injuries may make it necessary to breach the tank to remove a person rather than risk additional injury by removal through an existing manhole. However, the supervisor must ensure that no breaching procedure used for rescue would violate terms of the entry permit. For instance, if the tank must be breached by cutting with a torch, the tank surfaces to be cut must be free of volatile or combustible coatings within 4 inches (10.16 cm) of the cutting line and the atmosphere within the tank must be below the LFL.

Retrieval line and harnesses. The retrieval lines and harnesses generally required under this standard are usually impractical for use in tanks because the internal configuration of the tanks and their interior baffles and other structures would prevent rescuers from

hauling out injured entrants. However, unless the rescue procedure calls for breaching the tank for rescue, the rescue team shall be trained in the use of retrieval lines and harnesses for removing injured employees through manholes.

B. *Repair or service of "used" tanks and bulk trailers.*

Sources of hazards. In addition to facing the potential hazards encountered in fabrication or manufacturing, tanks or trailers which have been in service may contain residues of dangerous materials, whether left over from the transportation of hazardous cargoes or generated by chemical or bacterial action on residues of non-hazardous cargoes.

Control of atmospheric hazards. A "used" tank shall be brought into areas where tank entry is authorized only after the tank has been emptied, cleansed (without employee entry) of any residues, and purged of any potential atmospheric hazards.

Welding. In addition to tank cleaning for control of atmospheric hazards, coating and surface materials shall be removed 4 inches (10.16 cm) or more from any surface area where welding or other torch work will be done and care taken that the atmosphere within the tank remains well below the LFL. (Follow the requirements of 29 CFR 1910, Subpart Q, OSHA's welding standard, at all times.)

Permits. An entry permit valid for up to 1 year shall be issued prior to authorization of entry into used tank trailers, dry bulk trailers or trucks. In addition to the pre-entry cleaning requirement, this permit shall require the employee safeguards specified for new tank fabrication or construction perm areas.

Authorization. Only the area supervisor ma authorize an employee to enter a tank trailer, dry bulk trailer or truck within the permit area. The area supervisor must determine that the entry permit requirements have been met before authorizing entry.

Appendix D - 1

Confined Space Entry Permit

Date & Time Issued:_____ Date and Time Expires:_____

Job site/Space I.D.:_____ Job Supervisor_____

Equipment to be worked on:_____ Work to be performed: _____

Stand-by personnel_____ _____ _____

1. Atmospheric Checks: Time _____
   Oxygen _____%
   Explosive _____% L.F.L.
   Toxic _____PPM

2. Tester's signature_____

3. Source isolation (No Entry):	N/A	Yes	No
Pumps or lines blinded, disconnected, or blocked	( )	( )	( )
4. Ventilation Modification:	**N/A**	**Yes**	**No**
Mechanical	( )	( )	( )
Natural Ventilation only	( )	( )	( )

5. Atmospheric check after isolation and Ventilation:

Oxygen_____%	>	19.5 %	
Explosive_____% L.F.L.	<	10 %	
Toxic_____PPM	<	10	PPM H_2S

Time_____

Testers signature_____

6. Communication procedures: _____

_____

7. Rescue procedures: _____

_____

_____

_____

_____

_____

8. Entry, standby, and back up persons:

	Yes	No
Successfully completed required training?		
Is it current?	( )	( )

9. Equipment:

	N/A	Yes	No
Direct reading gas monitor - tested	( )	( )	( )
Safety harnesses and lifelines for entry and standby persons	( )	( )	( )
Hoisting equipment	( )	( )	( )
Powered communications	( )	( )	( )
SCBA's for entry and standby persons	( )	( )	( )
Protective Clothing	( )	( )	( )
All electric equipment listed Class I, Division I, Group D and Non-sparking tools	( )	( )	( )

10. Periodic atmospheric tests:

Oxygen ___% Time___	Oxygen ___% Time___	Oxygen ___% Time___	Oxygen ___% Time___
Explosive___% Time___	Explosive___% Time___	Explosive___% Time___	Explosive___% Time___
Toxic ___% Time___	Toxic ___% Time___	Toxic ___% Time___	Toxic ___% Time___

We have reviewed the work authorized by this permit and the information contained here-in. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any squares are marked in the "No" column. This permit is not valid unless all appropriate items are completed.

Permit Prepared By: (Supervisor)_____ _____

Approved By: (Unit Supervisor)_____ _____

Reviewed By (Cs Operations Personnel):_____ _____

(printed name) (signature)

This permit to be kept at job site. Return job site copy to Safety Office following job completion.

Copies: White Original (Safety Office) Yellow (Unit Supervisor) Hard(Job site)

Appendix D - 2

ENTRY PERMIT

PERMIT VALID FOR 8 HOURS ONLY. ALL PERMIT COPIES REMAIN AT SITE UNTIL JOB COMPLETED

DATE: - - SITE LOCATION/DESCRIPTION _____

PURPOSE OF ENTRY _____

SUPERVISOR(S) in charge of crews Type of Crew Phone # _____

COMMUNICATION PROCEDURES _____

RESCUE PROCEDURES (PHONE NUMBERS AT BOTTOM) _____

* BOLD DENOTES MINIMUM REQUIREMENTS TO BE COMPLETED AND REVIEWED PRIOR TO ENTRY*

REQUIREMENTS COMPLETED	DATE	TIME	REQUIREMENTS COMPLETED	DATE	TIME
Lock Out/De-energize/Try-out			Full Body Harness w/"D" ring		
Line(s) Broken-Capped-Blank			Emergency Escape Retrieval Eq		
Purge-Flush and Vent			Lifelines		
Ventilation			Fire Extinguishers		
Secure Area (Post and Flag)			Lighting (Explosive Proof)		
Breathing Apparatus			Protective Clothing		
Resuscitator - Inhalator			Respirator(s) (Air Purifying)		
Standby Safety Personnel			Burning and Welding Permit		

Note: Items that do not apply enter N/A in the blank.

** RECORD CONTINUOUS MONITORING RESULTS EVERY 2 HOURS **

CONTINUOUS MONITORING**	Permissible Entry Level								
TEST(S) TO BE TAKEN									
PERCENT OF OXYGEN	19.5% to 23.5%								
LOWER FLAMMABLE LIMIT	Under 10%								
CARBON MONOXIDE	+35 PPM								
Aromatic Hydrocarbon	+ 1 PPM	* 5PPM							
Hydrogen Cyanide	(Skin)	* 4PPM							
Hydrogen Sulfide	+10 PPM	*15PPM							
Sulfur Dioxide	+ 2 PPM	* 5PPM							
Ammonia		*35PPM							

* Short-term exposure limit:Employee can work in the area up to 15 minutes.

+ 8 hr. Time Weighted Avg.:Employee can work in area 8 hrs (longer with appropriate respiratory protection).

REMARKS: _____

GAS TESTER NAME & CHECK #	INSTRUMENT(S) USED	MODEL &/OR TYPE	SERIAL &/OR UNIT #

SAFETY STANDBY PERSON IS REQUIRED FOR ALL CONFINED SPACE WORK

SAFETY STANDBY PERSON(S)	CHECK #	CONFINED SPACE ENTRANT(S)	CHECK #	CONFINED SPACE ENTRANT(S)	CHECK #

SUPERVISOR AUTHORIZATION - ALL CONDITIONS SATISFIED _____ DEPARTMENT/PHONE _____

AMBULANCE 2800 FIRE 2900 Safety 4901 Gas Coordinator 4529/5187

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APPENDIX E TO § 1910.146—SEWER SYSTEM ENTRY

Sewer entry differs in three vital respects from other permit entries: first, there rarely exists any way to completely isolate the space (a section of a continuous system) to be entered; second, because isolation is not complete, the atmosphere may suddenly and unpredictably become lethally hazardous (toxic, flammable or explosive) from causes beyond the control of the entrant or employer, and third, experienced sewer workers are especially knowledgeable in entry and work in their permit spaces because of their frequent entries. Unlike other employments where permit space entry is a rare and exceptional event, sewer workers' usual work environment is a permit space.

(1) *Adherence to procedure.* The employer should designate as entrants only employees who are thoroughly trained in the employer's sewer entry procedures and who demonstrate that they follow these entry procedures exactly as prescribed when performing sewer entries.

(2) *Atmospheric monitoring.* Entrants should be trained in the use of, and be equipped with, atmospheric monitoring equipment which sounds an audible alarm, in addition to its visual readout, whenever one of the following conditions are encountered: Oxygen concentration less than 19.5 percent; flammable gas or vapor at 10 percent or more of the lower flammable limit (LFL); or hydrogen sulfide or carbon monoxide at or above 10 ppm or 35 ppm, respectively, measured as an 8-hour time-weighted average. Atmospheric monitoring equipment needs to be calibrated according to the manufacturer's instructions. The oxygen sensor/broad range sensor is best suited for initial use in situations where the actual or potential contaminants have not been identified, because broad range sensors, unlike substance-specific sensors, enable employers to obtain an overall reading of the hydrocarbons (flammables) present in the space. However, such sensors only indicate that a hazardous threshold of a class of chemicals has been exceeded. They do not measure the levels of contamination of specific substances. Therefore, substance-specific devices, which measure the actual levels of specific substances, are best suited for use where actual and potential contaminants have been identified. The measurements obtained with substance-specific devices are of vital importance to the employer when decisions are made concerning the measures necessary to protect entrants (such as ventilation or personal protective equipment) and the setting and attainment of appropriate entry conditions. However, the sewer environment may suddenly and unpredictably change, and the substance-specific devices may not detect the potentially lethal atmospheric hazards which may enter the sewer environment.

Although OSHA considers the information and guidance provided above to be appropriate and useful in most sewer entry situations, the Agency emphasizes that each employer must consider the unique circumstances, including the predictability of the atmosphere, of the sewer permit spaces in the employer's workplace in preparing for entry. Only the employer can decide, based upon his or her knowledge of, and experience with permit spaces in sewer systems, what the best type of testing instrument may be for any specific entry operation.

The selected testing instrument should be carried and used by the entrant in sewer line work to monitor the atmosphere in the entrant's environment, and in advance of the entrant's direction of movement, to warn the entrant of any deterioration in atmospheric conditions. Where several entrants are working together in the same immediate location, one instrument, used by the lead entrant, is acceptable.

(3) *Surge flow and flooding.* Sewer crews should develop and maintain liaison, to the extent possible, with the local weather bureau and fire and emergency services in their area so that sewer work may be delayed or interrupted and entrants withdrawn whenever sewer lines might be suddenly flooded by rain or fire suppression activities, or whenever flammable or other hazardous materials are released into sewers during emergencies by industrial or transportation accidents.

(4) *Special Equipment.* Entry into large bore sewers may require the use of special equipment. Such equipment might include such items as atmosphere monitoring devices with automatic audible alarms, escape self-contained breathing apparatus (ESCBA) with at least 10 minute air supply (or other NIOSH approved self-rescuer), and waterproof flashlights, and may also include boats and rafts, radios and rope stand-offs for pulling around bends and corners as needed.

[58 FR 4549, Jan. 14, 1993; 58 FR 34845, June 29, 1993, as amended at 59 FR 26114, May 19, 1994]

§ 1910.147 The control of hazardous energy (lockout/tagout).

(a) *Scope, application and purpose*—(1) *Scope.* (i) This standard covers the servicing and maintenance of machines and equipment in which the *unexpected* energization or start up of the machines or equipment, or release of stored energy could cause injury to employees. This standard establishes minimum performance requirements for the control of such hazardous energy.

(ii) This standard does not cover the following:

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29CFR 1910.147 - The Control of Hazardous Energy (Lockout/Tagout)

APPENDIX E TO § 1910.146—SEWER SYSTEM ENTRY

Sewer entry differs in three vital respects from other permit entries; first, there rarely exists any way to completely isolate the space (a section of a continuous system) to be entered; second, because isolation is not complete, the atmosphere may suddenly and unpredictably become lethally hazardous (toxic, flammable or explosive) from causes beyond the control of the entrant or employer, and third, experienced sewer workers are especially knowledgeable in entry and work in their permit spaces because of their frequent entries. Unlike other employments where permit space entry is a rare and exceptional event, sewer workers' usual work environment is a permit space.

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The selected testing instrument should be carried and used by the entrant in sewer line work to monitor the atmosphere in the entrant's environment, and in advance of the entrant's direction of movement, to warn the entrant of any deterioration in atmospheric conditions. Where several entrants are working together in the same immediate location, one instrument, used by the lead entrant, is acceptable.

(3) *Surge flow and flooding.* Sewer crews should develop and maintain liaison, to the extent possible, with the local weather bureau and fire and emergency services in their area so that sewer work may be delayed or interrupted and entrants withdrawn whenever sewer lines might be suddenly flooded by rain or fire suppression activities, or whenever flammable or other hazardous materials are released into sewers during emergencies by industrial or transportation accidents.

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§ 1910.147 The control of hazardous energy (lockout/tagout).

(a) *Scope, application and purpose*—(1) *Scope.* (i) This standard covers the servicing and maintenance of machines and equipment in which the *unexpected* energization or start up of the machines or equipment, or release of stored energy could cause injury to employees. This standard establishes minimum performance requirements for the control of such hazardous energy.

(ii) This standard does not cover the following:

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(A) Construction, agriculture and maritime employment;

(B) Installations under the exclusive control of electric utilities for the purpose of power generation, transmission and distribution, including related equipment for communication or metering; and

(C) Exposure to electrical hazards from work on, near, or with conductors or equipment in electric utilization installations, which is covered by subpart S of this part; and

(D) Oil and gas well drilling and servicing.

(2) *Application.* (i) This standard applies to the control of energy during servicing and/or maintenance of machines and equipment.

(ii) Normal production operations are not covered by this standard (See subpart O of this part). Servicing and/or maintenance which takes place during normal production operations is covered by this standard only if;:

(A) An employee is required to remove or bypass a guard or other safety device; or

(B) An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

NOTE: *Exception to paragraph (a)(2)(ii):* Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, are not covered by this standard if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection (See subpart O of this part).

(iii) This standard does not apply to the following.

(A) Work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energization or start up of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing or maintenance.

(B) Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water or petroleum products when they are performed on pressurized pipelines, provided that the employer demonstrates that (*1*) continuity of service is essential; (*2*) shutdown of the system is impractical; and (*3*) documented procedures are followed, and special equipment is used which will provide proven effective protection for employees.

(3) *Purpose.* (i) This section requires employers to establish a program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices, and to otherwise disable machines or equipment to prevent unexpected energization, start-up or release of stored energy in order to prevent injury to employees.

(ii) When other standards in this part require the use of lockout or tagout they shall be used and supplemented by the procedural and training requirements of this section.

(b) *Definitions applicable to this section.*

Affected employee. An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Authorized employee. A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this section.

Capable of being locked out. An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

Energized. Connected to an energy source or containing residual or stored energy.

Energy isolating device. A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: A manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

Energy source. Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Hot tap. A procedure used in the repair, maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

Lockout. The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout device. A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in a safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

Normal production operations. The utilization of a machine or equipment to perform its intended production function.

Servicing and/or maintenance. Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the *unexpected* energization or startup of the equipment or release of hazardous energy.

Setting up. Any work performed to prepare a machine or equipment to perform its normal production operation.

Tagout. The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout device. A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

(c) *General*—(1) *Energy control program.* The employer shall establish a program consisting of energy control procedures, employee training and periodic inspections to ensure that before any employee performs any servicing or maintenance on a machine or equipment where the unexpected energizing, start up or release of stored energy could occur and cause injury, the machine or equipment shall be isolated from the energy source, and rendered inoperative.

(2) *Lockout/tagout.* (i) If an energy isolating device is not capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize a tagout system.

(ii) If an energy isolating device is capable of being locked out, the employer's energy control program under paragraph (c)(1) of this section shall utilize lockout, unless the employer can demonstrate that the utilization of a tagout system will provide full employee protection as set forth in paragraph (c)(3) of this section.

(iii) After January 2, 1990, whenever replacement or major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machine or equipment shall be designed to accept a lockout device.

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(3) *Full employee protection.* (i) When a tagout device is used on an energy isolating device which is capable of being locked out, the tagout device shall be attached at the same location that the lockout device would have been attached, and the employer shall demonstrate that the tagout program will provide a level of safety equivalent to that obtained by using a lockout program.

(ii) In demonstrating that a level of safety is achieved in the tagout program which is equivalent to the level of safety obtained by using a lockout program, the employer shall demonstrate full compliance with all tagout-related provisions of this standard together with such additional elements as are necessary to provide the equivalent safety available from the use of a lockout device. Additional means to be considered as part of the demonstration of full employee protection shall include the implementation of additional safety measures such as the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or the removal of a valve handle to reduce the likelihood of inadvertent energization.

(4) *Energy control procedure.* (i) Procedures shall be developed, documented and utilized for the control of potentially hazardous energy when employees are engaged in the activities covered by this section.

NOTE: *Exception:* The employer need not document the required procedure for a particular machine or equipment, when all of the following elements exist: (1) The machine or equipment has no potential for stored or residual energy or reaccumulation of stored energy after shut down which could endanger employees; (2) the machine or equipment has a single energy source which can be readily identified and isolated; (3) the isolation and locking out of that energy source will completely deenergize and deactivate the machine or equipment; (4) the machine or equipment is isolated from that energy source and locked out during servicing or maintenance; (5) a single lockout device will achieve a locked-out condition; (6) the lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance; (7) the servicing or maintenance does not create hazards for other employees; and (8) the employer, in utilizing this exception, has had no accidents involving the unexpected activation or reenergization of the machine or equipment during servicing or maintenance.

(ii) The procedures shall clearly and specifically outline the scope, purpose, authorization, rules, and techniques to be utilized for the control of hazardous energy, and the means to enforce compliance including, but not limited to, the following:

(A) A specific statement of the intended use of the procedure;

(B) Specific procedural steps for shutting down, isolating, blocking and securing machines or equipment to control hazardous energy;

(C) Specific procedural steps for the placement, removal and transfer of lockout devices or tagout devices and the responsibility for them; and

(D) Specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

(5) *Protective materials and hardware.* (i) Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided by the employer for isolating, securing or blocking of machines or equipment from energy sources.

(ii) Lockout devices and tagout devices shall be singularly identified; shall be the only devices(s) used for controlling energy; shall not be used for other purposes; and shall meet the following requirements:

(A) *Durable.* (*1*) Lockout and tagout devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.

(*2*) Tagout devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.

(*3*) Tags shall not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled and stored.

(B) *Standardized.* Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria: Color; shape; or size; and additionally, in the case of tagout

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devices, print and format shall be standardized.

(C) *Substantial—(1) Lockout devices.* Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.

(2) *Tagout devices.* Tagout devices, including and their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all-environment-tolerant nylon cable tie.

(D) *Identifiable.* Lockout devices and tagout devices shall indicate the identity of the employee applying the device(s).

(iii) Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as the following: *Do Not Start, Do Not Open, Do Not Close, Do Not Energize, Do Not Operate.*

(6) *Periodic inspection.* (i) The employer shall conduct a periodic inspection of the energy control procedure at least annually to ensure that the procedure and the requirements of this standard are being followed.

(A) The periodic inspection shall be perfomed by an authorized employee other than the ones(s) utilizing the energy control procedure being inspected.

(B) The periodic inspection shall be conducted to correct any deviations or inadequacies identified.

(C) Where lockout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

(D) Where tagout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized and affected employee, of that employee's responsibilities under the energy control procedure being inspected, and the elements set forth in paragraph (c)(7)(ii) of this section.

(ii) The employer shall certify that the periodic inspections have been performed. The certification shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the employees included in the inspection, and the person performing the inspection.

(7) *Training and communication.* (i) The employer shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees. The training shall include the following:

(A) Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.

(B) Each affected employee shall be instructed in the purpose and use of the energy control procedure.

(C) All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about the procedure, and about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.

(ii) When tagout systems are used, employees shall also be trained in the following limitations of tags:

(A) Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.

(B) When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.

(C) Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.

(D) Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.

(E) Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

(F) Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

(iii) Employee retraining.

(A) Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.

(B) Additional retraining shall also be conducted whenever a periodic inspection under paragraph (c)(6) of this section reveals, or whenever the employer has reason to believe, that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

(C) The retraining shall reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

(iv) The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.

(8) *Energy isolation.* Lockout or tagout shall be performed only bythe authorized employees who are performing the servicing or maintenance.

(9) *Notification of employees.* Affected employees shall be notified by the employer or authorized employee of the application and removal of lockout devices or tagout devices. Notification shall be given before the controls are applied, and after they are removed from the machine or equipment.

(d) *Application of control.* The established procedures for the application of energy control (the lockout or tagout procedures) shall cover the following elements and actions and shall be done in the following sequence:

(1) *Preparation for shutdown.* Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.

(2) *Machine or equipment shutdown.* The machine or equipment shall be turned off or shut down using the procedures established for the machine or equipment. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.

(3) *Machine or equipment isolation.* All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy source(s).

(4) *Lockout or tagout device application.* (i) Lockout or tagout devices shall be affixed to each energy isolating device by authorized employees.

(ii) Lockout devices, where used, shall be affixed in a manner to that will hold the energy isolating devices in a "safe" or "off" position.

(iii) Tagout devices, where used, shall be affixed in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the "safe" or "off" position is prohibited.

(A) Where tagout devices are used with energy isolating devices designed with the capability of being locked, the tag attachment shall be fastened at the same point at which the lock would have been attached.

(B) Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

(5) *Stored energy.* (i) Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe.

(ii) If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.

(6) *Verification of isolation.* Prior to starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall verify that isolation and deenergization of the machine or equipment have been accomplished.

(e) *Release from lockout or tagout.* Before lockout or tagout devices are removed and energy is restored to the machine or equipment, procedures shall be followed and actions taken by the authorized employee(s) to ensure the following:

(1) *The machine or equipment.* The work area shall be inspected to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.

(2) *Employees.* (i) The work area shall be checked to ensure that all employees have been safely positioned or removed.

(ii) After lockout or tagout devices have been removed and before a machine or equipment is started, affected employees shall be notified that the lockout or tagout device(s) have been removed.

(3) *Lockout or tagout devices removal.* Each lockout or tagout device shall be removed from each energy isolating device by the employee who applied the device. *Exception to paragraph (e)(3):* When the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed under the direction of the employer, provided that specific procedures and training for such removal have been developed, documented and incorporated into the employer's energy control program. The employer shall demonstrate that the specific procedure provides equivalent safety to the removal of the device by the authorized employee who applied it. The specific procedure shall include at least the following elements:

(i) Verfication by the employer that the authorized employee who applied the device is not at the facility;

(ii) Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed; and

(iii) Ensuring that the authorized employee has this knowledge before he/she resumes work at that facility.

(f) *Additional requirements*—(1) *Testing or positioning of machines, equipment or components thereof.* In situations in which lockout or tagout devices must be temporarily removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component thereof, the following sequence of actions shall be followed:

(i) Clear the machine or equipment of tools and materials in accordance with paragraph (e)(1) of this section;

(ii) Remove employees from the machine or equipment area in accordance with paragraph (e)(2) of this section;

(iii) Remove the lockout or tagout devices as specified in paragraph (e)(3) of this section;

(iv) Energize and proceed with testing or positioning;

(v) Deenergize all systems and reapply energy control measures in accordance with paragraph (d) of this section to continue the servicing and/or maintenance.

(2) *Outside personnel (contractors, etc.).* (i) Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer shall inform each other of their respective lockout or tagout procedures.

(ii) The on-site employer shall ensure that his/her employees understand and comply with the restrictions and prohibitions of the outside employer's energy control program.

(3) *Group lockout or tagout.* (i) When servicing and/or maintenance is performed by a crew, craft, department or other group, they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

(ii) Group lockout or tagout devices shall be used in accordance with the procedures required by paragraph (c)(4) of this section including, but not necessarily limited to, the following specific requirements:

(A) Primary responsibility is vested in an authorized employee for a set number of employees working under