May 13, 2022 21494044

Mr. Tim Krause, Director of Engineering
Granger Waste Services
16980 Wood Road
Lansing, MI 48906

RE: RESPONSE TO COMPLETENESS NOTICE OF DEFICIENCY
GRANGER GRAND RIVER MID LANDFILL (MID 082 771 700)
POST-CLOSURE OPERATING LICENSE RENEWAL APPLICATION

Dear Mr. Krause:

On April 13, 2022, Granger received a letter from the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE) documenting the administrative completeness review of the hazardous waste management facility post-closure operating license renewal application for the Granger Grand River MID Landfill.

EGLE determined that the renewal application was administratively incomplete and noted the deficiencies below. We have re-stated the noted deficiencies (italic text) and provided a response (normal text).

Forms

1. *Submit a completed EQP 5150 form. Please note that all Part A information requirements must be included on either the EQP 5111 form or EQP 5150 forms.*

   The Site Identification Form (EQP 5150) dated September 2009 is included in **Attachment A**.

2. *Include up to date copies of all other state environmental permits.*

   The Stormwater General Permit Certificate of Coverage No. MIS410095 is included in **Attachment B.** Also included in **Attachment B** is the Renewable Operating Permit for the Grand River Avenue Landfill and Generating Station (MI-ROP-N5996-2018).

General Information

3. *Revise Section 2.0 to justify why containers, tanks, and treatment sections are not included in the application.*

   The MID landfill does not include any hazardous waste containers, tanks or treatment system. There is a leachate treatment system (not currently in use) for MID and the adjacent Part 115 landfill leachate, however, the MID leachate has been delisted/redesignated as liquid industrial waste (Petition to Delist Hazardous Waste Landfill Leachate, submitted by Granger, June 30, 2004). A statement reflecting this has been added to Section 2.0 as requested. The revised Section 2.0 is provided in **Attachment C**.

Hydrogeology and Groundwater Monitoring Engineering Report

4. *Include the three hydrogeological investigation reports, noted as attachments, in Section 3.0, and revise Section 3.0 to identify where the necessary information is located in each report.*

   Copies of the three past hydrogeological investigation reports referenced are provided in Appendix H. Section 3.0 has been revised to include additional summaries of the site geology and hydrogeology and information regarding site boring logs and lithologic profiles. Boring logs and lithologic profiles for the site are provided in Appendix I, this includes all recent boring logs performed to replace monitoring wells to maintain the monitoring well network of the site. The revised Section 3.0 and new appendices are provided in **Attachment D**. The revised operation license permit application review checklist is provided with **Attachment E**.

5. *Revise the Section 3.0 to identify that the Post-Closure Groundwater Statistical Evaluation Program is included in the application as Appendix F-3.*

   Section 3.0 has been revised to note that the Post-Closure Groundwater Statistical Evaluation Program is provided in Appendix F-3. The revised Section 3.0 is provided in **Attachment D**.

6. *Revise Section 3.0 to include the necessary information referenced in the Annual Groundwater Reports.*

   The 2021 Annual Groundwater Report is provided in **Attachment F**. Section 3.2 has been added to the application to discuss/summarize the characterization of impacted groundwater and is provided in **Attachment G**. The revised operation license permit application review checklist is provided with **Attachment E**.

Monitoring and Groundwater Corrective Action

7. *Revise the application to provide justification of why a soil monitoring program and an ambient air monitoring program are not included in the monitoring programs.*

   Consistent with past post-closure operation permit applications, the fact that a cap has been constructed over the site to achieve both encapsulation and closure has been used as justification that air and soil monitoring programs are unnecessary; Section 3.1 has been revised to include this statement. The revised Section 3.0 is provided in **Attachment D**.

Inspection

8. *Revise the application to include all the information associated with inspection (Section 2.3 and Appendix A) in the template, Inspection Schedule – A5, located online at EGLE - Hazardous Waste Program Forms and License Applications (Michigan.gov).*

Section 2.3 has been revised to include the templated items outlined in Form EQP 5111 Attachment Template A5, Inspection Requirements. The revised Section 2.3 is included in **Attachment H**. The inspection section has been included in a revised Appendix A, which is included in **Attachment H.**

9. *Revise Section 2.3 to identify where the information is located.*

The revised Section 2.3 and revised Appendix A is included in **Attachment H**.

Contingency Plan

10. *A contingency plan must be included in the application as an appendix. This plan must contain all the information needed to satisfy the requirements per 40 Code of Federal Regulations (CFR) 270.14(b)(7).*

Per R299.9508(3), a contingency plan satisfying the requirements of 40 CFR 270.14(b)(7) is not necessary for an operating license application for the post-closure period. The facility has an Emergency Action Plan (EAP) and Stormwater Pollution Prevention Plan (SWPPP) that serve as the contingency plan for the facility. The EAP and SWPPP are referenced in the revised Section 2.1 (**Attachment C**) are provided in a new Appendix J (included as **Attachment I** to this letter)**.**

11. *Revise the application to include a section that identifies where the information is located.*

Section 2.1 has been revised to reference the EAP and SWPPP Plan which are provided in a new Appendix J.

Training

12. *Revise the application to include a section that addresses personnel training. This section must contain all the information needed to satisfy the requirements per 40 CFR 270.14(b)(12).*

Per R299.9508(3), a personnel training section satisfying the requirements of 40 CFR 270.14(b)(12) is not necessary for an operating license application for the post-closure period. Annual training requirements are covered in the SWPPP and EAP (Appendix J) which are provided here in **Attachment I**.

Sincerely,

Golder Associates Inc.

Samuel F. Stafford, PE
Lead Consultant

David M. List, PE
Senior Director

SFS/DML

Attachments: Attachment A –Site Identification Form
Attachment B – State Environmental Permits
Attachment C – Revised Section 2.0
Attachment D – Revised Section 3.0, Appendix H, and Appendix I
Attachment E – Revised Application Review Checklist
Attachment F – 2021 Annual Groundwater Report
Attachment G – Revised Section 3.2
Attachment H – Revised Section 2.3 and Appendix A
Attachment I – Appendix J
.

https://golderassociates.sharepoint.com/sites/152409/project files/5 technical work/mid post-closure op app/rai/granger mid lf post-closure app cnod response_051322.docx

ATTACHMENT A

Site Identification Form

Required under authority of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Failure to submit this information may result in civil or criminal penalties.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
Waste and Hazardous Materials Division

SITE IDENTIFICATION

DEQ

The form is being submitted

CHECK CORRECT BOX(ES)

If submitting a subsequent notification you can contact the MDEQ-WHMD District or Lansing office for a pre-populated form. For locations and phone numbers go to www.michigan.gov/deq.

☐ **as initial notification**: to notify as a new site or new owner for the site: Mail this form and the user charge fee with either a receipt from paying the $50.00 fee on-line using a Master Card, VISA, or Discover Card (https://www.thepayplace.com/mi/deq/siteid) or by check made payable to the State of Michigan. Mail to MDEQ Revenue Office - HWCU, PO Box 30657, Lansing, MI 48909-8157 **OR**

☒ **as subsequent notification**: to change, update, or verify site information for an existing owner of a site with a previously issued site id number: Mail directly to WHMD-MDEQ at WHMD-MDEQ, Notification Unit, PO Box 30241, Lansing, MI 48909-4797 if a fee is not required. Otherwise submit to MDEQ Revenue Office (see above).

AND ANY OF THE FOLLOWING

☐ as a component of a Hazardous Waste Permit Part A (submit to WHMD-MDEQ)

☐ as a component of the Hazardous Waste (biennial) Report (submit to WHMD-MDEQ)

II. Site's ID Number

A. Site's Identification (ID) Number: MID 082771700

III. Name of Site

TYPE OR PRINT CLEARLY

A. Legal Company Name: Watertown Development Corp.

B. Site Specific Name (d/b/a): Granger Grand River 082771700 Landfill

IV. NAICS for this Site

A. 562212	B.	C.	D.

V. Site Location Address and Other Site Information

TYPE OR PRINT CLEARLY

Street Address line 1: 8550 West Grand River

Address line 2

City, Town, or Village: Grand Ledge

State, Province or Subdivision (2 letters): MI

Country: US

County Name (MI only): Clinton

Zip or Postal Code: 48837 -

Tax Number: 38-2028140

Approx / Ave Number of Employees: 4

VI. Site Mailing Address

TYPE OR PRINT CLEARLY

Street Address line 1 or PO Box: 16980 Wood Road

Address line 2:

City, Town, or Village: Lansing

State, Province or Subdivision (2 letters): MI

Country: US

Zip or Postal Code: 48906 -

VII. Site Contact Person

TYPE OR PRINT CLEARLY

First Name: Charles

MI: S

Last Name: Annett

Phone Number: (517) 371-9727

Phone number extension:

email address: Cannett@Grangernet.com

Fax number: (517) 371-9776

VIII. Indian Reservation

Facility on Indian Reservation Land ☐ yes ☒ no

IX. Owner of the site and/or Operator of Site

TYPE OR PRINT CLEARLY

Add any additional owners or operators on the comment page. The property owner is not required unless said property owner also acts as the owner or operator of the activity that generates the waste

A. (check applicable box(es))

☒ Owner ☐ Operator

Approx date became owner or operator: 03/17/1980

Approx date ceased as owner or operator:

Name: Watertown Development Corp.

Type (check one): ☒Private ☐County ☐District ☐Federal ☐Indian ☐Municipal ☐State ☐Other

B. (check applicable box(es))

☐ Owner ☒ Operator

Approx date became owner &/or operator: 03/17/1980

Approx date ceased as owner &/or operator:

Name: Granger Land Development Co.

Type (check one): ☒Private ☐County ☐District ☐Federal ☐Indian ☐Municipal ☐State ☐Other

C. (check applicable box(es))

☐ Owner ☐ Operator

Approx date became owner or operator:

Approx date ceased as owner or operator:

Name:

Type (check one): ☐Private ☐County ☐District ☐Federal ☐Indian ☐Municipal ☐State ☐Other

X. Type of Regulated Waste Activity: <u>You must put an "X" in the appropriate box(es) for the current regulated waste activity</u>. The date of the signature in Section XI will be used as the date the regulated waste activity(ies) you check below began. However, in Box A1, if the activity began earlier than the signature date, enter the correct date after "Date activity began" in yyyyddmm format. If any other regulated waste activity(ies) in A.2 - A.8 or Box-E began earlier, write in the correct date(s) in XII Comments. The date a certain activity began can sugject the site to different requirements, such as annual user charges. If your activity(ies) change during the year a 'Subsequent Site Identification' form should be submitted indicating the change.

A. Hazardous Waste Activity(ies) **at this location**

1. Generator of hazardous waste (choose one of the following three categories a-c)
   - ☐ a. LQG: Greater than 1,000 kg/mo (2,200 lbs.) of non-acute hazardous waste; **or**
   - ☐ b. SQG: 100 to 1,000 kg/mo (220 - 2,200 lbs.) of non-acute hazardous waste; **or**
   - ☐ c. CESQG: Less than 100 kg/mo of non-acute hazardous waste

Date activity began: ________________

For items 2 through 8, check all that apply

2. Transporter of hazardous waste
   - ☐ a. Transport hazardous waste
   - ☐ b. Commingle waste
   - ☐ c. Offloads during transportation

   [may require a permit & registration]

3. Designated facility (hazardous waste received from off-site)
   - ☐ a. Treats or treated waste on-site at this location
   - ☐ b. Stores or stored waste on-site at this location
   - ☐ c. Disposes of or disposed of waste on-site at this location
   - ☐ d. Recycles recyclable materials on-site at this location

   [requires submittal of Part A & permit]

☐ 4. Underground injection well on-site at this location

☐ 5. Import agent for hazardous waste

☐ 6. Generates mixed radioactive waste on-site at this location

☐ 7. Accepts hazardous waste from CESQG & accumulates over 1000kg on-site at this location

8. Exempt boiler and/or Industrial Furnace on-site at this location
   - ☐ a. Smelting, melting, and refining furnace exemption
   - ☐ b. Small quantity on-site burner exemption

B. Polychlorinated biphenyls (PCBs) generated at this location.

☐ Generated an item, product, or material containing a concentration equal to or greater than 100 ppm of PCB

Regulated Waste Activity section continues; see next page

X. Type of Regulated Waste Activity - CONTINUED

C. Used Oil Activities **at this location**, check all that apply: (used oil generator only - go to E.) [see comments for additional information]

Used Oil Fuel Marketer
- ☐ a. Marketer who directs shipments of off-specification used oil to used oil burner.
- ☐ b. Marketer who first claims the used oil meets the specifications.

☐ 2. Off-specification Used Oil Burner

3. Used Oil Transporter (check one only)
- ☐ a. Transporter only
- ☐ b. Transporter with transfer facility

[requires a permit & registration]

☐ 4. Used Oil Processor
☐ 5. Used Oil Re-refiner
☐ 6. Used Oil Collection or Aggregation Point
☐ 7. Collection Center or Aggregation Point that accepts DIY Used Oil

D Universal Waste Activities **at this location**, check all that apply:

1. Large Quantity Handler: check the box(es) for the universal wastes generated or accumulated

type of universal waste	generating	accumulating over 5,000kg
a. Batteries	☐	☐
b. Thermostats	☐	☐
c. Mercury Thermometers	☐	☐
d. Devices containing elemental mercury	☐	☐
e. Mercury Switches	☐	☐
f. Pesticides	☐	☐
g. Electric Lamps	☐	☐
h. Pharmaceuticals	☐	☐
i. Consumer Electronics	☐	☐

☐ 2. Destination Facility of Universal Waste (a hazardous waste permit may be required for this activity)

E. Liquid Industrial Waste Activities **at this location**, check all that apply: (not hazardous waste activity)

☐ 1. Liquid Industrial Waste Transporter
[requires a permit & registration]
☐ 2. Transporting own waste
☐ 3. Liquid Industrial Waste Generator
☐ 4. Liquid Industrial Waste Designated Facility

F.

☒ 1. The site is still in business at this location but generation of waste or any other regulated waste activity has ceased as of (date) (mm/dd/yyyy): 1985

☐ 2. The site is out of business at this location and generation of waste or any other regulated waste activity has ceased as of (date) (mm/dd/yyyy): ____________

XI. Certification: I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment.

Signature of owner, operator, or authorized representative	**Name and Official Title (type or print)**	**Date Signed (mm-dd-yyyy)**
Chas S. Annett	Charles S. Annett Name Vice President Title	11-27-2009

XII. Comments:

To review the current regulated waste activity at this location please log into to the public website at http://www.deqstate.mi.us/wdspi

The Granger MID 082 771 700 Landfill is a closed landfill and is seeking renewal of a Post-Closure Operating License. The site generally accepted non-hazardous municipal solid waste. However, during the 1982-1983 time frame a small amount of contaminated soil from spill cleanups and waste material classified as hazardous due to the presence of heavy metals were accepted at the Granger Grand River MID 082 771 700.

Subsequent to the acceptance of those materials, the entire site was capped and closed in accordance with the appropriate regulations. The Michigan Department of Natural Resources (now the Michigan Department of Environmental Quality—MDEQ) acknowledged in a April 13, 1990 correspondence that all the closure criteria had been fulfilled and that Granger Land Development was released from the financial capability requirements for closure and liability coverage under Part 7 of the Act 64 rules.

On September 30, 1999 the MDEQ Waste Management Division issued a post-closure operating license for the site pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451). Since that time the site has been operated under a post-closure operating license.

ATTACHMENT B

State Environmental Permits

STORMWATER GENERAL PERMIT CERTIFICATE OF COVERAGE NO. MIS410095

EGLE

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
WATER RESOURCES DIVISION
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
Authorized by Part 31, Water Resources Protection, of the
Natural Resources and Environmental Protection Act, 1994 PA 451, as Amended

CERTIFICATE OF COVERAGE (COC)

Under General Permit No. MIS410000
SW-Industrial CY4 General Permit

COC NO.:	MIS410095
DESIGNATED NAME:	Granger Land Dev-Grand Ledge
PERMITTEE:	Granger Land Development Company
MAILING ADDRESS:	8550 West Grand River Avenue Grand Ledge, MI 48837

This COC authorizes Granger Land Development Company to discharge an unspecified amount of storm water that meets the criteria established in General Permit No. MIS410000. The discharge is from the Granger Land Development Company-Grand Ledge facility located at 8550 West Grand River Avenue, Grand Ledge, Michigan 48837. The discharge is to the Looking Glass River.

This authorization is based on certification received on September 24, 2018, that the permittee is in compliance with the following requirements of the Storm Water Pollution Prevention Plan and the general permit:

- Source identification requirements
- Industrial Storm Water Certified Operator requirements
- Prohibition of unauthorized non-storm water discharges
- Nonstructural preventative measures and source controls
- Structural storm water pollution control requirements as needed

Unless specified otherwise in the General Permit, all contact with the Department of Environment, Great Lakes, and Energy (Department), and all Department approvals, shall be directed to or made by the Water Resources Division's Lansing District Office located at 525 West Allegan Street, 1st Floor, South Tower, Lansing, MI 48933,
Telephone: 517-284-6651, Fax: 517-241-3571.

Any person who is aggrieved by this COC may file a sworn petition with the Michigan Administrative Hearing System within the Michigan Department of Licensing and Regulatory Affairs, c/o the Michigan Department of Environment, Great Lakes, and Energy, setting forth the conditions of the COC that are being challenged and specifying the grounds for the challenge. The Michigan Department of Licensing and Regulatory Affairs may reject any petition filed more than 60 days after issuance as being untimely.

The issuance of this COC does not authorize violation of any federal, state, or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other Department of Environment, Great Lakes, and Energy permits, or approvals from other units of government as may be required by law.

This COC is based on a complete application submitted on September 24, 2018. The permittee is subject to the conditions specified in General Permit No. MIS410000, issued August 3, 2018, expiring April 1, 2024. This COC may be modified, terminated, reissued, or revoked as allowed for in General Permit No. MIS410000. On its effective date, this COC shall supersede COC No. MIS410095 (expiring April 1, 2019).

This COC takes effect on the date of issuance.

Issued May 1, 2020

Original signed by Tarek Buckmaster
Tarek Buckmaster, Supervisor
Industrial and Storm Water Permits Unit
Permits Section
Water Resources Division

RENEWABLE OPERATING PERMIT FOR GRAND RIVER AVENUE LANDFILL AND GENERATING STATION

(MI-ROP-N5996-2018)

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

EFFECTIVE DATE: August 1, 2018

ISSUED TO

Granger Grand River Avenue Landfill and Grand River Generating Station

State Registration Number (SRN): N5996

LOCATED AT

8550 West Grand River Avenue, Grand Ledge, Michigan 48837

RENEWABLE OPERATING PERMIT

Permit Number: MI-ROP-N5996-2018

Expiration Date: August 1, 2023

Administratively Complete ROP Renewal Application Due Between
February 1, 2022 and February 1, 2023

This Renewable Operating Permit (ROP) is issued in accordance with and subject to Section 5506(3) of Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451). Pursuant to Michigan Air Pollution Control Rule 210(1), this ROP constitutes the permittee's authority to operate the stationary source identified above in accordance with the general conditions, special conditions and attachments contained herein. Operation of the stationary source and all emission units listed in the permit are subject to all applicable future or amended rules and regulations pursuant to Act 451 and the federal Clean Air Act.

Michigan Department of Environmental Quality

Brad Myott, Lansing District Supervisor

TABLE OF CONTENTS

AUTHORITY AND ENFORCEABILITY

For the purpose of this permit, the **permittee** is defined as any person who owns or operates an emission unit at a stationary source for which this permit has been issued. The **department** is defined in Rule 104(d) as the Director of the Michigan Department of Environmental Quality (MDEQ) or his or her designee.

The permittee shall comply with all specific details in the permit terms and conditions and the cited underlying applicable requirements. All terms and conditions in this ROP are both federally enforceable and state enforceable unless otherwise footnoted. Certain terms and conditions are applicable to most stationary sources for which an ROP has been issued. These general conditions are included in Part A of this ROP. Other terms and conditions may apply to a specific emission unit, several emission units which are represented as a flexible group, or the entire stationary source which is represented as a Source-Wide group. Special conditions are identified in Parts B, C, D and/or the appendices.

In accordance with Rule 213(2)(a), all underlying applicable requirements are identified for each ROP term or condition. All terms and conditions that are included in a PTI are streamlined, subsumed and/or is state-only enforceable will be noted as such.

In accordance with Section 5507 of Act 451, the permittee has included in the ROP application a compliance certification, a schedule of compliance, and a compliance plan. For applicable requirements with which the source is in compliance, the source will continue to comply with these requirements. For applicable requirements with which the source is not in compliance, the source will comply with the detailed schedule of compliance requirements that are incorporated as an appendix in this ROP. Furthermore, for any applicable requirements effective after the date of issuance of this ROP, the stationary source will meet the requirements on a timely basis, unless the underlying applicable requirement requires a more detailed schedule of compliance.

Issuance of this permit does not obviate the necessity of obtaining such permits or approvals from other units of government as required by law.

SECTION 1 - GRANGER GRAND RIVER LANDFILL

A. GENERAL CONDITIONS

Permit Enforceability

- All conditions in this permit are both federally enforceable and state enforceable unless otherwise noted. **(R 336.1213(5))**

- Those conditions that are hereby incorporated in a state-only enforceable Source-Wide PTI pursuant to Rule 201(2)(d) are designated by footnote one. **(R 336.1213(5)(a), R 336.1214a(5))**

- Those conditions that are hereby incorporated in a federally enforceable Source-Wide PTI pursuant to Rule 201(2)(c) are designated by footnote two. **(R 336.1213(5)(b), R 336.1214a(3))**

General Provisions

1. The permittee shall comply with all conditions of this ROP. Any ROP noncompliance constitutes a violation of Act 451, and is grounds for enforcement action, for ROP revocation or revision, or for denial of the renewal of the ROP. All terms and conditions of this ROP that are designated as federally enforceable are enforceable by the Administrator of the United States Environmental Protection Agency (USEPA) and by citizens under the provisions of the federal Clean Air Act (CAA). Any terms and conditions based on applicable requirements which are designated as “state-only” are not enforceable by the USEPA or citizens pursuant to the CAA. **(R 336.1213(1)(a))**

2. It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this ROP. **(R 336.1213(1)(b))**

3. This ROP may be modified, revised, or revoked for cause. The filing of a request by the permittee for a permit modification, revision, or termination, or a notification of planned changes or anticipated noncompliance does not stay any ROP term or condition. This does not supersede or affect the ability of the permittee to make changes, at the permittee’s own risk, pursuant to Rule 215 and Rule 216. **(R 336.1213(1)(c))**

4. The permittee shall allow the department, or an authorized representative of the department, upon presentation of credentials and other documents as may be required by law and upon stating the authority for and purpose of the investigation, to perform any of the following activities: **(R 336.1213(1)(d))**
   a. Enter, at reasonable times, a stationary source or other premises where emissions-related activity is conducted or where records must be kept under the conditions of the ROP.
   b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of the ROP.
   c. Inspect, at reasonable times, any of the following:
      i. Any stationary source.
      ii. Any emission unit.
      iii. Any equipment, including monitoring and air pollution control equipment.
      iv. Any work practices or operations regulated or required under the ROP.
   d. As authorized by Section 5526 of Act 451, sample or monitor at reasonable times substances or parameters for the purpose of assuring compliance with the ROP or applicable requirements.

5. The permittee shall furnish to the department, within a reasonable time, any information the department may request, in writing, to determine whether cause exists for modifying, revising, or revoking the ROP or to determine compliance with this ROP. Upon request, the permittee shall also furnish to the department copies of any records that are required to be kept as a term or condition of this ROP. For information which is claimed by the permittee to be confidential, consistent with the requirements of the 1976 PA 442, MCL §15.231 et seq., and known as the Freedom of Information Act, the person may also be required to furnish the records directly to the USEPA together with a claim of confidentiality. **(R 336.1213(1)(e))**

6. A challenge by any person, the Administrator of the USEPA, or the department to a particular condition or a part of this ROP shall not set aside, delay, stay, or in any way affect the applicability or enforceability of any other condition or part of this ROP. **(R 336.1213(1)(f))**

7. The permittee shall pay fees consistent with the fee schedule and requirements pursuant to Section 5522 of Act 451. **(R 336.1213(1)(g))**

8. This ROP does not convey any property rights or any exclusive privilege. **(R 336.1213(1)(h))**

Equipment & Design

9. Any collected air contaminants shall be removed as necessary to maintain the equipment at the required operating efficiency. The collection and disposal of air contaminants shall be performed in a manner so as to minimize the introduction of contaminants to the outer air. Transport of collected air contaminants in Priority I and II areas requires the use of material handling methods specified in Rule 370(2).[2] **(R 336.1370)**

10. Any air cleaning device shall be installed, maintained, and operated in a satisfactory manner and in accordance with the Michigan Air Pollution Control rules and existing law. **(R 336.1910)**

Emission Limits

11. Unless otherwise specified in this ROP, the permittee shall comply with Rule 301, which states, in part, "Except as provided in subrules 2, 3, and 4 of this rule, a person shall not cause or permit to be discharged into the outer air from a process or process equipment a visible emission of a density greater than the most stringent of the following:"[2] **(R 336.1301(1))**
    a. A 6-minute average of 20% opacity, except for one 6-minute average per hour of not more than 27% opacity.
    b. A limit specified by an applicable federal new source performance standard.

    The grading of visible emissions shall be determined in accordance with Rule 303.

12. The permittee shall not cause or permit the emission of an air contaminant or water vapor in quantities that cause, alone or in reaction with other air contaminants, either of the following:
    a. Injurious effects to human health or safety, animal life, plant life of significant economic value, or property.[1] **(R 336.1901(a))**
    b. Unreasonable interference with the comfortable enjoyment of life and property.[1] **(R 336.1901(b))**

Testing/Sampling

13. The department may require the owner or operator of any source of an air contaminant to conduct acceptable performance tests, at the owner's or operator's expense, in accordance with Rule 1001 and Rule 1003, under any of the conditions listed in Rule 1001(1).[2] **(R 336.2001)**

14. Any required performance testing shall be conducted in accordance with Rule 1001(2), Rule 1001(3) and Rule 1003. **(R 336.2001(2), R 336.2001(3), R 336.2003(1))**

15. Any required test results shall be submitted to the Air Quality Division (AQD) in the format prescribed by the applicable reference test method within 60 days following the last date of the test. **(R 336.2001(5))**

Monitoring/Recordkeeping

16. Records of any periodic emission or parametric monitoring required in this ROP shall include the following information specified in Rule 213(3)(b)(i), where appropriate. **(R 336.1213(3)(b))**
    a. The date, location, time, and method of sampling or measurements.
    b. The dates the analyses of the samples were performed.
    c. The company or entity that performed the analyses of the samples.
    d. The analytical techniques or methods used.
    e. The results of the analyses.
    f. The related process operating conditions or parameters that existed at the time of sampling or measurement.

17. All required monitoring data, support information and all reports, including reports of all instances of deviation from permit requirements, shall be kept and furnished to the department upon request for a period of not less than 5 years from the date of the monitoring sample, measurement, report or application. Support information includes all calibration and maintenance records and all original strip-chart recordings, or other original data records, for continuous monitoring instrumentation and copies of all reports required by the ROP. **(R 336.1213(1)(e), R 336.1213(3)(b)(ii))**

Certification & Reporting

18. Except for the alternate certification schedule provided in Rule 213(3)(c)(iii)(B), any document required to be submitted to the department as a term or condition of this ROP shall contain an original certification by a Responsible Official which states that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete. **(R 336.1213(3)(c))**

19. A Responsible Official shall certify to the appropriate AQD District Office and to the USEPA that the stationary source is and has been in compliance with all terms and conditions contained in the ROP except for deviations that have been or are being reported to the appropriate AQD District Office pursuant to Rule 213(3)(c). This certification shall include all the information specified in Rule 213(4)(c)(i) through (v) and shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the certification are true, accurate, and complete. The USEPA address is: USEPA, Air Compliance Data - Michigan, Air and Radiation Division, 77 West Jackson Boulevard, Chicago, Illinois 60604-3507. **(R 336.1213(4)(c))**

20. The certification of compliance shall be submitted annually for the term of this ROP as detailed in the special conditions, or more frequently if specified in an applicable requirement or in this ROP. **(R 336.1213(4)(c))**

21. The permittee shall promptly report any deviations from ROP requirements and certify the reports. The prompt reporting of deviations from ROP requirements is defined in Rule 213(3)(c)(ii) as follows, unless otherwise described in this ROP. **(R 336.1213(3)(c))**
    a. For deviations that exceed the emissions allowed under the ROP, prompt reporting means reporting consistent with the requirements of Rule 912 as detailed in Condition 25. All reports submitted pursuant to this paragraph shall be promptly certified as specified in Rule 213(3)(c)(iii).
    b. For deviations which exceed the emissions allowed under the ROP and which are not reported pursuant to Rule 912 due to the duration of the deviation, prompt reporting means the reporting of all deviations in the semiannual reports required by Rule 213(3)(c)(i). The report shall describe reasons for each deviation and the actions taken to minimize or correct each deviation.
    c. For deviations that do not exceed the emissions allowed under the ROP, prompt reporting means the reporting of all deviations in the semiannual reports required by Rule 213(3)(c)(i). The report shall describe the reasons for each deviation and the actions taken to minimize or correct each deviation.

22. For reports required pursuant to Rule 213(3)(c)(ii), prompt certification of the reports is described in Rule 213(3)(c)(iii) as either of the following: **(R 336.1213(3)(c))**
    a. Submitting a certification by a Responsible Official with each report which states that, based on information and belief formed after reasonable inquiry, the statements and information in the report are true, accurate, and complete.
    b. Submitting, within 30 days following the end of a calendar month during which one or more prompt reports of deviations from the emissions allowed under the ROP were submitted to the department pursuant to Rule 213(3)(c)(ii), a certification by a Responsible Official which states that; “based on information and belief formed after reasonable inquiry, the statements and information contained in each of the reports submitted during the previous month were true, accurate, and complete.” The certification shall include a listing of the reports that are being certified. Any report submitted pursuant to Rule 213(3)(c)(ii) that will be certified on a monthly basis pursuant to this paragraph shall include a statement that certification of the report will be provided within 30 days following the end of the calendar month.

23. Semiannually for the term of the ROP as detailed in the special conditions, or more frequently if specified, the permittee shall submit certified reports of any required monitoring to the appropriate AQD District Office. All instances of deviations from ROP requirements during the reporting period shall be clearly identified in the reports. **(R 336.1213(3)(c)(i))**

24. On an annual basis, the permittee shall report the actual emissions, or the information necessary to determine the actual emissions, of each regulated air pollutant as defined in Rule 212(6) for each emission unit utilizing the emissions inventory forms provided by the department. **(R 336.1212(6))**

25. The permittee shall provide notice of an abnormal condition, start-up, shutdown, or malfunction that results in emissions of a hazardous or toxic air pollutant which continue for more than one hour in excess of any applicable standard or limitation, or emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation, as required in Rule 912, to the appropriate AQD District Office. The notice shall be provided not later than two business days after the start-up, shutdown, or discovery of the abnormal conditions or malfunction. Notice shall be by any reasonable means, including electronic, telephonic, or oral communication. Written reports, if required under Rule 912, must be submitted to the appropriate AQD District Supervisor within 10 days after the start-up or shutdown occurred, within 10 days after the abnormal conditions or malfunction has been corrected, or within 30 days of discovery of the abnormal conditions or malfunction, whichever is first. The written reports shall include all of the information required in Rule 912(5) and shall be certified by a Responsible Official in a manner consistent with the CAA.[2] **(R 336.1912)**

Permit Shield

26. Compliance with the conditions of the ROP shall be considered compliance with any applicable requirements as of the date of ROP issuance, if either of the following provisions is satisfied. **(R 336.1213(6)(a)(i), R 336.1213(6)(a)(ii))**
    a. The applicable requirements are included and are specifically identified in the ROP.
    b. The permit includes a determination or concise summary of the determination by the department that other specifically identified requirements are not applicable to the stationary source.

    Any requirements identified in Part E of this ROP have been identified as non-applicable to this ROP and are included in the permit shield.

27. Nothing in this ROP shall alter or affect any of the following:
    a. The provisions of Section 303 of the CAA, emergency orders, including the authority of the USEPA under Section 303 of the CAA. **(R 336.1213(6)(b)(i))**
    b. The liability of the owner or operator of this source for any violation of applicable requirements prior to or at the time of this ROP issuance. **(R 336.1213(6)(b)(ii))**
    c. The applicable requirements of the acid rain program, consistent with Section 408(a) of the CAA. **(R 336.1213(6)(b)(iii))**

   d. The ability of the USEPA to obtain information from a source pursuant to Section 114 of the CAA. **(R 336.1213(6)(b)(iv))**

28. The permit shield shall not apply to provisions incorporated into this ROP through procedures for any of the following:
    a. Operational flexibility changes made pursuant to Rule 215. **(R 336.1215(5))**
    b. Administrative Amendments made pursuant to Rule 216(1)(a)(i)-(iv). **(R 336.1216(1)(b)(iii))**
    c. Administrative Amendments made pursuant to Rule 216(1)(a)(v) until the amendment has been approved by the department. **(R 336.1216(1)(c)(iii))**
    d. Minor Permit Modifications made pursuant to Rule 216(2). **(R 336.1216(2)(f))**
    e. State-Only Modifications made pursuant to Rule 216(4) until the changes have been approved by the department. **(R 336.1216(4)(e))**

29. Expiration of this ROP results in the loss of the permit shield. If a timely and administratively complete application for renewal is submitted not more than 18 months, but not less than 6 months, before the expiration date of the ROP, but the department fails to take final action before the end of the ROP term, the existing ROP does not expire until the renewal is issued or denied, and the permit shield shall extend beyond the original ROP term until the department takes final action. **(R 336.1217(1)(c), R 336.1217(1)(a))**

Revisions

30. For changes to any process or process equipment covered by this ROP that do not require a revision of the ROP pursuant to Rule 216, the permittee must comply with Rule 215. **(R 336.1215, R 336.1216)**

31. A change in ownership or operational control of a stationary source covered by this ROP shall be made pursuant to Rule 216(1). **(R 336.1219(2))**

32. For revisions to this ROP, an administratively complete application shall be considered timely if it is received by the department in accordance with the time frames specified in Rule 216. **(R 336.1210(10))**

33. Pursuant to Rule 216(1)(b)(iii), Rule 216(2)(d) and Rule 216(4)(d), after a change has been made, and until the department takes final action, the permittee shall comply with both the applicable requirements governing the change and the ROP terms and conditions proposed in the application for the modification. During this time period, the permittee may choose to not comply with the existing ROP terms and conditions that the application seeks to change. However, if the permittee fails to comply with the ROP terms and conditions proposed in the application during this time period, the terms and conditions in the ROP are enforceable. **(R 336.1216(1)(c)(iii), R 336.1216(2)(d), R 336.1216(4)(d))**

Re-openings

34. A ROP shall be reopened by the department prior to the expiration date and revised by the department under any of the following circumstances:
    a. If additional requirements become applicable to this stationary source with three or more years remaining in the term of the ROP, but not if the effective date of the new applicable requirement is later than the ROP expiration date. **(R 336.1217(2)(a)(i))**
    b. If additional requirements pursuant to Title IV of the CAA become applicable to this stationary source. **(R 336.1217(2)(a)(ii))**
    c. If the department determines that the ROP contains a material mistake, information required by any applicable requirement was omitted, or inaccurate statements were made in establishing emission limits or the terms or conditions of the ROP. **(R 336.1217(2)(a)(iii))**
    d. If the department determines that the ROP must be revised to ensure compliance with the applicable requirements. **(R 336.1217(2)(a)(iv))**

Renewals0

35. For renewal of this ROP, an administratively complete application shall be considered timely if it is received by the department not more than 18 months, but not less than 6 months, before the expiration date of the ROP. **(R 336.1210(8))**

Stratospheric Ozone Protection

36. If the permittee is subject to Title 40 of the Code of Federal Regulations (CFR), Part 82 and services, maintains, or repairs appliances except for motor vehicle air conditioners (MVAC), or disposes of appliances containing refrigerant, including MVAC and small appliances, or if the permittee is a refrigerant reclaimer, appliance owner or a manufacturer of appliances or recycling and recovery equipment, the permittee shall comply with all applicable standards for recycling and emissions reduction pursuant to 40 CFR Part 82, Subpart F.

37. If the permittee is subject to 40 CFR Part 82, and performs a service on motor (fleet) vehicles when this service involves refrigerant in the MVAC, the permittee is subject to all the applicable requirements as specified in 40 CFR Part 82, Subpart B, Servicing of Motor Vehicle Air Conditioners. The term “motor vehicle” as used in Subpart B does not include a vehicle in which final assembly of the vehicle has not been completed by the original equipment manufacturer. The term MVAC as used in Subpart B does not include the air-tight sealed refrigeration system used for refrigerated cargo or an air conditioning system on passenger buses using Hydrochlorofluorocarbon-22 refrigerant.

Risk Management Plan

38. If subject to Section 112(r) of the CAA and 40 CFR Part 68, the permittee shall register and submit to the USEPA the required data related to the risk management plan for reducing the probability of accidental releases of any regulated substances listed pursuant to Section 112(r)(3) of the CAA as amended in 40 CFR 68.130. The list of substances, threshold quantities, and accident prevention regulations promulgated under 40 CFR Part 68, do not limit in any way the general duty provisions under Section 112(r)(1).

39. If subject to Section 112(r) of the CAA and 40 CFR Part 68, the permittee shall comply with the requirements of 40 CFR Part 68, no later than the latest of the following dates as provided in 40 CFR 68.10(a):
    a. June 21, 1999,
    b. Three years after the date on which a regulated substance is first listed under 40 CFR 68.130, or
    c. The date on which a regulated substance is first present above a threshold quantity in a process.

40. If subject to Section 112(r) of the CAA and 40 CFR Part 68, the permittee shall submit any additional relevant information requested by any regulatory agency necessary to ensure compliance with the requirements of 40 CFR Part 68.

41. If subject to Section 112(r) of the CAA and 40 CFR Part 68, the permittee shall annually certify compliance with all applicable requirements of Section 112(r) as detailed in Rule 213(4)(c)). **(40 CFR Part 68)**

Emission Trading

42. Emission averaging and emission reduction credit trading are allowed pursuant to any applicable interstate or regional emission trading program that has been approved by the Administrator of the USEPA as a part of Michigan’s State Implementation Plan. Such activities must comply with Rule 215 and Rule 216. **(R 336.1213(12))**

Permit to Install (PTI)

43. The process or process equipment included in this permit shall not be reconstructed, relocated, or modified unless a PTI authorizing such action is issued by the department, except to the extent such action is exempt from the PTI requirements by any applicable rule.[2] **(R 336.1201(1))**

44. The department may, after notice and opportunity for a hearing, revoke PTI terms or conditions if evidence indicates the process or process equipment is not performing in accordance with the terms and conditions of the PTI or is violating the department's rules or the CAA.[2] **(R 336.1201(8), Section 5510 of Act 451)**

45. The terms and conditions of a PTI shall apply to any person or legal entity that now or hereafter owns or operates the process or process equipment at the location authorized by the PTI. If a new owner or operator submits a written request to the department pursuant to Rule 219 and the department approves the request, this PTI will be amended to reflect the change of ownership or operational control. The request must include all of the information required by Subrules (1)(a), (b) and (c) of Rule 219. The written request shall be sent to the appropriate AQD District Supervisor, MDEQ.[2] **(R 336.1219)**

46. If the installation, reconstruction, relocation, or modification of the equipment for which PTI terms and conditions have been approved has not commenced within 18 months of the original PTI issuance date, or has been interrupted for 18 months, the applicable terms and conditions from that PTI, as incorporated into the ROP, shall become void unless otherwise authorized by the department. Furthermore, the person to whom that PTI was issued, or the designated authorized agent, shall notify the department via the Supervisor, Permit Section, MDEQ, AQD, P. O. Box 30260, Lansing, Michigan 48909, if it is decided not to pursue the installation, reconstruction, relocation, or modification of the equipment allowed by the terms and conditions from that PTI.[2] **(R 336.1201(4))**

Footnotes:

[1] This condition is state-only enforceable and was established pursuant to Rule 201(1)(b).

[2] This condition is federally enforceable and was established pursuant to Rule 201(1)(a).

B. SOURCE-WIDE CONDITIONS

Part B outlines the Source-Wide Terms and Conditions that apply to this stationary source. The permittee is subject to these special conditions for the stationary source in addition to the general conditions in Part A and any other terms and conditions contained in this ROP.

The permittee shall comply with all specific details in the special conditions and the underlying applicable requirements cited. If a specific condition type does not apply to this source, NA (not applicable) has been used in the table. If there are no Source-Wide Conditions, this section will be left blank.

C. EMISSION UNIT CONDITIONS

Part C outlines terms and conditions that are specific to individual emission units listed in the Emission Unit Summary Table. The permittee is subject to the special conditions for each emission unit in addition to the General Conditions in Part A and any other terms and conditions contained in this ROP.

The permittee shall comply with all specific details in the special conditions and the underlying applicable requirements cited. If a specific condition type does not apply, NA (not applicable) has been used in the table. If there are no conditions specific to individual emission units, this section will be left blank.

EMISSION UNIT SUMMARY TABLE

The descriptions provided below are for informational purposes and do not constitute enforceable conditions.

Emission Unit ID	Emission Unit Description (Including Process Equipment & Control Device(s))	Installation Date/ Modification Date	Flexible Group ID
EULANDFILL<50	This emission unit is of a landfill which has a design capacity greater than 2.5 million megagrams and 2.5 million cubic meters, but actual emissions based upon an established Tier 2 value in the landfill calculation are less than 50 megagrams. Actual design capacity is 8.6 MM Mg. This landfill was constructed prior to May 30, 1991 and is therefore subject to 40 CFR Part 62 Subpart GGG (Federal Plan Requirements for Existing Municipal Solid Waste Landfills).	11-006-1981/ NA	NA
EUASBESTOS	Any active or inactive asbestos disposal site.	02-1999/ NA	NA

EULANDFILL<50
EMISSION UNIT CONDITIONS

DESCRIPTION

This emission unit is a landfill which has a design capacity greater than 2.5 million megagrams and 2.5 million cubic meters, but actual emissions based upon an established Tier 2 value in the landfill calculation are less than 50 megagrams. Actual design capacity is 8.6 MM Mg. This landfill was constructed prior to May 30, 1991 (construction permit was last issued in 1981) and is therefore subject to 40 CFR Part 62 Subpart GGG (Federal Plan Requirements for Existing Municipal Solid Waste Landfills).

Flexible Group ID: NA

POLLUTION CONTROL EQUIPMENT

Landfill gas is collected from the landfill using an active collection system, prior to being treated and subsequently combusted in landfill gas engines (FGICE). An open flare is used for excess landfill gas.

I. EMISSION LIMIT(S)

Pollutant	Limit	Time Period/ Operating Scenario	Equipment	Monitoring/ Testing Method	Underlying Applicable Requirements
NA					

II. MATERIAL LIMIT(S)

Material	Limit	Time Period/ Operating Scenario	Equipment	Monitoring/ Testing Method	Underlying Applicable Requirements
NA					

III. PROCESS/OPERATIONAL RESTRICTION(S)

1. The permittee shall calculate the annual NMOC emission rates using methods outlined in Appendix 7-1 or the most recent version of USEPA's Landfill Gas Emissions Model (LandGEM) and compare the calculated rate to the standard of 50 megagrams per year. **(40 CFR 62.14354(a), 40 CFR 60.754(a)(1))**

IV. DESIGN/EQUIPMENT PARAMETER(S)

NA

V. TESTING/SAMPLING

Records shall be maintained on file for a period of five years. **(R 336.1213(3)(b)(ii))**

1. The permittee shall determine the NMOC mass emission rate by testing at the owner's expense, in accordance with Department requirements. Testing shall be performed using procedures and calculations, as described in Appendices 5-1 and 7-1. An alternate method, or a modification to the approved EPA method, may be specified in an AQD approved test protocol. No less than 30 days prior to testing, the permittee shall submit a complete test plan to the AQD Technical Programs Unit and District Office. The AQD must approve the final plan prior to testing, including any modifications to the method in the test protocol that are proposed after initial submittal. The permittee must submit a complete report of the test results to the AQD Technical Programs Unit and District

Office within 60 days following the last date of the test. **(R 336.2001, R 336.2003, R 336.2004, 40 CFR 62.14354, 40 CFR 60.752(b)(1), 40 CFR 60.754(a))**

   a. Upon completion of each Tier test, the permittee shall compare the results to the NMOC mass emission rate standard of 50 Mg per year. If the results are equal to or greater than 50 Mg, then the permittee shall move to the next higher tier in accordance with the following: Tier 1 and Tier 2 shall be recalculated annually if the NMOC mass emission rate is less than the standard. **(40 CFR 62.14354, 40 CFR 60.754(a)(3) and (4))**
   b. Tier 2 testing shall be performed at least once every five years. **(40 CFR 60.754(a)(4))**
   c. Tier 3 testing shall be performed to establish a site-specific methane generation rate constant. **(40 CFR 60.754(a)(4))**

2. Each permittee seeking to use other methods to determine the NMOC concentration or a site-specific methane generation rate constant as an alternative to methods in Tier 2 and Tier 3 must request and have received approval from USEPA prior to submitting a test protocol to AQD. **(40 CFR 60.754(a)(5))**

See Appendices 5-1 and 7-1

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1213(3)(b)(ii))**

1. The permittee shall maintain up-to-date, readily accessible, on-site records of the design capacity report which triggered 40 CFR 60.752(b), the current amount of solid waste in place, and the year-by-year waste acceptance rate. Off-site records may be maintained if they are retrievable within 4 hours. The permittee shall keep all records on file in a format acceptable to the AQD District Supervisor and make them available upon request. **(40 CFR 62.14355(a), 40 CFR 60.758(a))**

See Appendix 7-1

VII. REPORTING

1. Prompt reporting of deviations pursuant to General Conditions 21 and 22 of Part A. **(R 336.1213(3)(c)(ii))**

2. Semiannual reporting of monitoring and deviations pursuant to General Condition 23 of Part A. The report shall be postmarked or received by the appropriate AQD District Office by March 15 for reporting period July 1 to December 31 and September 15 for reporting period January 1 to June 30. **(R 336.1213(3)(c)(i))**

3. Annual certification of compliance pursuant to General Conditions 19 and 20 of Part A. The report shall be postmarked or received by the appropriate AQD District Office by March 15 for the previous calendar year. **(R 336.1213(4)(c))**

4. The permittee shall submit an annual NMOC emission rate report to the appropriate AQD District Office, except as provided for in 40 CFR 60.757(b)(1)(ii). This report shall contain an annual or 5-year estimate of the NMOC emission rate, as provided for in 40 CFR 60.754(a), and all the data, calculations, sample reports and measurements used to estimate the annual or 5-year emissions. **(40 CFR 62.14355(a), 40 CFR 60.757(b)(1) and (2))**

5. The permittee shall submit an initial design capacity report no later than 90 days after the date of commenced construction, modification, or reconstruction. This report must contain the information described in 40 CFR 60.757(a)(2). **(40 CFR 60.757(a)(1) and (2))**

6. The permittee shall submit an amended design capacity report providing notification of an increase in the design capacity of the landfill within 90 days of an increase in the maximum design capacity of the landfill to meet or exceed 2.5 million megagrams and 2.5 million cubic meters. **(40 CFR 60.757(a)(3))**

7. If the permittee elects to recalculate the NMOC emission rate after Tier 2 NMOC sampling and analysis and the resulting rate is less than 50 Mg per year, a revised NMOC emission rate report with the recalculated emission rate shall be submitted within 180 days of the first calculated exceedance of 50 Mg per year using Tier 1. **(40 CFR 60.757(c)(1))**

8. If the permittee elects to recalculate the NMOC emission rate after determining a site-specific methane generation rate constant k, as provided in Tier 3, and the resulting NMOC emission rate is less than 50 Mg per year, a revised NMOC emission rate report and the resulting site-specific methane generation rate constant k shall be submitted within 1 year of the first calculated emission rate equaling or exceeding 50 Mg per year. **(40 CFR 60.757(c)(2))**

9. The permittee shall submit a closure report to the appropriate AQD District Office within 30 days of waste acceptance cessation. The AQD may request additional information as may be necessary to verify that permanent closure has taken place in accordance with the requirements of 40 CFR 258.60. If a closure report has been submitted to the AQD, no additional wastes may be placed into the landfill without filing a notification of modification as described under 40 CFR 60.7(a)(4). **(40 CFR 60.757(e))**

See Appendix 8-1

VIII. STACK/VENT RESTRICTION(S)

The exhaust gases from the stacks listed in the table below shall be discharged unobstructed vertically upwards to the ambient air unless otherwise noted:

Stack & Vent ID	Maximum Exhaust Dimensions (inches)	Minimum Height Above Ground (feet)	Underlying Applicable Requirements
NA			

IX. OTHER REQUIREMENT(S)

1. If the NMOC emission rate is equal to or greater than 50 megagrams per year, the permittee shall install a collection and control system in compliance with § 60.752(b)(2). **(40 CFR 62.14356(a), 40 CFR 60.752(b)(2)(iv))**

2. If a modification of the landfill, as defined in 40 CFR 60.751, results in an increase in the permitted design capacity, the permittee shall immediately comply with the requirements of 40 CFR Part 60 Subpart WWW. **(R 336.1213(3), 40 CFR 14352(a)(1))**

3. The permittee shall comply with all applicable requirements of 40 CFR Part 62, Subpart GGG, "Federal Plan Requirements for Municipal Solid Waste Landfills That Commenced Construction Prior to May 30, 1991, and Have Not Been Modified or Reconstructed Since May 30, 1991." **(40 CFR 62.14352)**

4. The permittee shall comply with all applicable requirements in 40 CFR Part 60 Subpart WWW. **(40 CFR 62.14354, 40 CFR 62.14355(a))**

5. The permittee shall comply with the requirements of the National Emission Standards for Hazardous Air Pollutants (NESHAP), as specified in 40 CFR Part 63 Subparts A and AAAA, as they apply to EULANDFILL<50. **(40 CFR Part 63, Subparts A and AAAA)**

Footnotes:

[1] This condition is state only enforceable and was established pursuant to Rule 201(1)(b).
[2] This condition is federally enforceable and was established pursuant to Rule 201(1)(a).

EU-ASBESTOS
EMISSION UNIT CONDITIONS

DESCRIPTION

This landfill is actively accepting or has accepted asbestos waste in the past.

Flexible Group ID: NA

POLLUTION CONTROL EQUIPMENT

NA

I. EMISSION LIMIT(S)

Pollutant	Limit	Time Period/ Operating Scenario	Equipment	Monitoring/ Testing Method	Underlying Applicable Requirements
NA					

II. MATERIAL LIMIT(S)

Material	Limit	Time Period/ Operating Scenario	Equipment	Monitoring/ Testing Method	Underlying Applicable Requirements
NA					

III. PROCESS/OPERATIONAL RESTRICTIONS

1. The permittee shall meet the following operational requirements: **(40 CFR 61.154)**
   a. Either there must be no visible emissions to the outside air from any active waste disposal site where asbestos-containing waste material has been deposited, or the requirements of 40 CFR 61.154(c) or (d) **(SC III.1.c and SC III.1.d)** must be met. **(40 CFR 61.154(a))**
   b. Unless a natural barrier adequately deters access by the general public, either warning signs and fencing must be installed and maintained as follows, or the requirements of 40 CFR 61.154(c)(1) must be met. **(40 CFR 61.154(b))**
      i. Warning signs must be displayed at all entrances and at intervals of 100 m (330 ft) or less along the property line of the site or along the perimeter of the sections of the site where asbestos-containing waste material is deposited. **(40 CFR 61.154(b)(1))** The warning signs must:
         (1) Be posted in such a manner and location that a person can easily read the legend. **(40 CFR 61.154(b)(1)(i))**
         (1) Conform to the requirements of 51 cm by 36cm (20 inches by 14 inches) upright format signs specified in 29 CFR 1910.145(d)(4) and 40 CFR 61.154(b)(1). **(40 CFR 61.154(b)(1)(ii))**
         (2) The permittee shall display the legend in the lower panel with letter sizes and styles of a visibility at least equal to those specified in 40 CFR 61.154(b)(1). Spacing between any two lines must be at least equal to the height of the upper of the two lines. **(40 CFR 61.154(b)(1)(iii))**
      ii. The perimeter of the disposal site must be fenced in a manner adequate to deter access by the general public. **(40 CFR 61.154(b)(2))**
      iii. Upon request and supply of appropriate information, the appropriate AQD District Supervisor will determine whether a fence or a natural barrier adequately deters access by the general public. **(**40 CFR **61.154(b)(3))**

c. Rather than meet the no visible emission requirement of 40 CFR 61.154(a) **(SC III.1.a)**, at the end of each operating day, or at least once every 24-hour period while the site is in continuous operation, the asbestos-containing waste material that has been deposited at the site during the operating day or previous 24-hour period shall: **(40 CFR 61.154(c))**
   i. Be covered with at least 15 centimeters (6 inches) of compacted non-asbestos-containing material. **(40 CFR 61.154(c)(1))** or
   ii. Be covered with a resinous or petroleum-based dust suppression agent that effectively binds dust and controls wind erosion. Such an agent shall be used in the manner and frequency recommended for the particular dust by the dust suppression agent manufacturer to achieve and maintain dust control. Other equally effective dust suppression agents may be used upon prior approval by the appropriate AQD District Supervisor. For purposes of 40 CFR 61.154(c)(2), any used, spent, or other waste oil is not considered a dust suppression agent. **(40 CFR 61.154(c)(2))**

d. Rather than meet the no visible emission requirement of 40 CFR 61.154(a), use an alternative emissions control method that has received prior written approval by the appropriate AQD District Supervisor according to the procedures described in 40 CFR 61.149(c)(2). **(40 CFR 61.154(d))**

IV. DESIGN/EQUIPMENT PARAMETERS

1. The placement of gas collection devices determined in paragraph 40 CFR 60.759(a)(1) shall control all gas producing areas, except as provided by 40 CFR 60.759 (a)(3)(i) and (a)(3)(ii). **(40 CFR 60.759(a)(3))**
   a. Any segregated area of asbestos or non-degradable material may be excluded from collection if documented as provided under 40 CFR 60.758(d). The documentation shall provide the nature, date of deposition, location and amount of asbestos or non-degradable material deposited in the area, and shall be provided to the AQD upon request. **(40 CFR 60.759(a)(3)(i))**

V. TESTING/SAMPLING

NA

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1213(3)(b)(ii))**

1. For all asbestos-containing waste material received, the permittee of the active waste disposal site shall:
   a. Maintain waste shipment records that include the following information: **(40 CFR 61.154(e)(1))**
      i. The name, address, and telephone number of the waste generator. **(40 CFR 61.154(e)(1)(i))**
      ii. The name, address, and telephone number of the transporter(s). **(40 CFR 61.154(e)(1)(ii)**
      iii. The quantity of the asbestos-containing waste material in cubic meters (cubic yards). **(40 CFR 61.154(e)(1)(iii))**
      iv. The presence of improperly enclosed or uncovered waste, or any asbestos-containing waste material not sealed in leak-tight containers. Report in writing to the local, State, or USEPA Regional office responsible for administering the asbestos NESHAP program for the waste generator (identified in the waste shipment record), and, if different, the local, State, or USEPA Regional office responsible for administering the asbestos NESHAP program for the disposal site, by the following working day, the presence of a significant amount of improperly enclosed or uncovered waste. Submit a copy of the waste shipment record along with the report. **(40 CFR 61.154(e)(1)(iv))**
      v. The date of the receipt. **(40 CFR 61.154(e)(1)(v))**
   b. As soon as possible and no longer than 30 days after receipt of the waste, send a copy of the signed waste shipment record to the waste generator. **(40 CFR 61.154(e)(2))**
   c. Upon discovering a discrepancy between the quantity of waste designated on the waste shipment records and the quantity actually received, attempt to reconcile the discrepancy with the waste generator. If the discrepancy is not resolved within 15 days after receiving the waste, immediately report in writing to the local, State, or USEPA Regional office responsible for administering the asbestos NESHAP program for the waste generator (identified in the waste shipment record) **(40 CFR 61.154(e)(3))**

2. The permittee shall maintain, until closure, records of the location, depth and area, and quantity in cubic meters (cubic yards) of asbestos-containing waste material within the disposal site on a map or diagram of the disposal area storage. **(40 CFR 61.154(f))**

3. The permittee shall keep readily accessible documentation of the nature, date of deposition, amount, and location of asbestos-containing or non-degradable waste excluded from landfill gas collection as provided in 40 CFR 60.759(a)(3)(i) as well as any nonproductive areas excluded from landfill gas collection as provided in 40 CFR 60.759(a)(3)(ii). **(40 CFR 60.758(d)(2))**

4. The permittee shall keep records of one the following regarding any active disposal site where asbestos containing materials have been deposited: **(R 336.1213(3))**
   a. USEPA Method 22 readings demonstrating no visible emissions from any active disposal site where asbestos containing materials have been deposited. These readings are to be taken for 15 minutes each operating day.
   b. Records of the date asbestos waste is received, the amount and type of material that has been used to cover the asbestos waste, and documentation that the cover material was applied in the frequency required in SC III.1.c of this table.
   c. Records pursuant to an alternative emissions control method that has prior written approval of the AQD District Supervisor as noted in Special Condition III.1.d of this table.

VII. REPORTING

1. Prompt reporting of deviations pursuant to General Conditions 21 and 22 of Part A. **(R 336.1213(3)(c)(ii))**

2. Semiannual reporting of monitoring and deviations pursuant to General Condition 23 of Part A. Report shall be postmarked or received by appropriate AQD District Office by March 15 for reporting period July 1 to December 31 and September 15 for reporting period January 1 to June 30. **(R 336.1213(3)(c)(i))**

3. Annual certification of compliance pursuant to General Conditions 19 and 20 of Part A. Report shall be postmarked or received by appropriate AQD District Office by March 15 for the previous calendar year. **(R 336.1213(4)(c))**

4. The permittee shall submit to the appropriate AQD District Supervisor, upon closure of the facility, a copy of records of asbestos waste disposal locations and quantities. **(40 CFR 61.154(h))**

5. The permittee shall furnish upon request, and make available during normal business hours for inspection by the AQD, all records required by 40 CFR Part 61. **(40 CFR 61.154(i))**

6. Notify the AQD Technical Programs Unit and appropriate AQD District Office in writing at least 45 days prior to excavating or otherwise disturbing any asbestos-containing waste material that has been deposited at a waste disposal site and is covered. If the excavation will begin on a date other than the one contained in the original notice, notice of the new start date must be provided to the appropriate AQD District Office at least 10 working days before excavation begins and in no event shall excavation begin earlier than the date specified in the original notification. **(40 CFR 61.154(j))** Include the following information in the notice:
   a. Scheduled starting and completion dates. **(40 CFR 61.154(j)(1))**
   b. Reason for disturbing the waste. **(40 CFR 61.154(j)(2))**
   c. Procedures to be used to control emissions during the excavation, storage, transport, and ultimate disposal of the excavated asbestos-containing waste material. If deemed necessary, the AQD or may require changes in the emission control procedures to be used. **(40 CFR 61.154(j)(3))**
   d. Location of any temporary storage site and the final disposal site. **(40 CFR 61.154(j)(4))**

See Appendix 8-1

VIII. STACK/VENT RESTRICTION(S)

The exhaust gases from the stacks listed in the table below shall be discharged unobstructed vertically upwards to the ambient air unless otherwise noted:

Stack & Vent ID	Maximum Exhaust Dimensions (inches)	Minimum Height Above Ground (feet)	Underlying Applicable Requirements
NA			

IX. OTHER REQUIREMENT(S)

NA

Footnotes:

[1] This condition is state-only enforceable and was established pursuant to Rule 201(1)(b).

[2] This condition is federally enforceable and was established pursuant to Rule 201(1)(a).

D. FLEXIBLE GROUP CONDITIONS

Part D outlines the terms and conditions that apply to more than one emission unit. The permittee is subject to the special conditions for each flexible group in addition to the General Conditions in Part A and any other terms and conditions contained in this ROP.

The permittee shall comply with all specific details in the special conditions and the underlying applicable requirements cited. If a specific condition type does not apply, NA (not applicable) has been used in the table. If there are no special conditions that apply to more than one emission unit, this section will be left blank.

E. NON-APPLICABLE REQUIREMENTS

At the time of the ROP issuance, the AQD has determined that no non-applicable requirements have been identified for incorporation into the permit shield provision set forth in the General Conditions in Part A pursuant to Rule 213(6)(a)(ii).

APPENDICES

Appendix 1-1. Acronyms and Abbreviations

Common Acronyms		Pollutant / Measurement Abbreviations	
AQD	Air Quality Division	acfm	Actual cubic feet per minute
BACT	Best Available Control Technology	BTU	British Thermal Unit
CAA	Clean Air Act	°C	Degrees Celsius
CAM	Compliance Assurance Monitoring	CO	Carbon Monoxide
CEM	Continuous Emission Monitoring	CO_2e	Carbon Dioxide Equivalent
CFR	Code of Federal Regulations	dscf	Dry standard cubic foot
COM	Continuous Opacity Monitoring	dscm	Dry standard cubic meter
Department/ department	Michigan Department of Environmental Quality	°F	Degrees Fahrenheit
		gr	Grains
EU	Emission Unit	HAP	Hazardous Air Pollutant
FG	Flexible Group	Hg	Mercury
GACS	Gallons of Applied Coating Solids	hr	Hour
GC	General Condition	HP	Horsepower
GHGs	Greenhouse Gases	H_2S	Hydrogen Sulfide
HVLP	High Volume Low Pressure*	kW	Kilowatt
ID	Identification	lb	Pound
IRSL	Initial Risk Screening Level	m	Meter
ITSL	Initial Threshold Screening Level	mg	Milligram
LAER	Lowest Achievable Emission Rate	mm	Millimeter
MACT	Maximum Achievable Control Technology	MM	Million
MAERS	Michigan Air Emissions Reporting System	MW	Megawatts
MAP	Malfunction Abatement Plan	NMOC	Non-methane Organic Compounds
MDEQ	Michigan Department of Environmental Quality	NO_x	Oxides of Nitrogen
		ng	Nanogram
MSDS	Material Safety Data Sheet	PM	Particulate Matter
NA	Not Applicable	PM10	Particulate Matter equal to or less than 10 microns in diameter
NAAQS	National Ambient Air Quality Standards		
NESHAP	National Emission Standard for Hazardous Air Pollutants	PM2.5	Particulate Matter equal to or less than 2.5 microns in diameter
NSPS	New Source Performance Standards	pph	Pounds per hour
NSR	New Source Review	ppm	Parts per million
PS	Performance Specification	ppmv	Parts per million by volume
PSD	Prevention of Significant Deterioration	ppmw	Parts per million by weight
PTE	Permanent Total Enclosure	psia	Pounds per square inch absolute
PTI	Permit to Install	psig	Pounds per square inch gauge
RACT	Reasonable Available Control Technology	scf	Standard cubic feet
ROP	Renewable Operating Permit	sec	Seconds
SC	Special Condition	SO_2	Sulfur Dioxide
SCR	Selective Catalytic Reduction	TAC	Toxic Air Contaminant
SNCR	Selective Non-Catalytic Reduction	Temp	Temperature
SRN	State Registration Number	THC	Total Hydrocarbons
TEQ	Toxicity Equivalence Quotient	tpy	Tons per year
USEPA/EPA	United States Environmental Protection Agency	µg	Microgram
		µm	Micrometer or Micron
VE	Visible Emissions	VOC	Volatile Organic Compounds
		yr	Year

*For HVLP applicators, the pressure measured at the gun air cap shall not exceed 10 psig.

Appendix 2-1. Schedule of Compliance

The permittee certified in the ROP application that this stationary source is in compliance with all applicable requirements and the permittee shall continue to comply with all terms and conditions of this ROP. A Schedule of Compliance is not required. **(R 336.1213(4)(a), R 336.1119(a)(ii))**

Appendix 3-1. Monitoring Requirements

Specific monitoring requirement procedures, methods or specifications are detailed in Part A or the appropriate Source-Wide, Emission Unit and/or Flexible Group Special Conditions. Therefore, this appendix is not applicable.

Appendix 4-1. Recordkeeping

Specific recordkeeping requirement formats and procedures are detailed in Part A or the appropriate Source-Wide, Emission Unit and/or Flexible Group Special Conditions. Therefore, this appendix is not applicable.

Appendix 5-1. Testing Procedures

The permittee shall use the following approved test plans, procedures, and averaging to measure the pollutant emissions for the applicable requirements referenced in EULANDFILL<50.

Tier 1

The owner or operator must calculate NMOC mass emission rate utilizing Equation 1 or 2 in Appendix 7, as applicable, and compare it to the standard of 50 Mg per year. **(40 CFR 60.754(a)(2))**

Tier 2

The permittee shall determine the NMOC concentration using the following sampling procedure:

> The permittee shall install at least two sample probes per hectare of landfill surface that has retained waste for at least 2 years. If the landfill is larger than 25 hectares in area, only 50 samples are required. The sample probes should be located to avoid known areas of nondegradable solid waste.
>
> The permittee shall collect and analyze one sample of landfill gas from each probe to determine the NMOC concentration using Method 25 or 25C of Appendix A of 40 CFR Part 60. Method 18 of Appendix A of 40 CFR Part 60 may be used to analyze the samples collected by the Method 25 or 25C sampling procedure. Taking composite samples from different probes into a single cylinder is allowed; however, equal sample volumes must be taken from each probe. For each composite, the sampling rate; collection times; beginning and ending cylinder vacuums; or alternative volume measurements must be recorded to verify that composite volumes are equal. Composite sample volumes should not be less than one liter unless evidence can be provided to substantiate the accuracy of smaller volumes. Terminate compositing before the cylinder approaches ambient pressure where measurement accuracy diminishes.
>
> If using Method 18, the permittee must identify all compounds in the sample and, at a minimum, test for those compounds published in the most recent Compilation of Air Pollutant Emission Factors (AP-42), minus carbon monoxide, hydrogen sulfide, and mercury. At a minimum, the instrument must be calibrated for each of the compounds on the list. Convert the concentration of each Method 18 compound to C_{NMOC} as hexane by multiplying by the ratio of its carbon atoms divided by six. If more than the required number of samples is taken, all samples must be used in the analysis.

The permittee must divide the NMOC concentration from Method 25 or 25C of Appendix A of 40 CFR Part 60 by six to convert from C_{NMOC} as carbon to C_{NMOC} as hexane. If the landfill has an active or passive gas removal system in place, Method 25 or 25C samples may be collected from these systems instead of surface probes provided the removal system can be shown to provide sampling as representative as the two-sampling-probe per hectare requirement. For active collection systems, samples may be collected from the common header pipe before the gas moving or condensate removal equipment. For these systems, a minimum of three samples must be collected from the header pipe.

The permittee must recalculate the NMOC mass emission rate using Equation 1 or Equation 2 in Appendix 7 using the average site-specific NMOC concentration from the collected samples. The permittee must compare results to the standard of 50 Mg per year. **(40 CFR 62.14354(a), 40 CFR 60.754(a)(3))**

Tier 3

The site-specific methane generation rate constant shall be determined using the procedures provided in Method 2E of Appendix A of 40 CFR Part 60. The permittee shall estimate the NMOC mass emission rate using **Equation 1** (40 CFR 60.754(a)(1)(i)) or **Equation 2** (40 CFR 60.754(a)(1)(ii)) and using a site-specific methane generation rate constant (k), and the site-specific NMOC concentration as determined in 40 CFR 60.754(a)(3) instead of the default values provided in 40 CFR 60.754(a)(1). The permittee shall compare the resulting NMOC mass emission rate to the standard of 50 Mg per year. **(40 CFR 62.14354(a), 40 CFR 60.754(a)(4))**

Appendix 6-1. Permits to Install

At the time of permit issuance, no Permits to Install have been issued to this facility. Therefore, this appendix is not applicable.

Appendix 7-1. Emission Calculations

The permittee shall use the following calculations in conjunction with monitoring, testing or recordkeeping data to determine compliance with the applicable requirements referenced in EULANDFILL<50.

Default Values

The permittee shall calculate the NMOC emission rate using either **Equation 1** (the equation provided in 40 CFR 60.764(a)(1)(i)), **Equation 2** (the equation provided in 40 CFR 60.764(a)(1)(ii)) or the most recent version of USEPA's LandGEM. Both equations may be used if the actual year-to-year solid waste acceptance rate is known, as specified in **Equation 1** (40 CFR 60.764(a)(1)(i)), for part of the life of the landfill and the actual year-to-year solid waste acceptance rate is unknown, as specified in **Equation 2** (the equation provided in 40 CFR 60.764(a)(1)(ii)), for part of the life of the landfill. The values to be used in both equations are 0.05 per year for k, 170 cubic meters per Mg for L_o, and 4,000 ppm by volume as hexane for the C_{NMOC}. For landfills located in geographical areas with a thirty-year annual average precipitation of less than 25 inches, as measured at the nearest representative official meteorological site, the k value to be used is 0.02 per year. **(40 CFR 62.14354(a), 40 CFR 60.754(a)(1))**

Equation 1

The following equation shall be used if the actual year-to-year solid waste acceptance rate is known. **(40 CFR 62.14354(a), 40 CFR 60.754(a)(1)(i))**

$$M_{NMOC} = \sum_{i=1}^{n} 2\,\mathrm{k}\,\mathrm{L_o} M_i \left(e^{-kt_i}\right)\left(C_{NMOC}\right)\left(3.6\times10^{-9}\right)$$

Where:

M_{NMOC} = Total NMOC emission rate from the landfill, Mg per year

k = methane generation rate constant, year^{-1}

L_o = methane generation potential, cubic meters per Mg solid waste

M_i = mass of solid waste in the ith section, Mg

t_i = age of the i^{th} section, years

C_{NMOC} = concentration of NMOC, ppmv as hexane

3.6×10^{-9} = conversion factor

The mass of nondegradable solid waste may be subtracted from the total mass of solid waste in a particular section of the landfill when calculating the value for M_i if documentation of the nature and amount of such wastes is maintained.

Equation 2

The following equation shall be used if the actual year-to-year solid waste acceptance rate is unknown. **(40 CFR 62.14354(a), 40 CFR 60.754(a)(1)(ii))**

$$M_{NMOC} = 2\mathrm{L_o}\ \mathrm{R}\ (\mathrm{e}^{-\mathrm{kc}} - \mathrm{e}^{-\mathrm{kt}})\ (C_{NMOC})\ (3.6 \times 10^{-9})$$

Where:

M_{NMOC} = mass emission rate of NMOC, Mg per year

L_o = methane generation potential, cubic meters per Mg solid waste

R = average annual acceptance rate, Mg per year

k = methane generation rate constant, year^{-1}

t = age of landfill, years

C_{NMOC} = concentration of NMOC, ppmv as hexane

c = time since closure, years; for active landfill c = 0 and $e^{-kc} = 1$

3.6×10^{-9} = conversion factor

The mass of nondegradable solid waste may be subtracted from the total mass of solid waste in a particular section of the landfill when calculating the value of R, if documentation of the nature and amount of such wastes is maintained.

Tier 1

The owner or operator must calculate NMOC mass emission rate utilizing Equation 1 or 2 in Appendix 7, as applicable, and compare it to the standard of 50 Mg per year. **(40 CFR 62.14354(a), 40 CFR 60.754(a)(2))**

Tier 2

The permittee shall recalculate the NMOC mass emission rate using **Equation 1** or **Equation 2** in **Appendix 7** and using the average NMOC concentration from the collected samples (**Tier 2** testing in **Appendix 5**) instead of the default value in the equation provided in 40 CFR 60.754(a)(1). **(40 CFR 62.14354(a), 40 CFR 60.754(a)(3)(i))**

If the resulting mass emission rate calculated using the site-specific NMOC concentration is equal to or greater than 50 megagrams per year, then the permittee shall either comply with 40 CFR 60.752(b)(2) (submit a collection and control system design plan prepared by a professional engineer within 1 year), or determine the site-specific methane generation rate constant and recalculate the NMOC emission rate using the site-specific methane generation rate using the procedure specified in **Tier 3** (40 CFR 60.752(a)(4)). **(40 CFR 62.14354, 40 CFR 60.754(a)(3)(ii))**

If the resulting **Tier 2** NMOC mass emission rate is less than 50 megagrams per year, the permittee shall submit a periodic estimate of the emission rate report as provided in 40 CFR 60.757(b)(1) and retest the site-specific NMOC concentration every 5 years using the methods specified in this section. **(40 CFR 62.14354, 40 CFR 60.754(a)(3)(iii))**

Tier 3

If the **Tier 3** NMOC mass emission rate as calculated using the site-specific methane generation rate and concentration of NMOC is equal to or greater than 50 megagrams per year, the permittee shall comply with 40 CFR 60.752(b)(2) (submit a collection and control system design plan prepared by a professional engineer within 1 year). **(40 CFR 62.14354, 40 CFR 60.754(a)(4)(i))**

If the NMOC mass emission rate is less than 50 Mg per year, then the permittee shall submit a periodic emission rate report as provided in 40 CFR 60.757(b)(1) and shall recalculate the NMOC mass emission rate annually, as provided in 40 CFR 60.757(b)(1) using **Equation 1** or **Equation 2**, and using the site-specific methane generation rate constant (**Tier 3**) and NMOC concentration (**Tier 2**) obtained in 40 CFR 60.764(a)(3). The calculation of the methane generation rate constant (**Tier 3**) is performed only once, and the value obtained from this test shall be used in all subsequent annual NMOC emission rate calculations. **(40 CFR 62.14354, 40 CFR 60.754(a)(4)(ii))**

Calculating Expected Gas Generation Flow Rates from the Landfill

For the purposes of calculating the maximum expected gas generation flow rate from the landfill to determine compliance with 40 CFR 60.752(b)(2)(ii)(A)(*1*), either **Equation 3** or **Equation 4**, below, shall be used. The k and L_o kinetic factors should be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42) or other site-specific values demonstrated to be appropriate and approved by the USEPA, Region V. If k has been determined as specified in 40 CFR 60.754(a)(4), the value of k determined from the test shall be used. A value of no more than 15 years shall be used for the intended use period of the gas mover equipment. The active life of the landfill is the age of the landfill plus the estimated number of years until closure. **(40 CFR 60.755(a)(1))**

If a collection and control system has been installed, actual flow data may be used to project the maximum expected gas generation flow rate instead of, or in conjunction with, **Equation 3** or **Equation 4**. If the landfill is still accepting waste, the actual measured flow data will not equal the maximum expected gas generation rate, so calculations using **Equation 3** or **Equation 4** or other methods shall be used to predict the maximum expected gas generation rate over the intended period of use of the gas control system equipment. **(40 CFR 62.14354(a), 40 CFR 60.755(a)(1)(ii))**

Equation 3

For sites with unknown year-to-year solid waste acceptance rate:

$$Q_m = 2L_o R (e^{-kc} - e^{-kt})$$

Where:

Q_m = maximum expected gas generation flow rate, cubic meters per year

L_o = methane generation potential, cubic meters per Mg solid waste

R = average annual acceptance rate, Mg per year

k = methane generation rate constant, year^{-1}

t = age of the landfill at equipment installation plus the time the owner or operator intends to use the gas mover equipment or active life of the landfill, whichever is less. If the equipment is installed after closure, t is the age of the landfill at installation, years

c = time since closure, years (for an active landfill c = 0 and e^{-kc} = 1)

Equation 4

For sites with known year-to-year solid waste acceptance rate:

$$Q_M = \sum_{i=1}^{n} 2\,k\,L_o\,M_i\left(e^{-kt_i}\right)$$

Where,

Q_M = maximum expected gas generation flow rate, cubic meters per year

k = methane generation rate constant, year^{-1}

L_o = methane generation potential, cubic meters per Mg solid waste

M_i = mass of solid waste in the ith section, Mg

t_i = age of the i^{th} section, years

Appendix 8-1. Reporting

A. Annual, Semiannual, and Deviation Certification Reporting

The permittee shall use the MDEQ, AQD, Report Certification form (EQP 5736) and MDEQ, AQD, Deviation Report form (EQP 5737) for the annual, semiannual and deviation certification reporting referenced in the Reporting Section of the Source-Wide, Emission Unit and/or Flexible Group Special Conditions. Alternative formats must meet the provisions of Rule 213(4)(c) and Rule 213(3)(c)(i), respectively, and be approved by the AQD District Supervisor.

B. Other Reporting

Specific reporting requirement formats and procedures are detailed in Part A or the appropriate Source-Wide, Emission Unit and/or Flexible Group Special Conditions. Therefore, Part B of this appendix is not applicable.

SECTION 2 - GRAND RIVER GENERATING STATION

A. GENERAL CONDITIONS

Permit Enforceability

- All conditions in this permit are both federally enforceable and state enforceable unless otherwise noted. **(R 336.1213(5))**

- Those conditions that are hereby incorporated in a state-only enforceable Source-Wide PTI pursuant to Rule 201(2)(d) are designated by footnote one. **(R 336.1213(5)(a), R 336.1214a(5))**

- Those conditions that are hereby incorporated in a federally enforceable Source-Wide PTI pursuant to Rule 201(2)(c) are designated by footnote two. **(R 336.1213(5)(b), R 336.1214a(3))**

General Provisions

1. The permittee shall comply with all conditions of this ROP. Any ROP noncompliance constitutes a violation of Act 451, and is grounds for enforcement action, for ROP revocation or revision, or for denial of the renewal of the ROP. All terms and conditions of this ROP that are designated as federally enforceable are enforceable by the Administrator of the United States Environmental Protection Agency (USEPA) and by citizens under the provisions of the federal Clean Air Act (CAA). Any terms and conditions based on applicable requirements which are designated as "state-only" are not enforceable by the USEPA or citizens pursuant to the CAA. **(R 336.1213(1)(a))**

2. It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this ROP. **(R 336.1213(1)(b))**

3. This ROP may be modified, revised, or revoked for cause. The filing of a request by the permittee for a permit modification, revision, or termination, or a notification of planned changes or anticipated noncompliance does not stay any ROP term or condition. This does not supersede or affect the ability of the permittee to make changes, at the permittee's own risk, pursuant to Rule 215 and Rule 216. **(R 336.1213(1)(c))**

4. The permittee shall allow the department, or an authorized representative of the department, upon presentation of credentials and other documents as may be required by law and upon stating the authority for and purpose of the investigation, to perform any of the following activities: **(R 336.1213(1)(d))**
   a. Enter, at reasonable times, a stationary source or other premises where emissions-related activity is conducted or where records must be kept under the conditions of the ROP.
   b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of the ROP.
   c. Inspect, at reasonable times, any of the following:
      i. Any stationary source.
      ii. Any emission unit.
      iii. Any equipment, including monitoring and air pollution control equipment.
      iv. Any work practices or operations regulated or required under the ROP.
   d. As authorized by Section 5526 of Act 451, sample or monitor at reasonable times substances or parameters for the purpose of assuring compliance with the ROP or applicable requirements.

5. The permittee shall furnish to the department, within a reasonable time, any information the department may request, in writing, to determine whether cause exists for modifying, revising, or revoking the ROP or to determine compliance with this ROP. Upon request, the permittee shall also furnish to the department copies of any records that are required to be kept as a term or condition of this ROP. For information which is claimed by the permittee to be confidential, consistent with the requirements of the 1976 PA 442, MCL §15.231 et seq., and known as the Freedom of Information Act, the person may also be required to furnish the records directly to the USEPA together with a claim of confidentiality. **(R 336.1213(1)(e))**

6. A challenge by any person, the Administrator of the USEPA, or the department to a particular condition or a part of this ROP shall not set aside, delay, stay, or in any way affect the applicability or enforceability of any other condition or part of this ROP. **(R 336.1213(1)(f))**

7. The permittee shall pay fees consistent with the fee schedule and requirements pursuant to Section 5522 of Act 451. **(R 336.1213(1)(g))**

8. This ROP does not convey any property rights or any exclusive privilege. **(R 336.1213(1)(h))**

Equipment & Design

9. Any collected air contaminants shall be removed as necessary to maintain the equipment at the required operating efficiency. The collection and disposal of air contaminants shall be performed in a manner so as to minimize the introduction of contaminants to the outer air. Transport of collected air contaminants in Priority I and II areas requires the use of material handling methods specified in Rule 370(2).[2] **(R 336.1370)**

10. Any air cleaning device shall be installed, maintained, and operated in a satisfactory manner and in accordance with the Michigan Air Pollution Control rules and existing law. **(R 336.1910)**

Emission Limits

11. Unless otherwise specified in this ROP, the permittee shall comply with Rule 301, which states, in part, "Except as provided in subrules 2, 3, and 4 of this rule, a person shall not cause or permit to be discharged into the outer air from a process or process equipment a visible emission of a density greater than the most stringent of the following:"[2] **(R 336.1301(1))**
    a. A 6-minute average of 20% opacity, except for one 6-minute average per hour of not more than 27% opacity.
    b. A limit specified by an applicable federal new source performance standard.

    The grading of visible emissions shall be determined in accordance with Rule 303.

12. The permittee shall not cause or permit the emission of an air contaminant or water vapor in quantities that cause, alone or in reaction with other air contaminants, either of the following:
    a. Injurious effects to human health or safety, animal life, plant life of significant economic value, or property.[1] **(R 336.1901(a))**
    b. Unreasonable interference with the comfortable enjoyment of life and property.[1] **(R 336.1901(b))**

Testing/Sampling

13. The department may require the owner or operator of any source of an air contaminant to conduct acceptable performance tests, at the owner's or operator's expense, in accordance with Rule 1001 and Rule 1003, under any of the conditions listed in Rule 1001(1).[2] **(R 336.2001)**

14. Any required performance testing shall be conducted in accordance with Rule 1001(2), Rule 1001(3) and Rule 1003. **(R 336.2001(2), R 336.2001(3), R 336.2003(1))**

15. Any required test results shall be submitted to the Air Quality Division (AQD) in the format prescribed by the applicable reference test method within 60 days following the last date of the test. **(R 336.2001(5))**

Monitoring/Recordkeeping

16. Records of any periodic emission or parametric monitoring required in this ROP shall include the following information specified in Rule 213(3)(b)(i), where appropriate. **(R 336.1213(3)(b))**
    a. The date, location, time, and method of sampling or measurements.
    b. The dates the analyses of the samples were performed.
    c. The company or entity that performed the analyses of the samples.
    d. The analytical techniques or methods used.
    e. The results of the analyses.
    f. The related process operating conditions or parameters that existed at the time of sampling or measurement.

17. All required monitoring data, support information and all reports, including reports of all instances of deviation from permit requirements, shall be kept and furnished to the department upon request for a period of not less than 5 years from the date of the monitoring sample, measurement, report or application. Support information includes all calibration and maintenance records and all original strip-chart recordings, or other original data records, for continuous monitoring instrumentation and copies of all reports required by the ROP. **(R 336.1213(1)(e), R 336.1213(3)(b)(ii))**

Certification & Reporting

18. Except for the alternate certification schedule provided in Rule 213(3)(c)(iii)(B), any document required to be submitted to the department as a term or condition of this ROP shall contain an original certification by a Responsible Official which states that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete. **(R 336.1213(3)(c))**

19. A Responsible Official shall certify to the appropriate AQD District Office and to the USEPA that the stationary source is and has been in compliance with all terms and conditions contained in the ROP except for deviations that have been or are being reported to the appropriate AQD District Office pursuant to Rule 213(3)(c). This certification shall include all the information specified in Rule 213(4)(c)(i) through (v) and shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the certification are true, accurate, and complete. The USEPA address is: USEPA, Air Compliance Data - Michigan, Air and Radiation Division, 77 West Jackson Boulevard, Chicago, Illinois 60604-3507. **(R 336.1213(4)(c))**

20. The certification of compliance shall be submitted annually for the term of this ROP as detailed in the special conditions, or more frequently if specified in an applicable requirement or in this ROP. **(R 336.1213(4)(c))**

21. The permittee shall promptly report any deviations from ROP requirements and certify the reports. The prompt reporting of deviations from ROP requirements is defined in Rule 213(3)(c)(ii) as follows, unless otherwise described in this ROP. **(R 336.1213(3)(c))**
    a. For deviations that exceed the emissions allowed under the ROP, prompt reporting means reporting consistent with the requirements of Rule 912 as detailed in Condition 25. All reports submitted pursuant to this paragraph shall be promptly certified as specified in Rule 213(3)(c)(iii).
    b. For deviations which exceed the emissions allowed under the ROP and which are not reported pursuant to Rule 912 due to the duration of the deviation, prompt reporting means the reporting of all deviations in the semiannual reports required by Rule 213(3)(c)(i). The report shall describe reasons for each deviation and the actions taken to minimize or correct each deviation.
    c. For deviations that do not exceed the emissions allowed under the ROP, prompt reporting means the reporting of all deviations in the semiannual reports required by Rule 213(3)(c)(i). The report shall describe the reasons for each deviation and the actions taken to minimize or correct each deviation.

22. For reports required pursuant to Rule 213(3)(c)(ii), prompt certification of the reports is described in Rule 213(3)(c)(iii) as either of the following: **(R 336.1213(3)(c))**
    a. Submitting a certification by a Responsible Official with each report which states that, based on information and belief formed after reasonable inquiry, the statements and information in the report are true, accurate, and complete.
    b. Submitting, within 30 days following the end of a calendar month during which one or more prompt reports of deviations from the emissions allowed under the ROP were submitted to the department pursuant to Rule 213(3)(c)(ii), a certification by a Responsible Official which states that; "based on information and belief formed after reasonable inquiry, the statements and information contained in each of the reports submitted during the previous month were true, accurate, and complete." The certification shall include a listing of the reports that are being certified. Any report submitted pursuant to Rule 213(3)(c)(ii) that will be certified on a monthly basis pursuant to this paragraph shall include a statement that certification of the report will be provided within 30 days following the end of the calendar month.

23. Semiannually for the term of the ROP as detailed in the special conditions, or more frequently if specified, the permittee shall submit certified reports of any required monitoring to the appropriate AQD District Office. All instances of deviations from ROP requirements during the reporting period shall be clearly identified in the reports. **(R 336.1213(3)(c)(i))**

24. On an annual basis, the permittee shall report the actual emissions, or the information necessary to determine the actual emissions, of each regulated air pollutant as defined in Rule 212(6) for each emission unit utilizing the emissions inventory forms provided by the department. **(R 336.1212(6))**

25. The permittee shall provide notice of an abnormal condition, start-up, shutdown, or malfunction that results in emissions of a hazardous or toxic air pollutant which continue for more than one hour in excess of any applicable standard or limitation, or emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation, as required in Rule 912, to the appropriate AQD District Office. The notice shall be provided not later than two business days after the start-up, shutdown, or discovery of the abnormal conditions or malfunction. Notice shall be by any reasonable means, including electronic, telephonic, or oral communication. Written reports, if required under Rule 912, must be submitted to the appropriate AQD District Supervisor within 10 days after the start-up or shutdown occurred, within 10 days after the abnormal conditions or malfunction has been corrected, or within 30 days of discovery of the abnormal conditions or malfunction, whichever is first. The written reports shall include all of the information required in Rule 912(5) and shall be certified by a Responsible Official in a manner consistent with the CAA.[2] **(R 336.1912)**

Permit Shield

26. Compliance with the conditions of the ROP shall be considered compliance with any applicable requirements as of the date of ROP issuance, if either of the following provisions is satisfied. **(R 336.1213(6)(a)(i), R 336.1213(6)(a)(ii))**
    a. The applicable requirements are included and are specifically identified in the ROP.
    b. The permit includes a determination or concise summary of the determination by the department that other specifically identified requirements are not applicable to the stationary source.

    Any requirements identified in Part E of this ROP have been identified as non-applicable to this ROP and are included in the permit shield.

27. Nothing in this ROP shall alter or affect any of the following:
    a. The provisions of Section 303 of the CAA, emergency orders, including the authority of the USEPA under Section 303 of the CAA. **(R 336.1213(6)(b)(i))**
    b. The liability of the owner or operator of this source for any violation of applicable requirements prior to or at the time of this ROP issuance. **(R 336.1213(6)(b)(ii))**
    c. The applicable requirements of the acid rain program, consistent with Section 408(a) of the CAA. **(R 336.1213(6)(b)(iii))**

   d. The ability of the USEPA to obtain information from a source pursuant to Section 114 of the CAA. **(R 336.1213(6)(b)(iv))**

28. The permit shield shall not apply to provisions incorporated into this ROP through procedures for any of the following:
    a. Operational flexibility changes made pursuant to Rule 215. **(R 336.1215(5))**
    b. Administrative Amendments made pursuant to Rule 216(1)(a)(i)-(iv). **(R 336.1216(1)(b)(iii))**
    c. Administrative Amendments made pursuant to Rule 216(1)(a)(v) until the amendment has been approved by the department. **(R 336.1216(1)(c)(iii))**
    d. Minor Permit Modifications made pursuant to Rule 216(2). **(R 336.1216(2)(f))**
    e. State-Only Modifications made pursuant to Rule 216(4) until the changes have been approved by the department. **(R 336.1216(4)(e))**

29. Expiration of this ROP results in the loss of the permit shield. If a timely and administratively complete application for renewal is submitted not more than 18 months, but not less than 6 months, before the expiration date of the ROP, but the department fails to take final action before the end of the ROP term, the existing ROP does not expire until the renewal is issued or denied, and the permit shield shall extend beyond the original ROP term until the department takes final action. **(R 336.1217(1)(c), R 336.1217(1)(a))**

Revisions

30. For changes to any process or process equipment covered by this ROP that do not require a revision of the ROP pursuant to Rule 216, the permittee must comply with Rule 215. **(R 336.1215, R 336.1216)**

31. A change in ownership or operational control of a stationary source covered by this ROP shall be made pursuant to Rule 216(1). **(R 336.1219(2))**

32. For revisions to this ROP, an administratively complete application shall be considered timely if it is received by the department in accordance with the time frames specified in Rule 216. **(R 336.1210(10))**

33. Pursuant to Rule 216(1)(b)(iii), Rule 216(2)(d) and Rule 216(4)(d), after a change has been made, and until the department takes final action, the permittee shall comply with both the applicable requirements governing the change and the ROP terms and conditions proposed in the application for the modification. During this time period, the permittee may choose to not comply with the existing ROP terms and conditions that the application seeks to change. However, if the permittee fails to comply with the ROP terms and conditions proposed in the application during this time period, the terms and conditions in the ROP are enforceable. **(R 336.1216(1)(c)(iii), R 336.1216(2)(d), R 336.1216(4)(d))**

Re-openings

34. A ROP shall be reopened by the department prior to the expiration date and revised by the department under any of the following circumstances:
    a. If additional requirements become applicable to this stationary source with three or more years remaining in the term of the ROP, but not if the effective date of the new applicable requirement is later than the ROP expiration date. **(R 336.1217(2)(a)(i))**
    b. If additional requirements pursuant to Title IV of the CAA become applicable to this stationary source. **(R 336.1217(2)(a)(ii))**
    c. If the department determines that the ROP contains a material mistake, information required by any applicable requirement was omitted, or inaccurate statements were made in establishing emission limits or the terms or conditions of the ROP. **(R 336.1217(2)(a)(iii))**
    d. If the department determines that the ROP must be revised to ensure compliance with the applicable requirements. **(R 336.1217(2)(a)(iv))**

Renewals

35. For renewal of this ROP, an administratively complete application shall be considered timely if it is received by the department not more than 18 months, but not less than 6 months, before the expiration date of the ROP. **(R 336.1210(8))**

Stratospheric Ozone Protection

36. If the permittee is subject to Title 40 of the Code of Federal Regulations (CFR), Part 82 and services, maintains, or repairs appliances except for motor vehicle air conditioners (MVAC), or disposes of appliances containing refrigerant, including MVAC and small appliances, or if the permittee is a refrigerant reclaimer, appliance owner or a manufacturer of appliances or recycling and recovery equipment, the permittee shall comply with all applicable standards for recycling and emissions reduction pursuant to 40 CFR Part 82, Subpart F.

37. If the permittee is subject to 40 CFR Part 82, and performs a service on motor (fleet) vehicles when this service involves refrigerant in the MVAC, the permittee is subject to all the applicable requirements as specified in 40 CFR Part 82, Subpart B, Servicing of Motor Vehicle Air Conditioners. The term “motor vehicle” as used in Subpart B does not include a vehicle in which final assembly of the vehicle has not been completed by the original equipment manufacturer. The term MVAC as used in Subpart B does not include the air-tight sealed refrigeration system used for refrigerated cargo or an air conditioning system on passenger buses using Hydrochlorofluorocarbon-22 refrigerant.

Risk Management Plan

38. If subject to Section 112(r) of the CAA and 40 CFR Part 68, the permittee shall register and submit to the USEPA the required data related to the risk management plan for reducing the probability of accidental releases of any regulated substances listed pursuant to Section 112(r)(3) of the CAA as amended in 40 CFR 68.130. The list of substances, threshold quantities, and accident prevention regulations promulgated under 40 CFR Part 68, do not limit in any way the general duty provisions under Section 112(r)(1).

39. If subject to Section 112(r) of the CAA and 40 CFR Part 68, the permittee shall comply with the requirements of 40 CFR Part 68, no later than the latest of the following dates as provided in 40 CFR 68.10(a):
    a. June 21, 1999,
    b. Three years after the date on which a regulated substance is first listed under 40 CFR 68.130, or
    c. The date on which a regulated substance is first present above a threshold quantity in a process.

40. If subject to Section 112(r) of the CAA and 40 CFR Part 68, the permittee shall submit any additional relevant information requested by any regulatory agency necessary to ensure compliance with the requirements of 40 CFR Part 68.

41. If subject to Section 112(r) of the CAA and 40 CFR Part 68, the permittee shall annually certify compliance with all applicable requirements of Section 112(r) as detailed in Rule 213(4)(c)). **(40 CFR Part 68)**

Emission Trading

42. Emission averaging and emission reduction credit trading are allowed pursuant to any applicable interstate or regional emission trading program that has been approved by the Administrator of the USEPA as a part of Michigan’s State Implementation Plan. Such activities must comply with Rule 215 and Rule 216. **(R 336.1213(12))**

Permit to Install (PTI)

43. The process or process equipment included in this permit shall not be reconstructed, relocated, or modified unless a PTI authorizing such action is issued by the department, except to the extent such action is exempt from the PTI requirements by any applicable rule.[2] **(R 336.1201(1))**

44. The department may, after notice and opportunity for a hearing, revoke PTI terms or conditions if evidence indicates the process or process equipment is not performing in accordance with the terms and conditions of the PTI or is violating the department's rules or the CAA.[2] **(R 336.1201(8), Section 5510 of Act 451)**

45. The terms and conditions of a PTI shall apply to any person or legal entity that now or hereafter owns or operates the process or process equipment at the location authorized by the PTI. If a new owner or operator submits a written request to the department pursuant to Rule 219 and the department approves the request, this PTI will be amended to reflect the change of ownership or operational control. The request must include all of the information required by Subrules (1)(a), (b) and (c) of Rule 219. The written request shall be sent to the appropriate AQD District Supervisor, MDEQ.[2] **(R 336.1219)**

46. If the installation, reconstruction, relocation, or modification of the equipment for which PTI terms and conditions have been approved has not commenced within 18 months of the original PTI issuance date, or has been interrupted for 18 months, the applicable terms and conditions from that PTI, as incorporated into the ROP, shall become void unless otherwise authorized by the department. Furthermore, the person to whom that PTI was issued, or the designated authorized agent, shall notify the department via the Supervisor, Permit Section, MDEQ, AQD, P. O. Box 30260, Lansing, Michigan 48909, if it is decided not to pursue the installation, reconstruction, relocation, or modification of the equipment allowed by the terms and conditions from that PTI.[2] **(R 336.1201(4))**

Footnotes:

[1] This condition is state-only enforceable and was established pursuant to Rule 201(1)(b).
[2] This condition is federally enforceable and was established pursuant to Rule 201(1)(a).

B. SOURCE-WIDE CONDITIONS

Part B outlines the Source-Wide Terms and Conditions that apply to this stationary source. The permittee is subject to these special conditions for the stationary source in addition to the general conditions in Part A and any other terms and conditions contained in this ROP.

The permittee shall comply with all specific details in the special conditions and the underlying applicable requirements cited. If a specific condition type does not apply to this source, NA (not applicable) has been used in the table. If there are no Source-Wide Conditions, this section will be left blank.

C. EMISSION UNIT CONDITIONS

Part C outlines terms and conditions that are specific to individual emission units listed in the Emission Unit Summary Table. The permittee is subject to the special conditions for each emission unit in addition to the General Conditions in Part A and any other terms and conditions contained in this ROP.

The permittee shall comply with all specific details in the special conditions and the underlying applicable requirements cited. If a specific condition type does not apply, NA (not applicable) has been used in the table. If there are no conditions specific to individual emission units, this section will be left blank.

EMISSION UNIT SUMMARY TABLE

The descriptions provided below are for informational purposes and do not constitute enforceable conditions.

Emission Unit ID	Emission Unit Description (Including Process Equipment & Control Device(s))	Installation Date/ Modification Date	Flexible Group ID
EUICE1	Stationary, non-emergency landfill gas, four-stroke lean burn reciprocating internal combustion engine (Caterpillar G3516) with a site rating of 1,138 horsepower and a maximum operating fuel requirement of approximately 8.6 MMBTU/hr. Manufacture date: 11/15/1990. Serial No. 3RC00275	04-10-1991/ NA	FGICE
EUICE3	Stationary, non-emergency landfill gas, four-stroke lean burn reciprocating internal combustion engine (Caterpillar G3516) with a site rating of 1,138 horsepower and a maximum operating fuel requirement of approximately 8.6 MMBTU/hr. Manufacture date: 12/16/1993. Serial No. 4EK00132	04-01-1994/ NA	FGICE
EUICE5	Stationary, non-emergency landfill gas, four-stroke lean burn reciprocating internal combustion engine (Caterpillar G3516) with a site rating of 1,138 horsepower and a maximum operating fuel requirement of approximately 8.6 MMBTU/hr. Manufacture date: 4/18/1995. Serial No. 4EK00479	09-23-1997/ NA	FGICE

D. FLEXIBLE GROUP CONDITIONS

Part D outlines the terms and conditions that apply to more than one emission unit. The permittee is subject to the special conditions for each flexible group in addition to the General Conditions in Part A and any other terms and conditions contained in this ROP.

The permittee shall comply with all specific details in the special conditions and the underlying applicable requirements cited. If a specific condition type does not apply, NA (not applicable) has been used in the table. If there are no special conditions that apply to more than one emission unit, this section will be left blank.

FLEXIBLE GROUP SUMMARY TABLE

The descriptions provided below are for informational purposes and do not constitute enforceable conditions.

Flexible Group ID	Flexible Group Description	Associated Emission Unit IDs
FGICE	Three (3) existing stationary non-emergency spark ignition, 4-stroke lean burn (4SLB) reciprocating internal combustion engines (RICE) with site ratings of 1,138 brake horsepower, and a maximum operating fuel requirement of approximately 8.6 MMBtu/hr.	EUICE1 EUICE3 EUICE5

FGICE
FLEXIBLE GROUP CONDITIONS

DESCRIPTION

Three (3) Caterpillar 3516, 1,138 hp, landfill gas-fired stationary, spark ignition 4-stroke lean burn (4SLB) reciprocating internal combustion engines (RICE) with a maximum operating fuel requirement of approximately 8.6 MMBtu/hr. These are existing non-emergency engines greater than 500 hp located at an area source of HAPs. Construction or reconstruction commenced prior to December 19, 2002.

Emission Unit: EUICE1, EUICE3, EUICE5

POLLUTION CONTROL EQUIPMENT

NA

I. EMISSION LIMIT(S)

Pollutant	Limit	Time Period/ Operating Scenario	Equipment	Monitoring/ Testing Method	Underlying Applicable Requirements
NA					

II. MATERIAL LIMIT(S)

Material	Limit	Time Period/ Operating Scenario	Equipment	Monitoring/ Testing Method	Underlying Applicable Requirements
NA					

III. PROCESS/OPERATIONAL RESTRICTION(S)

1. The permittee shall only burn treated landfill gas in FGICE. **(R 336.1213(2))**

2. The permittee shall submit to the AQD District Supervisor, for review and approval, a malfunction abatement/preventative maintenance plan (PM/MAP) for FGICE within 30 days of ROP issuance. After approval of the PM/MAP by the AQD District Supervisor, the permittee shall not operate FGICE unless the PM/MAP, or an alternate plan approved by the AQD District Supervisor, is implemented and maintained. The plan shall incorporate procedures recommended by the equipment manufacturer as well as incorporating standard industry practices. At a minimum the plan shall include:
   a. Identification of the equipment and, if applicable, air-cleaning device, and the supervisory personnel responsible for overseeing the inspection, maintenance, and repair.
   b. Description of the items or conditions to be inspected and frequency of the inspections or repairs.
   c. Identification of the equipment and, if applicable, air-cleaning device, operating parameters that shall be monitored to detect a malfunction or failure, the normal operating range of these parameters and a description of the method of monitoring or surveillance procedures.
   d. Identification of the major replacement parts that shall be maintained in inventory for quick replacement.
   e. A description of the corrective procedures or operational changes that shall be taken in the event of a malfunction or failure to achieve compliance with the applicable emission limits.

If the plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction at the time the plan is initially developed, the owner or operator shall revise the plan within 45 days after such an event occurs and submit the revised plan for approval to the AQD District Supervisor. Should the AQD determine the PM/MAP to be inadequate, the AQD District Supervisor may request modification of the plan to address those inadequacies. **(R 336.1213(2), R 336.1911)**

IV. DESIGN/EQUIPMENT PARAMETER(S)

NA

V. TESTING/SAMPLING

Records shall be maintained on file for a period of five years. **(R 336.1213(3)(b)(ii))**

NA

VI. MONITORING/RECORDKEEPING

Records shall be maintained on file for a period of five years. **(R 336.1213(3)(b)(ii))**

1. The permittee shall complete all required records in a format acceptable to the AQD District Supervisor and make them available by the last day of the calendar month, for the previous calendar month, unless otherwise specified in any monitoring/recordkeeping special condition. **(R 336.1213(3), R 336.1911)**

2. The permittee shall maintain the following record for each engine in FGICE:
   a. Engine manufacturer;
   b. Date engine was manufactured;
   c. Engine model number and model year;
   d. Maximum engine power;
   e. Engine serial number;
   f. Engine specification sheet;
   g. Date of initial startup of the engine;
   h. Date engine was removed from service at this stationary source;
   i. Date replacement engine was installed at this stationary source;
   j. Manufacturer’s data, specifications, and operating and maintenance procedures for each engine;
   k. Maintenance activities conducted according to the PM/MAP.

   The permittee shall keep the records on file in a format acceptable to the AQD District Supervisor and make them available to the Department upon request. **(R 336.1213(3), R 336.1911)**

VII. REPORTING

1. Prompt reporting of deviations pursuant to General Conditions 21 and 22 of Part A. **(R 336.1213(3)(c)(ii))**

2. Semiannual reporting of monitoring and deviations pursuant to General Condition 23 of Part A. The report shall be postmarked or received by the appropriate AQD District Office by March 15 for reporting period July 1 to December 31 and September 15 for reporting period January 1 to June 30. **(R 336.1213(3)(c)(i))**

3. Annual certification of compliance pursuant to General Conditions 19 and 20 of Part A. The report shall be postmarked or received by the appropriate AQD District Office by March 15 for the previous calendar year. **(R 336.1213(4)(c))**

VIII. STACK/VENT RESTRICTION(S)

The exhaust gases from the stacks listed in the table below shall be discharged unobstructed vertically upwards to the ambient air unless otherwise noted:

Stack & Vent ID	Maximum Exhaust Dimensions (inches)	Minimum Height Above Ground (feet)	Underlying Applicable Requirements
NA			

IX. OTHER REQUIREMENT(S)

1. The permittee shall comply with all applicable provisions of the National Emission Standards for Hazardous Air Pollutants, as specified in 40 CFR 63, Subpart A and Subpart ZZZZ as they apply to FGICE. **(40 CFR 63, Subparts A and ZZZZ)**

Footnotes:

[1] This condition is state only enforceable and was established pursuant to Rule 201(1)(b).

[2] This condition is federally enforceable and was established pursuant to Rule 201(1)(a).

E. NON-APPLICABLE REQUIREMENTS

At the time of the ROP issuance, the AQD has determined that no non-applicable requirements have been identified for incorporation into the permit shield provision set forth in the General Conditions in Part A pursuant to Rule 213(6)(a)(ii).

APPENDICES

Appendix 1-2. Acronyms and Abbreviations

Common Acronyms		Pollutant / Measurement Abbreviations	
AQD	Air Quality Division	acfm	Actual cubic feet per minute
BACT	Best Available Control Technology	BTU	British Thermal Unit
CAA	Clean Air Act	°C	Degrees Celsius
CAM	Compliance Assurance Monitoring	CO	Carbon Monoxide
CEM	Continuous Emission Monitoring	CO$_2$e	Carbon Dioxide Equivalent
CFR	Code of Federal Regulations	dscf	Dry standard cubic foot
COM	Continuous Opacity Monitoring	dscm	Dry standard cubic meter
Department/ department	Michigan Department of Environmental Quality	°F	Degrees Fahrenheit
		gr	Grains
EU	Emission Unit	HAP	Hazardous Air Pollutant
FG	Flexible Group	Hg	Mercury
GACS	Gallons of Applied Coating Solids	hr	Hour
GC	General Condition	HP	Horsepower
GHGs	Greenhouse Gases	H$_2$S	Hydrogen Sulfide
HVLP	High Volume Low Pressure*	kW	Kilowatt
ID	Identification	lb	Pound
IRSL	Initial Risk Screening Level	m	Meter
ITSL	Initial Threshold Screening Level	mg	Milligram
LAER	Lowest Achievable Emission Rate	mm	Millimeter
MACT	Maximum Achievable Control Technology	MM	Million
MAERS	Michigan Air Emissions Reporting System	MW	Megawatts
MAP	Malfunction Abatement Plan	NMOC	Non-methane Organic Compounds
MDEQ	Michigan Department of Environmental Quality	NO$_x$	Oxides of Nitrogen
		ng	Nanogram
MSDS	Material Safety Data Sheet	PM	Particulate Matter
NA	Not Applicable	PM10	Particulate Matter equal to or less than 10 microns in diameter
NAAQS	National Ambient Air Quality Standards		
NESHAP	National Emission Standard for Hazardous Air Pollutants	PM2.5	Particulate Matter equal to or less than 2.5 microns in diameter
NSPS	New Source Performance Standards	pph	Pounds per hour
NSR	New Source Review	ppm	Parts per million
PS	Performance Specification	ppmv	Parts per million by volume
PSD	Prevention of Significant Deterioration	ppmw	Parts per million by weight
PTE	Permanent Total Enclosure	psia	Pounds per square inch absolute
PTI	Permit to Install	psig	Pounds per square inch gauge
RACT	Reasonable Available Control Technology	scf	Standard cubic feet
ROP	Renewable Operating Permit	sec	Seconds
SC	Special Condition	SO$_2$	Sulfur Dioxide
SCR	Selective Catalytic Reduction	TAC	Toxic Air Contaminant
SNCR	Selective Non-Catalytic Reduction	Temp	Temperature
SRN	State Registration Number	THC	Total Hydrocarbons
TEQ	Toxicity Equivalence Quotient	tpy	Tons per year
USEPA/EPA	United States Environmental Protection Agency	µg	Microgram
		µm	Micrometer or Micron
VE	Visible Emissions	VOC	Volatile Organic Compounds
		yr	Year

*For HVLP applicators, the pressure measured at the gun air cap shall not exceed 10 psig.

Appendix 2-2. Schedule of Compliance

The permittee certified in the ROP application that this stationary source is in compliance with all applicable requirements and the permittee shall continue to comply with all terms and conditions of this ROP. A Schedule of Compliance is not required. **(R 336.1213(4)(a), R 336.1119(a)(ii))**

Appendix 3-2. Monitoring Requirements

Specific monitoring requirement procedures, methods or specifications are detailed in Part A or the appropriate Source-Wide, Emission Unit and/or Flexible Group Special Conditions. Therefore, this appendix is not applicable.

Appendix 4-2. Recordkeeping

Specific recordkeeping requirement formats and procedures are detailed in Part A or the appropriate Source-Wide, Emission Unit and/or Flexible Group Special Conditions. Therefore, this appendix is not applicable.

Appendix 5-2. Testing Procedures

There are no specific testing requirement plans or procedures for this ROP. Therefore, this appendix is not applicable.

Appendix 6-2. Permits to Install

At the time of permit issuance, no Permits to Install have been issued to this facility. Therefore, this appendix is not applicable.

Appendix 7-2. Emission Calculations

There are no specific emission calculations to be used for this ROP. Therefore, this appendix is not applicable.

Appendix 8-2. Reporting

A. Annual, Semiannual, and Deviation Certification Reporting

The permittee shall use the MDEQ, AQD, Report Certification form (EQP 5736) and MDEQ, AQD, Deviation Report form (EQP 5737) for the annual, semiannual and deviation certification reporting referenced in the Reporting Section of the Source-Wide, Emission Unit and/or Flexible Group Special Conditions. Alternative formats must meet the provisions of Rule 213(4)(c) and Rule 213(3)(c)(i), respectively, and be approved by the AQD District Supervisor.

B. Other Reporting

Specific reporting requirement formats and procedures are detailed in Part A or the appropriate Source-Wide, Emission Unit and/or Flexible Group Special Conditions. Therefore, Part B of this appendix is not applicable.

ATTACHMENT C

Revised Section 2.0

1.0 INTRODUCTION

The Granger Grand River MID 082 771 700 Landfill is owned and operated by Granger Land Development Company (Granger). Granger began operations of the Grand River facility for others in 1974 and purchased the landfill in 1980. Original operations of the facility by others began in 1970.

The post-closure period began on April 13, 1990 with certification from the Michigan Department of Natural Resources (MDNR) [currently the Michigan Department of Environment, Great Lakes, and Energy (EGLE)] that all the requirements of closure had been fulfilled.

Pursuant to R 299.9508(3), this operating license application for the post-closure period includes the following information:

a.) Information specified in 40 CFR §270.14(b)(1), (4) to (6), (11), (13), (14), (18), and (19) and (d);

b.) Information specified in R 299.9506 (Hydrogeological reports);

c.) Most recent post-closure cost estimate prepared in accordance with R 299.9702; and

d.) Copy of the documentation required to demonstrate compliance with R 299.9703.

The review checklist is provided with the application form.

2.0 GENERAL INFORMATION REQUIRED - 40 CFR §270.14(B) AND (D)

2.1 General Description [40 CFR §270.14(b)(1)]

The Granger MID Landfill is located at 8550 W. Grander River Highway, Grand Ledge, Michigan. In November 1980, to comply with RCRA, GLDC submitted a Part A application for Interim Status. During October 1981, after submitting detailed engineering plans to upgrade a portion of the site to Michigan Act 641 standards (predecessor to the current Part 115 standards), GLDC negotiated a Consent Agreement with Michigan Department of Natural Resources (MDNR) which limited the type and quantities of hazardous wastes which could be accepted at the site under constraints imposed by the Michigan Act 64. The limitations in the agreement were based upon the types and quantities of waste that had been received at the facility in the past. Between the years 1980 and 1983 the facility received 35,000 cubic yards of hazardous waste.

The site does not include any hazardous waste containers, tanks, or treatments systems. There is a leachate treatment system (air stripper) for treatment of (not currently in use) leachate from the MID and adjacent Part 115 landfill. Leachate from the MID landfill has been delisted/redesignated as liquid industrial waste (Petition to Delist Hazardous Waste Landfill Leachate, submitted by Granger, June 30, 2004).

Topographic maps of the site are provided on **Figure 1** and **Figure 1A**. The facility drawing for the site is provided on **Figure 2**. An aerial photograph of the site is provided on **Figure 3**.

The Emergency Action Plan and Stormwater Pollution Prevention Plan (SWPPP) are provided in **Appendix J**. These plans serve as contingency plan for the facility.

2.1.1 Isolation of Waste

Several actions have been taken to effectively isolate the waste material at the landfill from other disposal areas. These have included the following activities:

- Construction of clay walls at the perimeter of the landfill;

ATTACHMENT D

Revised Section 3.0, Appendix H and Appendix I

3.0 HYDROGEOLOGY

In lieu of the hydrogeological investigation report specified in R 299.9056. Granger is referencing the past hydrogeologic investigations that have been conducted at the site, including:

> Ostrander, A.G. 1977. "Hydrogeological Investigation of the Grand River Landfill in Watertown Township, Clinton County."
>
> Keck Consulting Services, Inc. 1981. "Hydrogeological Investigation Granger Landfill Expansion, Section 29, T.5N, R.3W, Watertown Township, Clinton County, Michigan."
>
> Keck Consulting Services, Inc. 1981. "Hydrogeological Investigation, Modification of Existing Facility, Granger Landfill, Section 29, T.5N, R.3W, Watertown Township, Clinton, County, Michigan."

In the past these investigations (provided in **Appendix H**) have been utilized to prepare the following brief summaries of the site geology and hydrogeology (Source: Granger Land Development, Post-Closure Plan, Granger Grand River MID 082 771 700 Landfill, March 30, 2009):

Site Geology

The report by Ostrander (1977) indicated that the landfill is located on the Grand Ledge end moraine which was formed by the Saginaw lobe ice sheet of the middle Wisconsinan Glacial Age.

A preliminary geological investigation identified the presence of top soil and brown clay overlying sand and gravel deposits, which in turn overlay a grey clay.

Additional borings indicated the presence of an upper zone of brown silty-sandy-pebbly clay overlying a zone of saturated silt, sand and gravel which overlay a grey-blue clay. The borings were completed 20'+ into the grey-blue clay confirming a continuous layer of grey-blue clay of at least 20 feet in thickness underneath the site.

In summarizing the results of their 1981 investigations, Keck Consulting Services reported similar findings. The sediments overlying the bedrock at the site are primarily ground moraine placed as the result of glacial action. Drift thickness at the site ranges from 30 to 90 feet. The site geology was variable since the ground moraine had been cut by braided streams carrying glacial outwash.

Hydrogeology

The report by Mr. Ostrander (1977) indicates that surface drainage from the site flows to the north into the Oppenlander Drain. The variable unit of sand and gravel underlying the surficial brown clay unit was reported to contain some perched saturation which also migrated to the north. The report indicated that the perched groundwater was present at elevations between 820- 840 feet msl. The presence of a deeper bedrock aquifer was also referenced but without any elevations.

The Keck Consulting Services, Inc. report also referenced the presence of areas of perched saturations at variable elevations. The depth to perched groundwater in borings ranged from 12- 16 feet BGL. The depths to groundwater measured in observation wells installed at the site ranged from 18-27 feet BGL. The data also indicated the presence of the deeper aquifer at an approximate elevation of 820 feet.

These hydrogeologic investigations have resulted in the current groundwater monitoring well network and groundwater monitoring program. The site geology is also summarized ~~as follows (source:~~in the Post-Closure Groundwater Statistical Evaluation Program~~,~~ (RMT, Inc., January 2006) provided in Appendix F-3:

- *A surficial granular deposit, which varies in thickness from several feet up to 30 feet. Portions of this deposit have been excavated in some of the areas of the landfill and have been hydraulically separated through the construction of a low permeable clay barrier system and a slurry wall.*
- *A silty clay deposit characterized as a till which acts as a hydraulic barrier to varying degrees across the site. The deposit is considered a confining layer in the southern portion of the site and a leaky confining layer in northern portions.*
- *A lower granular deposit which varies in thickness between several feet up to 30 feet.*
- *A lower silty clay characterized as a till.*
- *Sandstone bedrock consisting of the Saginaw Formation.*

The hydrogeology and three water bearing zones are summarized as follows (source: Post-Closure Groundwater Statistical Evaluation Program, RMT, Inc., January 2006):

- *A shallow drift aquifer, which is present in the near surface granular deposit. A groundwater recovery system is also modifying groundwater flow in these deposits.*
- *A deep drift aquifer, which is present in the lower granular deposit between the two till sequences. The groundwater flow in this unit appears to vary but generally flows from the southwest to northeast.*
- *A sandstone bedrock aquifer.*

Boring Logs and Lithologic Profiles

Past boring logs and lithologic profiles are provided in **Appendix I**. (Source: Granger Land Development, Post-Closure Plan, Granger Grand River MID 082 771 700 Landfill, March 30, 2009).

> *The first available information on soil borings intended to characterize the site relate to the investigation performed in 1976. The boring logs and cross-sections prepared by Mr. Allan Ostrander of the MDNR/MDEQ are contained as Appendix 7-A. It should be noted that some of the boring elevations, especially that of OB-5, are misplaced on the cross-sections. Each boring was completed at least 20 feet into the grey clay which confirmed that the formation was continuous across the site, with the upper elevation of the formation ranging from 825' at OB#6 to 838' at nearby OB#7. At least 77 feet of grey clay was reported present in the June 12, 1970 boring located most central to the site. The log for boring #9, the water supply well indicates the presence of 62 feet of grey clay from 837-775'.*
>
> *Observation wells OW-9 and OW-10 were next installed in 1980. Although these are very shallow wells and provide no additional information on the grey clay formation, the logs are contained in Appendix 7-B. OW-14 and OW-15 were installed in October. OW-14 was later replaced by MW-17 which is a bedrock monitoring well.*
>
> *Monitoring wells MW-16, MW-17, and MW-18, the bedrock monitoring wells, were installed in February 1982. Monitoring well MW-19, in the vicinity of the purge system, was installed in November 1981. The logs for monitoring wells MW-9 through MW-19 are contained in Appendix 7-B.*
>
> *Additional hydrogeologic investigation was conducted in 1983 by Keck Consulting Inc. The boring logs and lithologic profiles from this investigation are contained in Appendix 7-C. As part of that investigation, MW-21s and MW-22d were installed in boring B-177 and MW-23s, and MW-24 were installed in boring B-184.*
>
> *Appendix 7-D contains the boring logs for the remaining piezometers and monitoring wells at the site. Logs are provided for P-28, P-29, P-30, P-31, P-33, P-36, P-37, MW-25, MW-40, MW- 41, MW-43s, MW-43d, MW-44, MW-45 and the purge wells PW-38, PW-39, PW-46, PW-48, PW-49 and PW-50. A boring log could not be located for P-26.*

More recent boring logs conducted since the last post-closure permit renewal are also included in **Appendix I**. These borings were performed with monitoring well replacements as necessary to maintain the groundwater monitoring network.

3.1 Summary of Recent Monitoring Data

As noted in Section 2.1.1, a cap constructed both as part of the final closure of the site and as part of the encapsulation of the site. The cap has been and will be inspected and maintained under the post-closure operating license and therefore air monitoring and soil monitoring are unnecessary. As noted in the previous post-closure operation permit application (source: Granger Land Development, Post-Closure Plan, Granger Grand River MID 082 771 700 Landfill, March 30, 2009), the cap will prevent wastes from volatizing to the atmosphere or blowing off-site and will prevent landfill personnel and equipment from coming into contact with hazardous waste and tracking them to other areas of the site.

The following sections summarize the monitoring data from the last five (5) annual groundwater monitoring reports (2016 through 2020).

3.1.1 Groundwater

The groundwater monitoring plan is presented in Section 1 of the attached Monitoring Plan (**Attachment F**). Groundwater contour maps from the 2020 annual groundwater report are provided in **Attachment F-1**. In the past three years (2018, 2019 and 2020), no statistical exceedances have been confirmed.

3.1.1.1 Bedrock Aquifer

Bedrock aquifer groundwater samples are collected semi-annually from monitoring wells MW-16 (upgradient), MW-17 and MW-18. In the past 5-years, the groundwater samples from the bedrock aquifer have not had any detections for VOCs above the laboratory limits and no inorganic parameter has exceeded its prediction limit. The groundwater data indicate the site has not impacted the groundwater in the bedrock aquifer.

3.1.1.2 Deep Glacial Drift Aquifer

Deep glacial drift aquifer samples are collected semi-annually from monitoring wells MW-44 (upgradient), MW-14dr, MW-20r, MW-22dr, MW-24dr, MW-25r, MW-42r[2], MW-43d, and MW-45. In the past 5 years, the groundwater samples from the deep glacial drift aquifer have not had any detection of VOCs above the laboratory limits. Sodium and chloride impacts from roadway salt impacted runoff are present at MW-14dr, MW-22dr, MW-24dr and MW-25r, as discussed in further detail in recent annual groundwater monitoring reports. As summarized in the 2020 annual groundwater report, the data indicate that the site activities have not impacted the groundwater in the deep glacial drift aquifer.

3.1.1.3 Shallow Glacial Drift Aquifer

Shallow glacial drift aquifer samples are collected semi-annually from MW-9, MW-14sr, MW-21sr, MW-23sr, MW-40, and MW-43s. The sampling data indicated normal variability of naturally occulting inorganic parameters and no VOCs have been detected above the laboratory detection limit in the past 5-years. Sodium, chloride, and to a lesser extent potassium impacts from roadway salt impacted runoff are present at MW-14sr, MW-21sr and MW-23sr, as discussed in further detail in recent annual groundwater monitoring reports. Boron was detected above prediction limits at MW-23sr in 2016 and 2017 but less than prediction limits in 2018-2020. There was a slight exceedance of lead in MW-40 during Q1 of 2019. The well was resampled and the concentration was non-detect. MW-40 is an upgradient well so this exceedance was attributed to natural variability in geochemistry.

APPENDIX H

Past Hydrogeological Investigations

Ostrander, A.G. 1977. "Hydrogeological Investigation of the Grand River Landfill in Watertown Township, Clinton County."

GRANGER
Land Development Co.
2702 S. Cedar Street
Lansing, Michigan 48909

ALTON L. GRANGER RONALD K. GRANGER JERRY P. GRANGER

February 9, 1979

Mr. Kurt Guter
Snell Environmental Group
1120 E. May Street
Lansing, MI 48906

Dear Mr. Guter:

Enclosed herewith is the information you requested pertaining to our sanitary landfill, located in Watertown Township, Clinton County.

a)	Sheet 1R	Final Grading Plan with contours indicating grades as of December 29, 1978.
b)	Sheet 1	Site Plan with proposed extension.
c)		Hydrogeological Report dated February 17, 1977.

Looking forward to hearing from you the week of February 19, 1979.

Very truly yours,

Jerry P. Granger

JG/sma
Enclosure

HYDROGEOLOGICAL INVESTIGATION OF THE GRAND RIVER LANDFILL IN WATERTOWN TOWNSHIP, CLINTON COUNTY

This investigation of the Granger Grand River Sanitary Landfill is to study hydrogeological conditions at the site and correct the problem of leachate generation and pollution of the ground and surface waters of the area.

The existing sanitary landfill operation is located in the east half of the northwest quarter, and the north half of the northeast quarter of the southwest quarter, of Section 29, T5N, R3W, Watertown Township, Clinton County (Figure 1). The site has an area of 90 acres. Topographically, the initial area prior to the fill was a low valley with relief to the west, south and east. Surveyed ground elevations from recent test borings and observation wells show a variation in elevation between 870.93 feet and 835.20 feet (U.S.G.S.) above the sea level. The elevations in the central portion of the site have been altered due to excavation and landfilling of the area.

Geologically, the existing sanitary landfill is located on the Grand Ledge end moraine of the main Lagrange morainic system. This morainic system was formed by the Saginaw lobe ice sheet of the middle Wisconsinan Glacial Age. Natural glacial sediments associated with the moraine are clay, sands and gravels.

In general, surface drainage from the site flows to the north through a culvert beneath Interstate 96 via Oppenlander Drain to the Looking Glass River. On July 6, 1976, surface water samples were collected by the DNR staff at locations shown on Figure 2 and analyzed for pH, BOD, NO_2, NO_3, COD, Cl, Fe, total solids, total dissolved solids, and hardness. The laboratory analyses (Appendix, page 1) indicated potential contamination of water seeping out of the landfill.

A preliminary geological investigation was performed on June 12, 1970 by John R. Byerlay, Geological Survey Division, DNR, prior to landfilling operations on the site. A series of five 15'-20' test holes were requested on the site. The results indicated a 15'± thick layer of porous sand and gravel directly overlaying the gray clay. Mr. Byerlay's report also indicates an overburden of 1'-8' of top soil and brown clay (thicker on the valley slopes) above the sand and gravel layer. He indicated that the porous sand and gravel layer was transmitting perched groundwater which became surface water at the Interstate 96 culvert. Mr. Byerlay also determined water elevations of 830'± at the south end of the site and 820'± at the north end of the site, indicating 10' difference in head of the groundwater and its flow to the north towards the Oppenlander Drain.

On July 29, 1970, Mr. Byerlay requested a test boring on the site to a depth of 77' (Figure 3, circle indicates this boring). This broing established that suitable thicknesses of natural clay underlies in the central valley portion of the site and above the deeper aquifer and the bedrock.

On June 3, 1976, seven soil borings and groundwater observation wells were recommended by the DNR staff to update the hydrogeology of the Grand River Sanitary Landfill and work out a solution to the problem by providing engineering modifications. Well points and casing were installed in each boring. The logs of borings and observation wells are included in the appendix pages 2 - 8.

The results of the seven new borings show a cross section of surface soil and brown silty-sandy-pebbly clay overlaying very permeable and mostly saturated silt, sand and gravel zones which overlay a gray-blue clay. Borings were completed 20'+ into the gray-blue clay (781'-807' elevation range) confirming a continuous layer of gray-blue clay of at least 20 feet in thickness underneath the site as shown in the cross sections (Figures 3,5,6,7 and 8). These results confirm Mr. Byerlay's earlier observation as described above.

Water elevations in observation wells were measured November 18, 1976 by the DNR staff and show a range of 832.66' at the northwest corner of the site to 841.77' at the southeast corner of the site. A water table exists above the gray-blue clay in the permeable silt, sand, and gravel throughout the unexcavated areas of the site. A groundwater contour map (Figure 4) was drawn using the groundwater elevations from the seven observation wells. The contours in Figure 4 show the direction of the groundwater flow is generally to the north-central area of the site from the surrounding hilly terrain of the eastern, southern and western portions of the property. This flow direction follows the general pattern of the pre-excavation valley which occupied the central portion of the property.

A water well into the bedrock was also drilled at the time the DNR recommended seven observation wells were completed. The well record (Appendix page 9) shows the existence of adequate vertical clay to the depth of 97' to protect the usable bedrock aquifer in the Saginaw formation. The four domestic well logs in the near vicinity of the sanitary landfill site were completed in this bedrock aquifer to depths between 108-119 feet from the surface.

In its natural condition this site is not suitable for sanitary landfilling because the major concern is the water table above the gray-blue clay which has recharge areas to the immediate west, south, and east of the existing landfill site. There are variable amounts of groundwater entering the landfill site ranging from 2 to 25 feet in column thickness from the west, south and east directions (Figure 4). Engineering modifications must be considered to prevent groundwater infiltration into the site and above the gray-blue clay. This will minimize leachate generation at the site.

Allan G. Ostrander

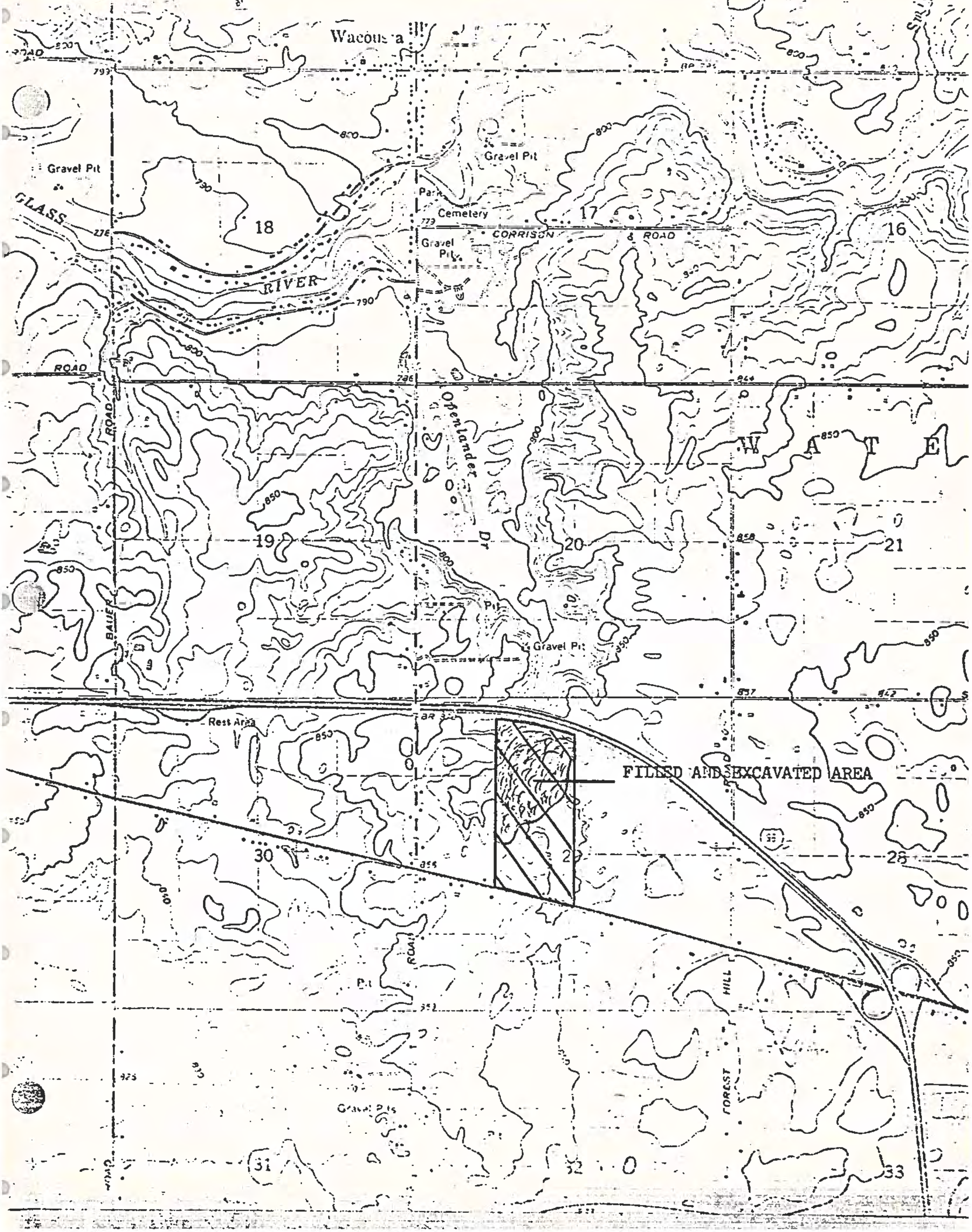
Allan G. Ostrander
Environmental Geologist

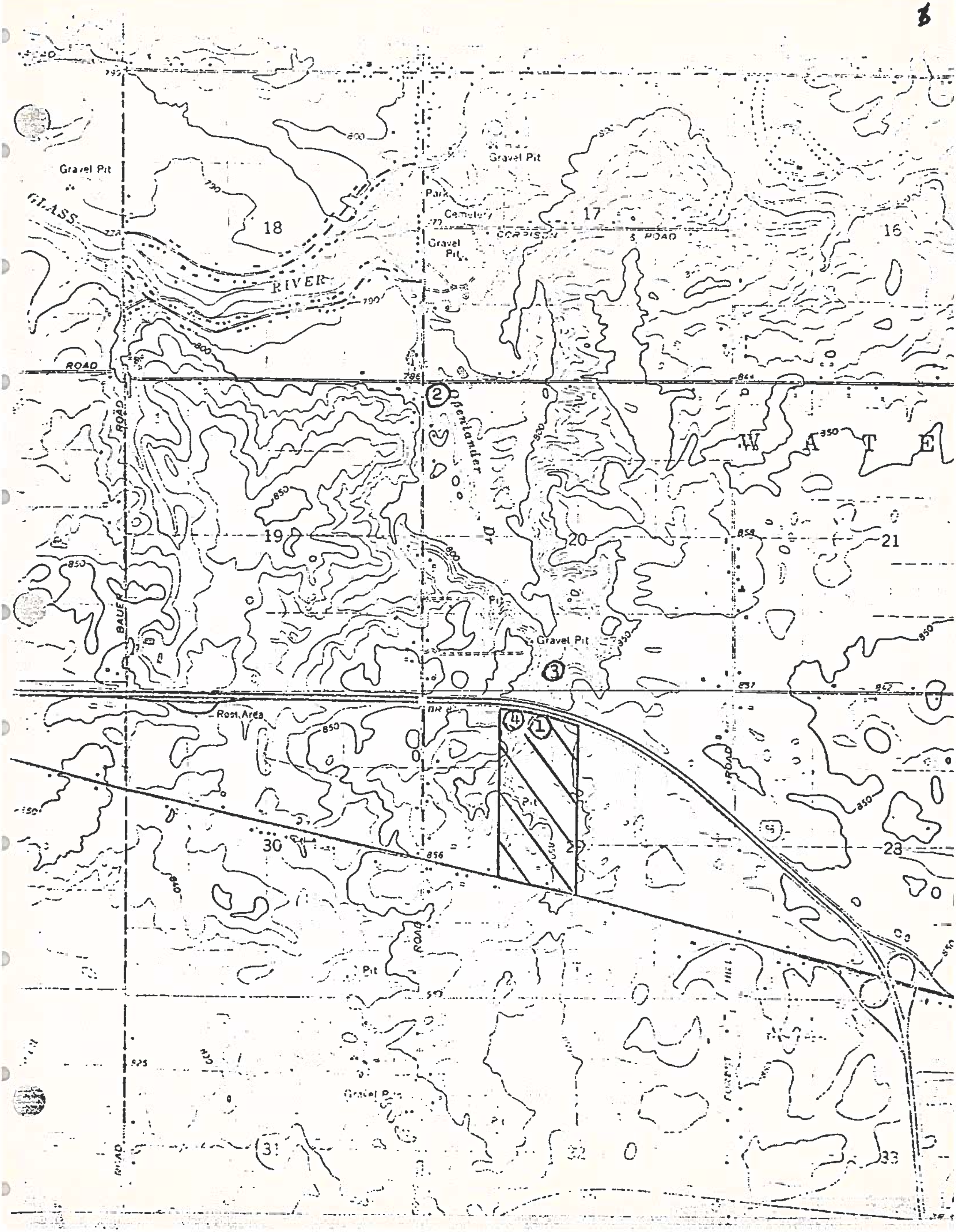
Reviewed by: B. P. Shah

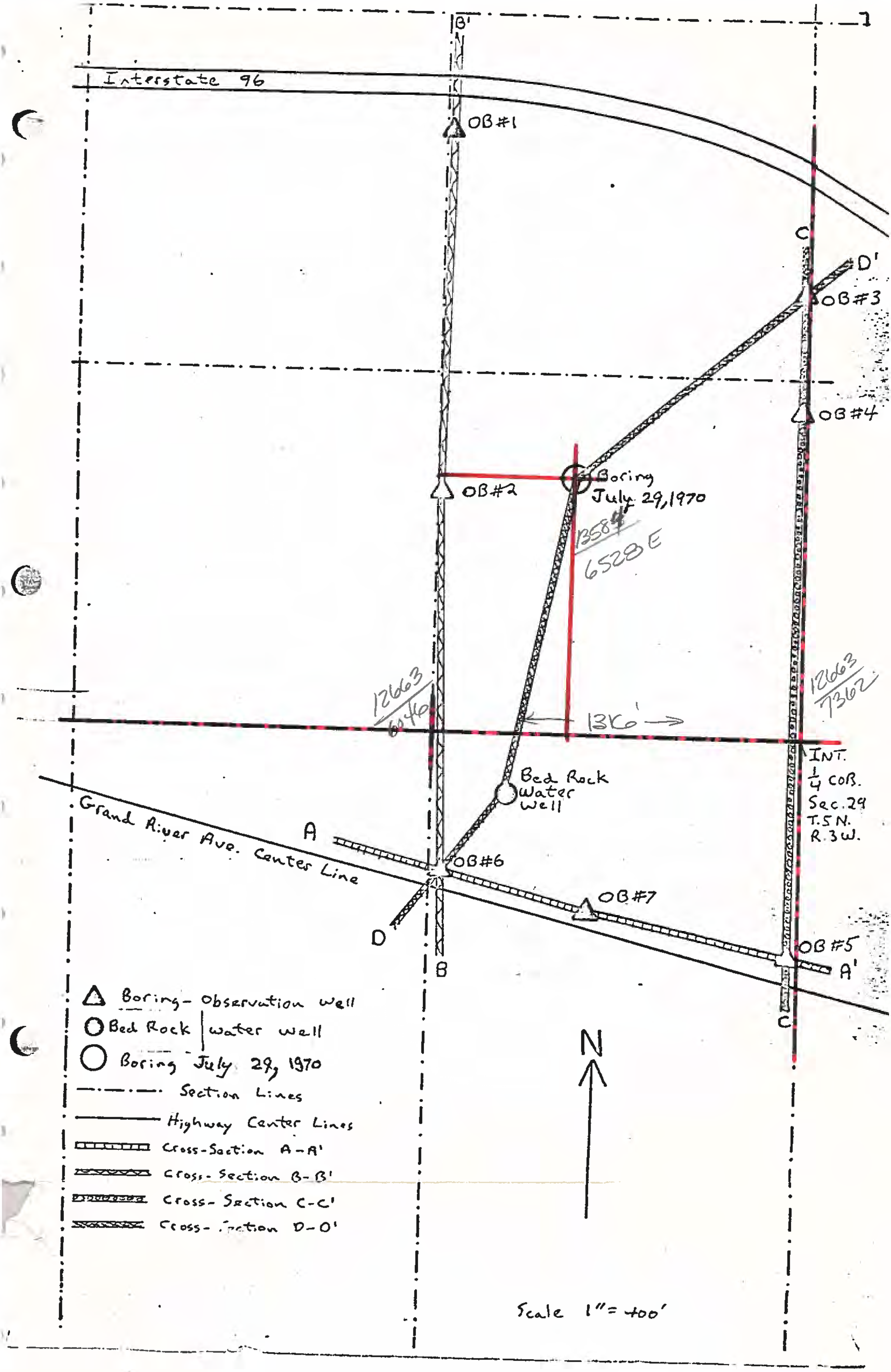
Date: February 17, 1977

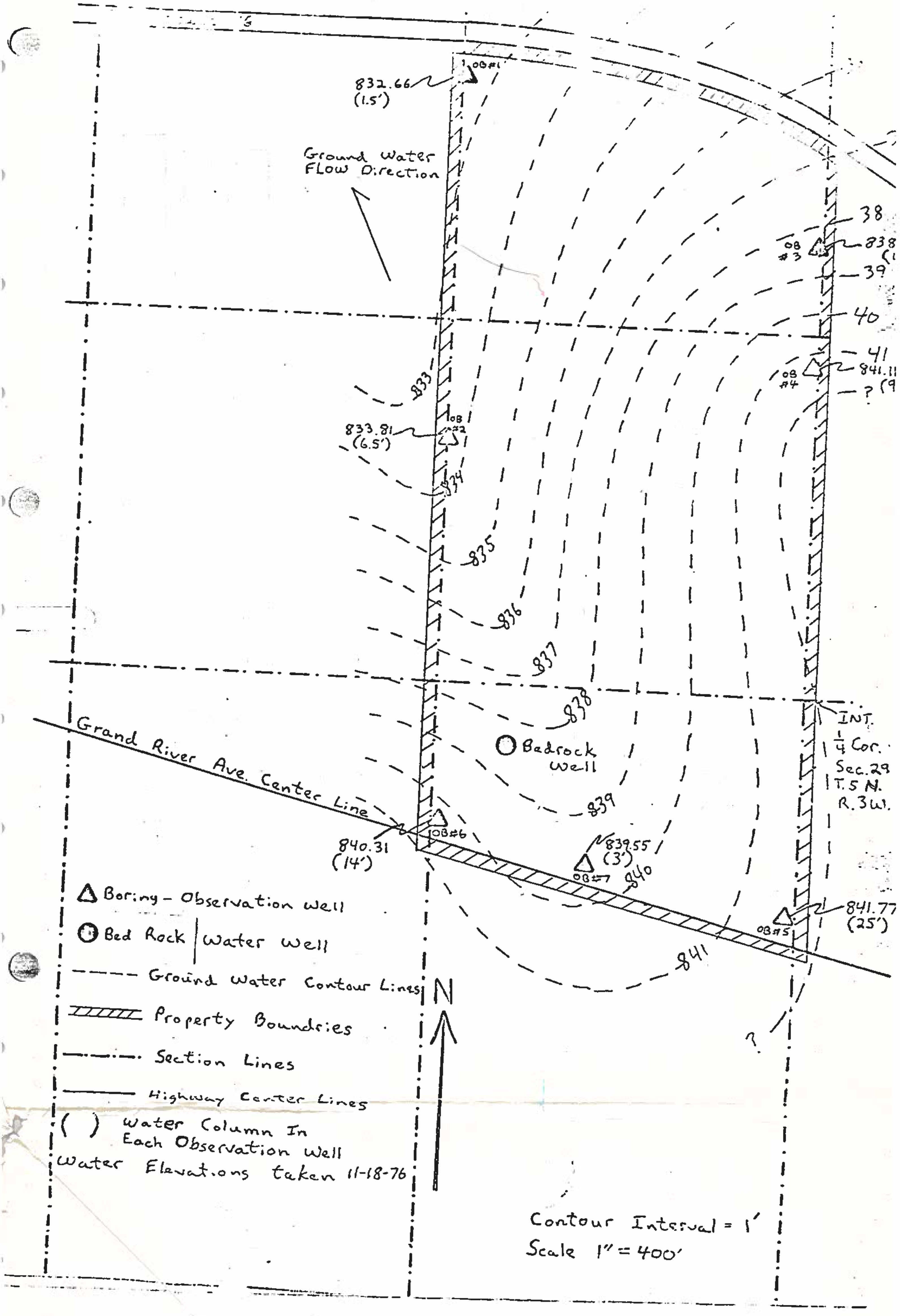
AGO:nc

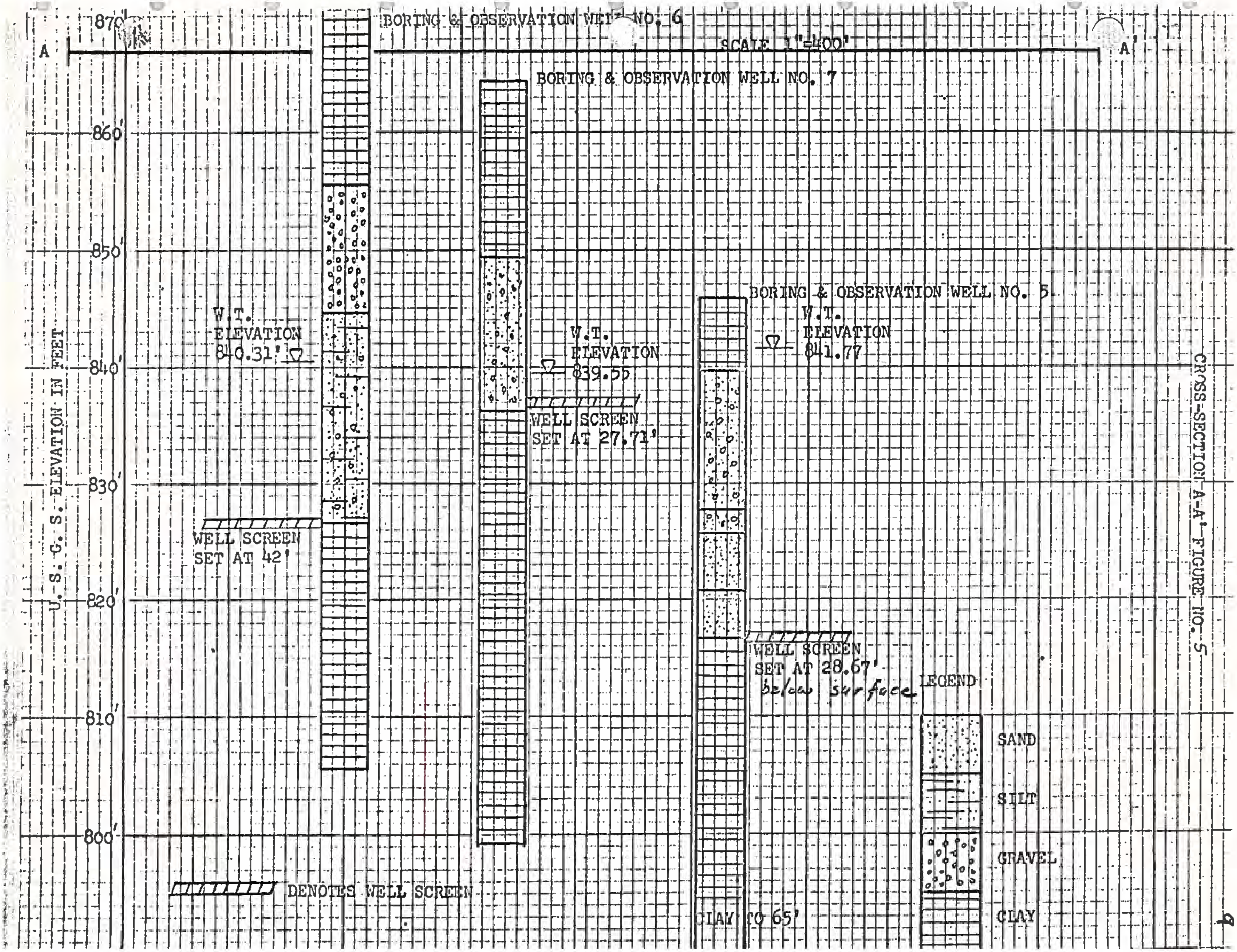
FIGURE NUMBER 1



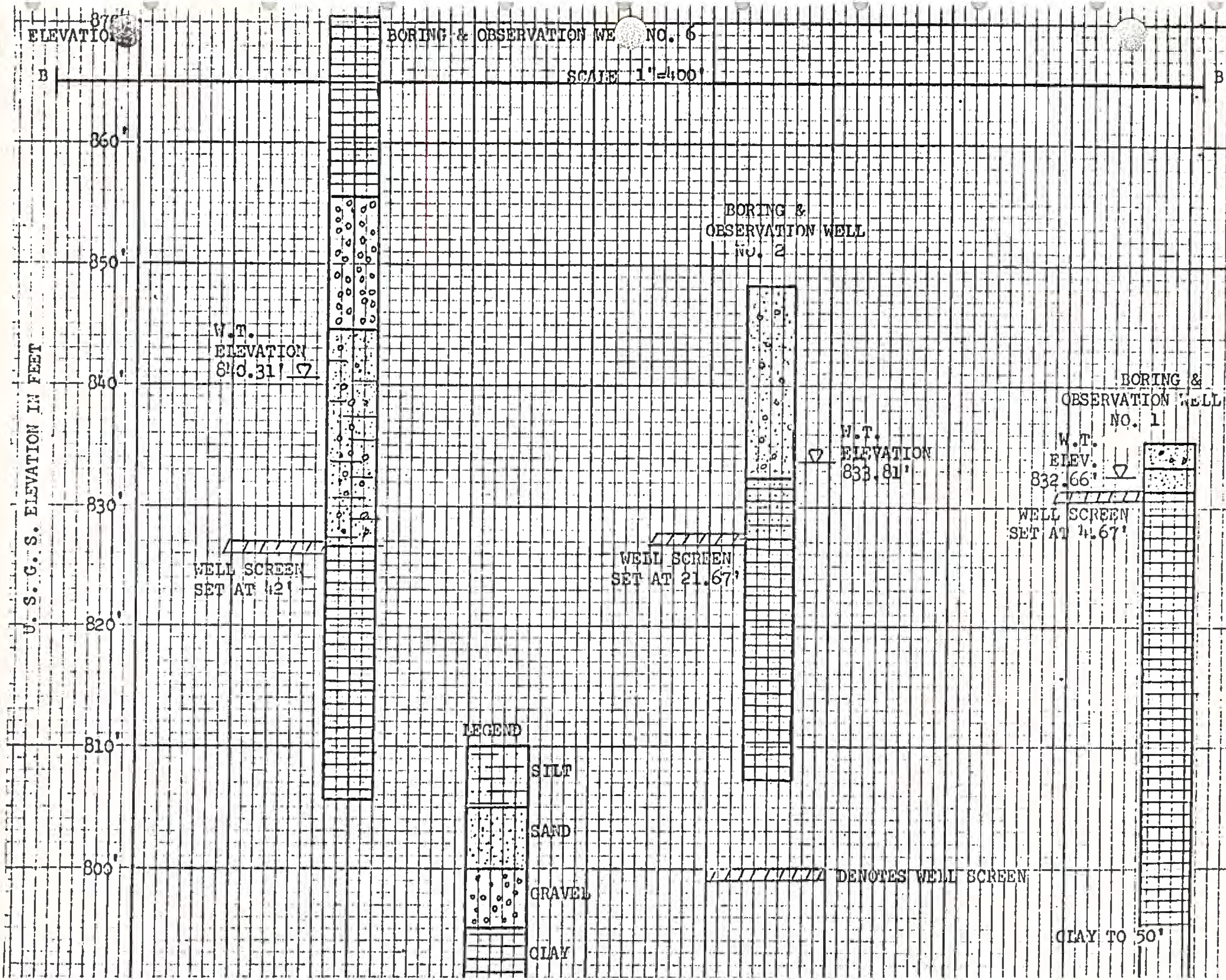

Gravel Pit
GLASS
RIVER
18
Park
Cemetery
Gravel Pit
Gravel Pit
17
CORRISON
S. ROAD
16
800
790
730
ROAD
786
2
Ofenlander Dr
W A T E
19
20
21
850
BAUER ROAD
Pit
Gravel Pit
3
857
842
Rest Area
4
1
Pit
30
856
23
ROAD
Pit
FOREST HILL
Gravel Pit
Pit
31
32
33
RIAD


Interstate 96
B'
N
OB#1
C
D'
OB#3
OB#4
OB#2
Boring
July 29, 1970
13584
6528 E
12663
6046
12663
7362
1316'
INT.
1/4 COR.
Sec. 29
T.5N.
R.3W.
Bed Rock Water Well
Grand River Ave. Center Line
A
OB#6
OB#7
D
B
OB#5
A'
C
Boring - Observation well
Bed Rock water well
Boring July 29, 1970
Section Lines
Highway Center Lines
Cross-Section A-A'
Cross-Section B-B'
Cross-Section C-C'
Cross-Section D-D'
N
Scale 1" = 400'

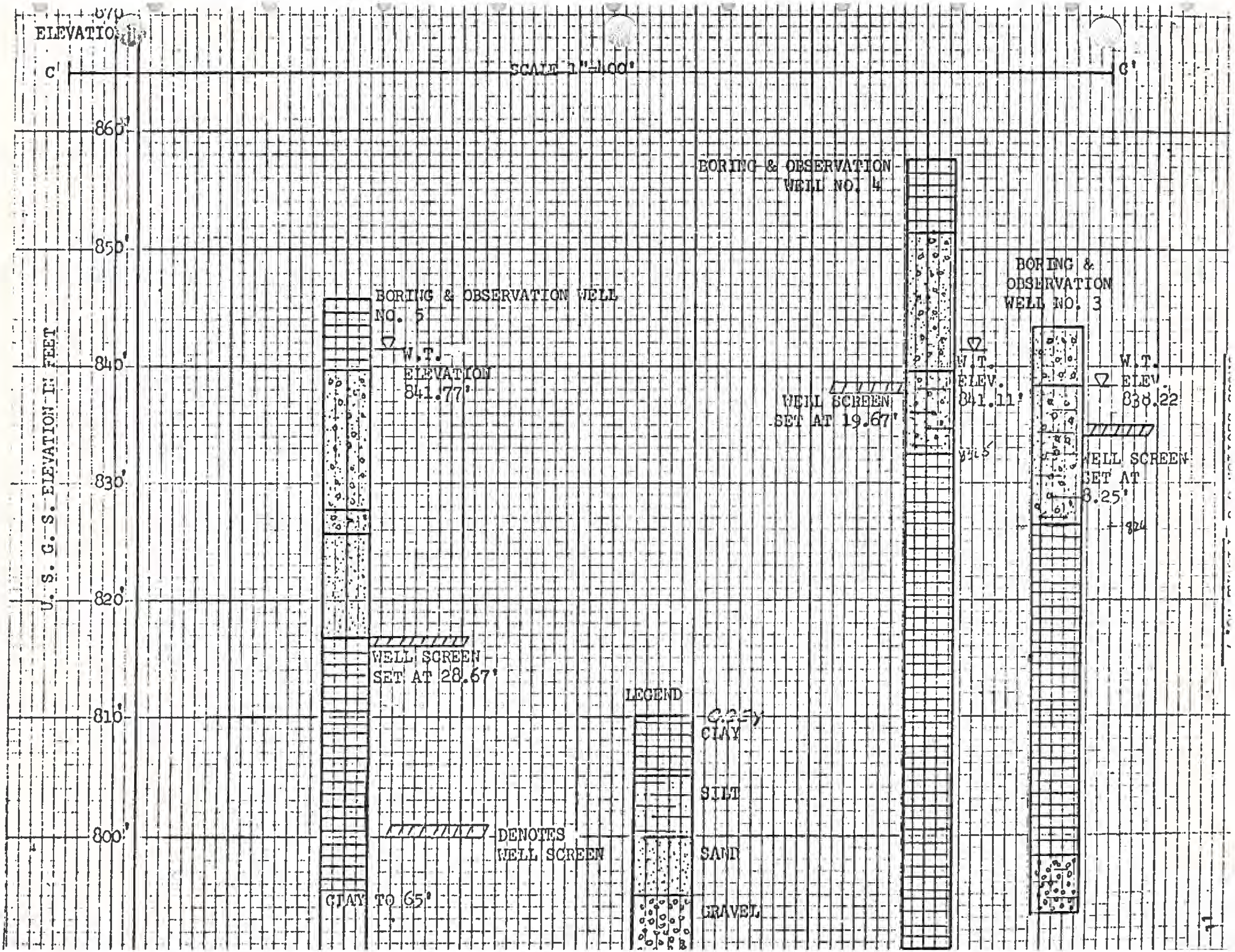

OB#1
832.66
(1.5')
Ground Water Flow Direction
38
OB #3
838
39
40
41
OB #4
841.1
?
833
833.81
(6.5')
OB #2
834
835
836
837
838
Bedrock Well
INT. 1/4 Cor. Sec. 29 T. 5 N. R. 3 W.
Grand River Ave. Center Line
839
OB#6
840.31
(14')
839.55
(3')
OB#7
840
841.77
(25')
OB#5
841
?
N
Boring - Observation Well
Bed Rock Water Well
Ground Water Contour Lines
Property Boundries
Section Lines
Highway Center Lines
( ) Water Column In Each Observation Well
Water Elevations taken 11-18-76
Contour Interval = 1'
Scale 1" = 400'

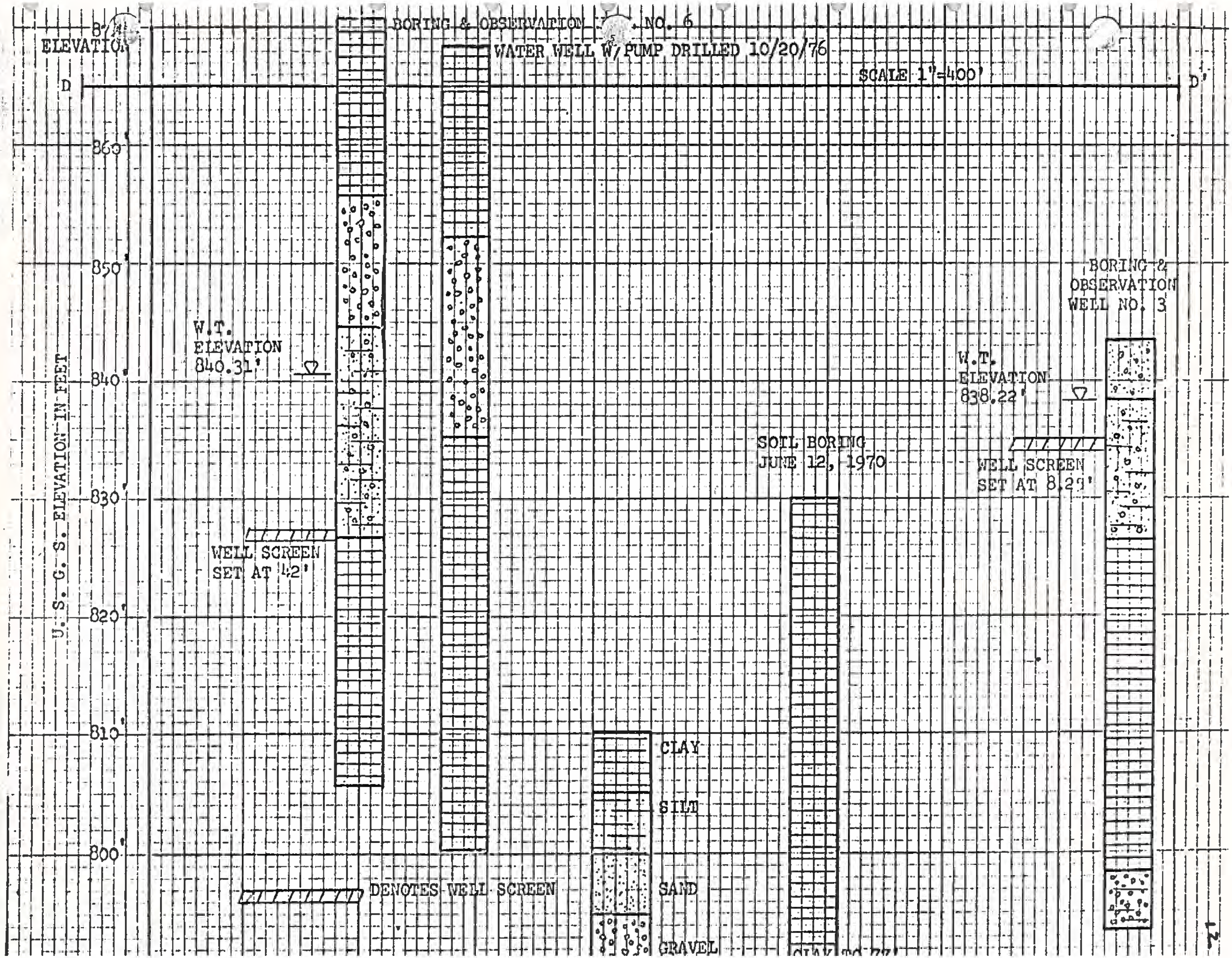


CROSS-SECTION A-A' FIGURE NO. 5



CROSS-SECTION B-B' FIGURE NO. 6


ELEVATION
870
860'
850'
840'
830'
820'
810'
800'
U. S. G. S. ELEVATION IN FEET
C'
SCALE 1"=400'
C'
BORING & OBSERVATION WELL NO. 5
W.T. ELEVATION 841.77'
WELL SCREEN SET AT 28.67'
CLAY TO 65'
BORING & OBSERVATION WELL NO. 4
WELL SCREEN SET AT 19.67'
W.T. ELEV. 841.11'
831.5
BORING & OBSERVATION WELL NO. 3
W.T. ELEV. 838.22
WELL SCREEN SET AT 8.25'
824
LEGEND
C.2.5y
CLAY
SILT
SAND
GRAVEL
DENOTES WELL SCREEN
7

8
ELEVATION
D
D'
BORING & OBSERVATION NO. 6
WATER WELL W/PUMP DRILLED 10/20/76
SCALE 1"=400'
860
850
840
830
820
810
800
U. S. G. S. ELEVATION IN FEET
W.T.
ELEVATION
840.31'
WELL SCREEN
SET AT 42'
BORING &
OBSERVATION
WELL NO. 3
W.T.
ELEVATION
838.22'
WELL SCREEN
SET AT 8.29'
SOIL BORING
JUNE 12, 1970
CLAY
SILT
SAND
GRAVEL
DENOTES WELL SCREEN
CLAY TO 77'

APPENDIX

CHEMICAL ANALYSIS - WASTE WATERS
MICHIGAN WATER RESOURCES COMMISSION

COD [illegible]
Metals - 250 [illegible] - [illegible]

SOURCE Grand River Landfill (NAME OF INDUSTRY OR MUNICIPALITY) Watertown (CITY OR TWP) Clinton (COUNTY)

SEND RESULTS TO ALLAN G OSTRANDER (NAME)
DNR Resource Recovery Div. (DISTRICT OR SECTION)

RECEIVING WATER Looking Glass River (NAME OF STREAM OR LAKE)

REMARKS (APPEARANCE, RECOMMENDED BOD DILUTIONS, ETC.)

COLLECTED BY G. Ostrander

RECEIVED BY RW

DATE RECEIVED 7-6-76

EXAMINER RW

	CARD TYPE	STORET NUMBER	DATE & TIME YYMMDDTTTT	DEPTH FEET	LAB NUMBER	CONDUIT FLOW MGD	TEMP °C	pH SU	BOD5 mg/l	T.S.S. mg/l	TOT-P mg/l	NH3-N mg/l	OIL mg/l	D.O. mg/l
	P			D	00000	50050	00010	00400	00310	00530	00665	00610	00560	00300
1	D		7[illegible]061240		04557			7.2	70					
2	D		7607061240		04558			8.1	<5					
3	D		7607061240		04559			7.2	45					
4	D		7607061240		04560			7.0	200					
5	D		7607061240											

	"DO NOT PUNCH" SOURCE DESCRIPTION OF SAMPLE	NO2+NO3 mg/l	COD mg/l	Cl mg/l	FC [illegible]	TS mg/l	TDS mg/l	Hard mg/l
1	Center Drain	.13	170	47	9,500	732	564	370
2	Clark & Wisconsin Rds [illegible]	.24	16	36	950	488	396	350
3	I96 Culvert 1000' North	.16	130	52	11,000	552	552	370
4	West Underground Drain Culvert	.03	480	140	45,000	1670	1130	750
5								

WATER WELL RECORD
Act 294 PA 1965

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

15

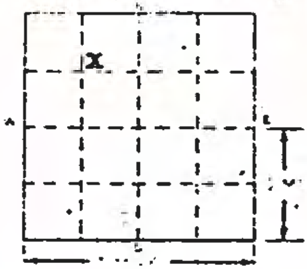
1 LOCATION OF WELL

County: Clinton | Township Name: Watertown | Fraction of Section: SW ¼, NE ¼, NW ¼ | Section Number: 19 | Town Number: 5N N S. | Range Number: 3W E W.

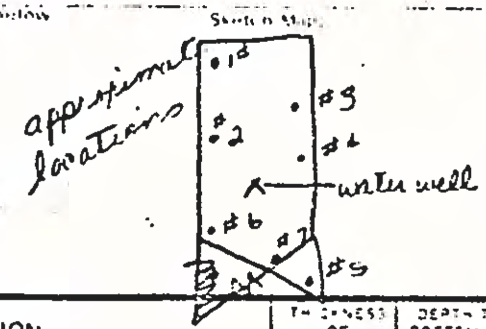
Distance And Direction from Road Intersections: Monitoring well No. 1 - Granger Land fill.

Street Address & City of Well Location

Locate with "X" in section below



Sketch Map



3 OWNER OF WELL: Granger Land Development
Address: 2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH: (completed) 55 ft. Date of Completion 9/1/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☒ Monitoring well No. 1

7 CASING: Threaded ☐ Welded ☐ Height: Above Below
Diam. Surface ____ ft.
____ in. to ____ ft. Depth Weight ____ lbs. ft.
____ in. to ____ ft. Depth Drive Shoe? Yes ☐ No ☐

8 SCREEN:
Type: 242-10 Dia.: 2"
Slot Gauze ____ Length ____
Set between ____ ft. and ____ ft.
Fittings: 4'2" pipe, 2' coupling, 2" cap

9 STATIC WATER LEVEL
____ ft. below land surface

10 PUMPING LEVEL below land surface
____ ft. after ____ hrs. pumping ____ g.p.m.
____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ____ Chlorides (Cl) ____
Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐ ____
Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination
____ feet ____ Direction ____ Type
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name ____
Model Number ____ HP ____ Volts ____
Length of Drop Pipe ____ ft. capacity ____ G.P.M.
Type: ☐ Submersible
☐ Jet ☐ Reciprocating

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Gravel and Clay	2	2
Brown Clay	2	4
Grey Clay	2	6
Light Grey Clay	22	28
Grey Clay stiff	2	30
Grey Clay - ~~xxxx~~ wet	20	50
Clay and sand	5	55

Recorded By The DNR Staff 1-6-77
Rim Casing Elevation 838.20'
Well Point Set at 4.67' below ground level
Static water level 832.66' 11-18-76

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.
Inv. 7543

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Gilbert and Ingalls, Inc. 0408
REGISTERED BUSINESS NAME REGISTRATION NO.
Address 6461 W. Howe Road, DeWitt, Mich. 48820
Signed Date 10/20/76
AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

16

WATER WELL RECORD

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

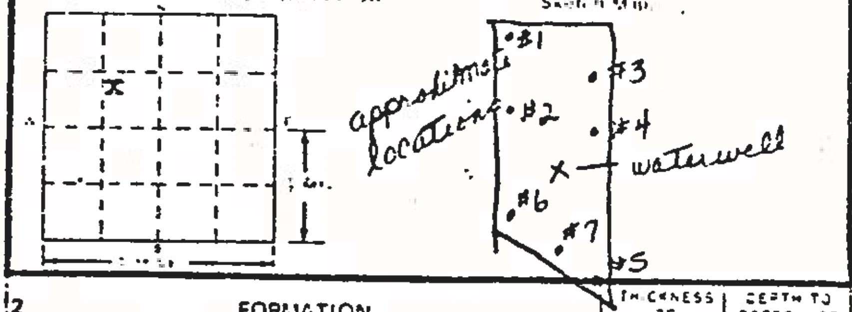
LOCATION OF WELL

County: Clinton | Township Name: Watertown | NW ¼ SE ¼ NW ¼ | Section Number: 19 | Town Number: 5N N/S. | Range Number: 3W E W

Distance And Direction from Road Intersection: Monitoring Well No. 2- Granger Land fill

Street address & City of Well Location

Locate with "X" in section below — Sketch Map



3 Owner of Well:
Address: Granger Land Development
2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH (completed): 41 ft. Date of Completion: 9/1/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☒ Monitoring well No. 2

7 CASING: Threaded ☒ Welded ☐
Diam.
____ in. to 2 ft. Depth
____ in. to ____ ft. Depth
Height: Above/Below Surface ____ ft.
Weight ____ lbs./ft.
Drive Shoe? Yes ☐ No ☐

8 SCREEN:
Type: 242-10 Dia.: 2"
Slot/Gauze ____ Length ____
Set between ____ ft. and ____ ft.
Fittings: 20' 2" galv. pipe
2-2" couplings, 1-2" cap

9 STATIC WATER LEVEL
____ ft. below land surface

10 PUMPING LEVEL below land surface
____ ft. after ____ hrs. pumping ____ g.p.m.
____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ____ Chlorides (Cl) ____
Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐ ____
Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination
____ feet ____ Direction ____ Type
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name ____
Model Number ____ HP ____ Volts ____
Length of Drop Pipe ____ ft. capacity ____ G.P.M.
Type: ☐ Submersible
☐ Jet ☐ Reciprocating

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Top soil	2	2
Sand and gravel	19	21
Grey Clay	20	41
	XXXXXXXXXXXX	

Recorded by the D.N.R. Staff 1-6-77

Rim Casing Elevation 850.31'

Well Point Set at 21.67' below Ground Level

Static Water Level 833.81' 11-18-76

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.
Inv. 7543

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Gilbert and Ingalls, Inc. — 0408
REGISTERED BUSINESS NAME — REGISTRATION NO.

Address: 6461 N. Town Road, DeWitt, Mich. 48820

Signed: ____ Date: 10/20/76

C67d 100M (Rev. 12-65)

GEOLOGICAL SURVEY COPY

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

17

1 LOCATION OF WELL

County: Clinton

Township Name: Watertown

Fraction: SW ¼ NE ¼ SW ¼ Section Number: 19

Town Number: 5N N/S.

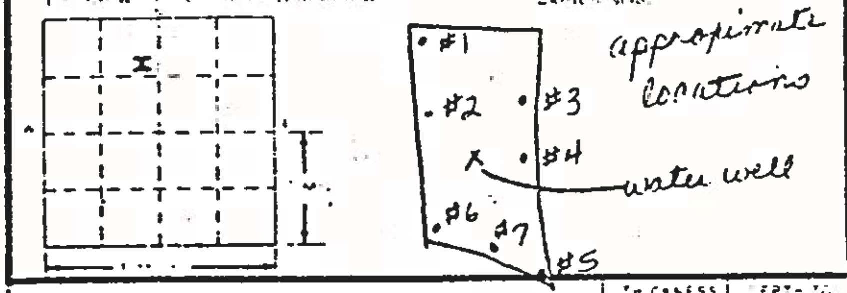
Range Number: 3W E/W.

Distance And Direction from Road Intersections: Monitoring well No. 3 - Grengor Landfill

Street Address & City of Well Location

Show location with "X" in section below

Sketch Map:



3 OWNER OF WELL:

Granger Land Development

Address: 2722 S. Cedar Street

Lansing, Michigan

4 WELL DEPTH (completed): 50 ft. Date of Completion: 9/2/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug

☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry

☐ Irrigation ☐ Air Conditioning ☐ Commercial

☐ Test Well ☒ Monitoring well No. 3

7 CASING: Threaded ☐ Welded ☐

Diam.

___ in. to ___ ft. Depth

___ in. to ___ ft. Depth

Height: Above/Below Surface ___ ft.

Weight ___ lbs./ft.

Drive Shoe? Yes ☐ No ☐

8 SCREEN:

Type: 242-10 Dia.: ___

Slot/Gauze ___ Length ___

Set between ___ ft. and ___ ft.

Fittings: 8' 2" pipe

1-2" coupling,1-2" cap

9 STATIC WATER LEVEL

7.77 ft. below land surface

10 PUMPING LEVEL below land surface

___ ft. after ___ hrs. pumping ___ g.p.m.

___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ___ Chlorides (Cl) ___

Hardness ___ Other ___

12 WELL HEAD COMPLETION: ☐ In Approved Pit

☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No

☐ Neat Cement ☐ Bentonite ☐ ___

Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination

___ feet ___ Direction ___ Type

Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed

Manufacturer's Name ___

Model Number ___ HP ___ Volts ___

Length of Drop Pipe ___ ft. capacity ___ G.P.M.

Type: ☐ Submersible

☐ Jet ☐ Reciprocating

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand and gravel	7	7
Gravel and clay	7	14
Grey Clay	36	50
	XXXXXXXXXXX	

Recorded By DNR Staff 1-6-77

Rim Casing Elevation 846.97'

Well Point Set at 8.25' below Ground Level

Static Water Level 838.22' 11-18-76

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

Inv. 7543

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Gilbert and Daniels, Inc. 0408

REGISTERED BUSINESS NAME REGISTRATION NO.

Address 6461 W. Howe Road, DeWitt, Michigan 48

Signed Date 10/20/76

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

WATER WELL RECORD
ACT 294

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

18

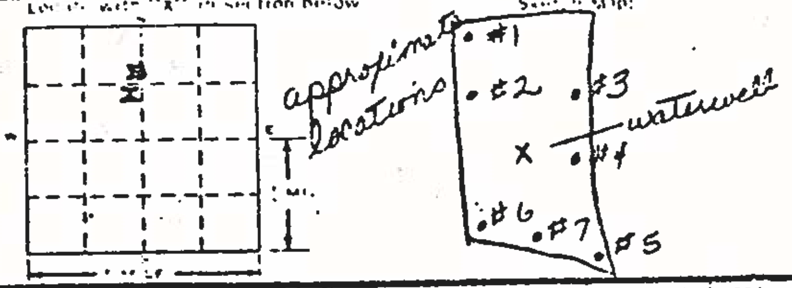
1 LOCATION OF WELL

County: Clinton | Township: Watertown | NE SE NW 1/4, Section 19 | Town Number 5N N/S. | Range Number 3W E/W.

Distance And Direction from Road Intersections:
Monitoring well No. 4 - Granger Landfill

Street Address & City of Well Location

Locate with "X" in Section Below | Sketch Map:



3 OWNER OF WELL:
Granger Land Development
Address 2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH: (completed) 67 ft. Date of Completion 9/2/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ______

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☒ Monitoring well

7 CASING: Threaded ☐ Welded ☐ Diam.
______ in. to ______ ft. Depth
______ in. to ______ ft. Depth
Height: Above/Below Surface ______ ft.
Weight ______ lbs./ft.
Drive Shoe? Yes ☐ No ☐

8 SCREEN:
Type: 242-7 Dia.: ______
Slot/Gauze ______ Length ______
Set between ______ ft. and ______ ft.
Fittings: 18' 2" galv. pipe
1-2" cap.

9 STATIC WATER LEVEL
______ ft. below land surface

10 PUMPING LEVEL below land surface
______ ft. after ___ hrs. pumping ______ g.p.m.
______ ft. after ___ hrs. pumping ______ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ______ Chlorides (Cl) ______
Hardness ______ Other ______

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐ ______
Depth: From ______ ft. to ______ ft.

14 Nearest Source of possible contamination
______ feet Direction ______ Type
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name ______
Model Number ______ HP ____ Volts ______
Length of Drop Pipe ______ ft. capacity ______ G.P.M.
Type: ☐ Submersible
☐ Jet ☐ Reciprocating

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Clay	6	6
Gravel	12	18
Brown Clay	7	25
Grey Clay	42	67

Recorded By the DNR. Staff 1-6-77
Rim Casing Elevation 859.69'
Well Point Set at 19.67' Below Ground Level
Static Water Level 841.11' 11-19-76

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.
Inv. 7543

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Gilbert and Ingalls, Inc. 0408
REGISTERED BUSINESS NAME REGISTRATION NO.
Address 6461 W. Howe Road, DeWitt, Mich. 48820
Signed ______ Date 10/20/76

D673 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

PUBLIC HEALTH 19

1 LOCATION OF WELL

County: Clinton

Township: Watertown

SE, NE, SW,

Section Number: 19

Town Number: 5N N/S.

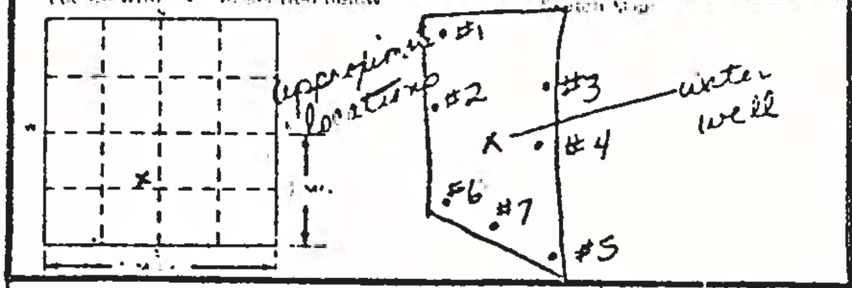
Range Number: 3W E/W.

Distance And Direction from Road Intersections:
Monitoring well No. 5
Granger Landfill

Street Address & City of Well Location

Locate with "X" in section below

Sketch Map



3 OWNER OF WELL:

Address: Granger Land Development
2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH (completed): 65 ft.

Date of Completion: 9/3/76

☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ______

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☒ Monitoring well No. 5

7 CASING: Threaded ☐ Welded ☐
Diam.
____ in. to ____ ft. Depth
____ in. to ____ ft. Depth

Height: Above Below
Surface ________ ft.
Weight ________ lbs./ft.
Drive Shoe? Yes ☐ No ☐

8 SCREEN:
Type: 242-10 Dia.: ________
Slot Gauze ________ Length ________
Set between ________ ft. and ________ ft.
Fittings: 27' 2" galv. pipe
1-2" coupling, 1-2" cap

9 STATIC WATER LEVEL
________ ft. below land surface

10 PUMPING LEVEL below land surface
________ ft. after ___ hrs. pumping ________ g.p.m.
________ ft. after ___ hrs. pumping ________ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ________ Chlorides (Cl) ________
Hardness ________ Other ________

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐ ________
Depth: From ________ ft. to ________ ft.

14 Nearest Source of possible contamination
______ feet ______ Direction ________ Type
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name ________
Model Number ________ HP ____ Volts ________
Length of Drop Pipe ______ ft. capacity ______ G.P.M.
Type: ☐ Submersible
☐ Jet ☐ Reciprocating

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Clay	6	6
Sand and Gravel	12	18
Fine sand	11	29
Grey Clay	16	45
Grey Clay tite	20	65

Recorded By the D.N.R Staff 1-6-77

Rim Casing Elevation 847.94'

Well Point Set at 28.67' below Ground Level

Static Water Level 841.77' 11-18-76

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

Inv. 7543

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Gilbert and Ingalls, Inc. 0408
REGISTERED BUSINESS NAME REGISTRATION NO.

Address 6461 W. Howe Road, DeWitt, Mich.

Signed AUTHORIZED REPRESENTATIVE Date 10/20/76

067d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

WATER WELL RECORD

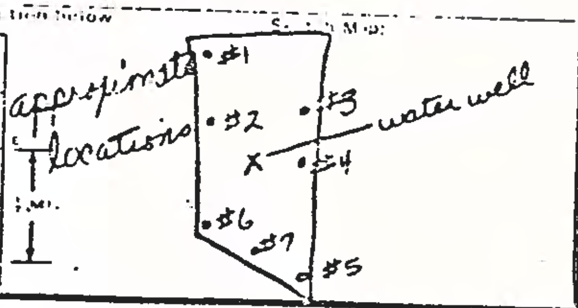
MICHIGAN DEPARTMENT OF PUBLIC HEALTH 20

1 LOCATION OF WELL

County: Clinton — Township: Watertown — NW, NE, SW — Section Number: 19 — Town Number: 5N N S. — Range Number: 3W E W

Distance And Direction from Road Intersections:
Monitoring well No. 6 - Granger Landfill

Street Address & City of Well Location
Locate with "X" in section below — Sketch Map:



1 MI.

3 OWNER OF WELL: Granger Land development
Address: 2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH (completed): 65 ft. — Date of Completion: 9/3/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☒ Monitoring well No. 6

7 CASING: Threaded ☐ Welded ☐ — Height: Above/Below Surface ____ ft.
Diam.
____ in. to ____ ft. Depth — Weight ____ lbs./ft.
____ in. to ____ ft. Depth — Drive Shoe? Yes ☐ No ☐

8 SCREEN:
Type: 2½2-10 Dia.: ____
Slot/Gauze ____ Length ____
Set between ____ ft. and ____ ft.
Fittings: ~~[illegible]~~ 27' 2" galv. pipe
1-2" coupling, ~~[illegible]~~ cap

9 STATIC WATER LEVEL
____ ft. below land surface

10 PUMPING LEVEL below land surface
____ ft. after ____ hrs. pumping ____ g.p.m.
____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ____ Chlorides (Cl) ____
Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐ ____
Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination
____ feet ____ Direction ____ Type
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name ____
Model Number ____ HP ____ Volts ____
Length of Drop Pipe ____ ft. capacity ____ G.P.M.
Type: ☐ Submersible ☐ Jet ☐ Reciprocating

2

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Clay	15	15
Gravel	12	27
Brown Clay	17	44 ←
Grey Clay	21	65
	XXXXXX	XXXXXX

Recorded By the D.N.R. Staff 1-6-77
Rim Casing Elevation 872.89'
Well Point Set at 42' below Ground Level
Static Water Level 840.31' 11-18-76

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.
Inv. 7543

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Gilbert and Ingalls, Inc. — 0408
REGISTRATION NO.

Address: 6151 W. Howe Road, DeWitt, Michigan

Signed — Date 10/20/75

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

WATER WELL RECORD

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

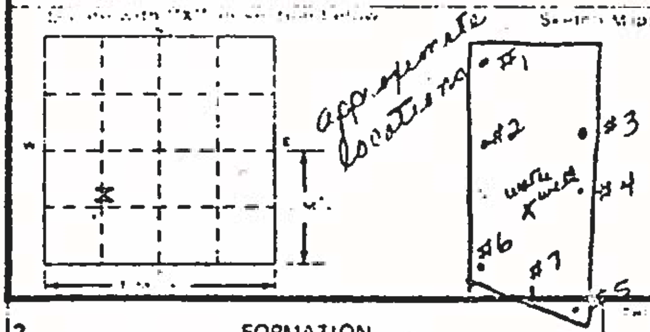
21

1 LOCATION OF WELL

County: Clinton | Township: Watertown | SW ¼ NE ¼ SW ¼ 19 | 5N N.S. | 3W E.W.

Distance and Direction from Road Intersections: Monitoring well No.7 - Granger Landfill

Street Address & City of Well Location



3 Owner: Granger Land Development

Address: 2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH: (completed) 65 ft. Date of Completion 9/7/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐

7 CASING: Threaded ☐ Welded ☐ Dia.: ___ in. to ___ ft. Depth; ___ in. to ___ ft. Depth

Height: Above/Below Surface ___ ft.

Weight ___ lbs./ft.

Drive Shoe? Yes ☐ No ☐

8 SCREEN:

Type: 242-10 Dia.: ___

Slot/Gauze ___ Length ___

Set between ___ ft. and ___ ft.

Fittings: 28' 2" galv. pipe
1-2" coupling, 1-2" cap.

9 STATIC WATER LEVEL

___ ft. below land surface

10 PUMPING LEVEL below land surface

___ ft. after ___ hrs. pumping ___ g.p.m.

___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ___ Chlorides (Cl) ___

Hardness ___ Other ___

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No

☐ Neat Cement ☐ Bentonite ☐ ___

Depth: From ___ ft. to ___ ft.

14 Nearest Source of possible contamination

___ feet ___ Direction ___ Type

Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed

Manufacturer's Name ___

Model Number ___ HP ___ Volts ___

Length of Drop Pipe ___ ft. capacity ___ G.P.M.

Type: ☐ Submersible ☐ Jet ☐ Reciprocating

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown clay	15	15
Sand and gravel	13	28
Grey Clay	37	65
	XXXXXXXXXX	

Recorded By the D.N.R. Staff 1-6-77

Rim Casing Elevation 868.30'

Well Point Set at 27.71' Below Ground Level

Static Water Level 839.55' 11-18-76

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

Inv. 7543

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Gilbert and [illegible], Inc. 6303

Registration No.

Address 6461 W. Howe Road, DeWitt, Michigan 4

Sign Date 10/20/76

D678 11OM (Rev. 12-…)

GEOLOGICAL SURVEY COPY

WATER WELL RECORD

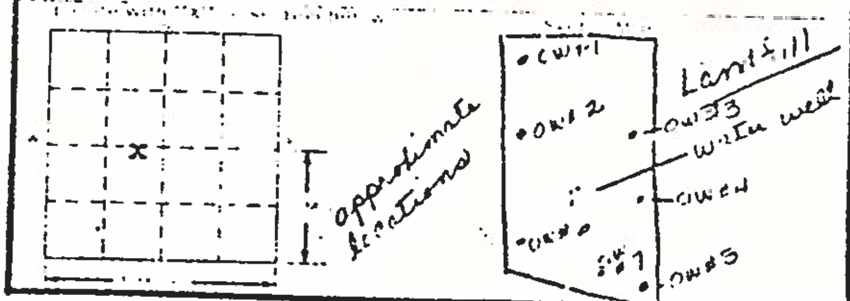
MICHIGAN DEPARTMENT OF PUBLIC HEALTH

22

1 LOCATION OF WELL

Clinton' Watertown NE ¼ NE 5N N. S. 3W E. W.

W. Grand River Avenue, Granger Land fill



Granger Land Development
2722 S. Cedar Street
Lansing, Michigan

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Clay	16	16
Gravel	17	33
Grey Clay	35	68
Grey clay and stones	22	90
Sticky grey clay	5	95
Grey Clay and gravel	2	97
Red Shale and sandy	5	102
Grey shale and sandstone	8	110
Grey Sandstone	105	215
	XXXXXXXXXXXXX	

USE A 2ND SHEET IF NEEDED

4 WELL DEPTH (completed) 215 ft. Date of Completion 9/10/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☒ Commercial
☐ Test Well ☐

7 CASING: Threaded ☐ Welded ☐
Diam. ~~3~~ 4 in. to 112 ft. Depth
____ in. to ____ ft. Depth
Height: Above/Below Surface ____ ft.
Weight 11 lbs. ft.
Drive Shoe? Yes ☐ No ☐

8 SCREEN:
Type: ____ Dia.: ____
Slot/Gauze ____ Length ____
Set between ____ ft. and ____ ft.
Fittings:

9 STATIC WATER LEVEL
____ ft. below land surface

10 PUMPING LEVEL below land surface
70 ft. after ____ hrs. pumping 30 g.p.m.
____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ____ Chlorides (Cl) ____
Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☒ Yes ☐ No
☐ Neat Cement ☒ Bentonite ☐ ____
Depth: From 0 ft. to 112 ft.

14 Nearest Source of possible contamination
____ feet ____ Direction ____ Type
Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name Myers
Model Number SG 102-10AA HP 1 Volts ____
Length of Drop Pipe 84 ft. capacity ____ G.P.M.
Type: ☒ Submersible
☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

Inv. 7568

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Gilbert and Mills, Inc. 0408
REGISTERED NAME REGISTRATION NO.
Address 6461 W. Howe Road, DeWitt, Michigan
Signed Date 10/20/76

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

**Keck Consulting Services, Inc. 1981.
"Hydrogeological Investigation Granger Landfill Expansion, Section 29, T.5N, R.3W, Watertown Township, Clinton County, Michigan."**

KECK consulting services, inc.
1099 W.GRAND RIVER · WILLIAMSTON, MI 48895 · (517) 655-4391

January 13, 1981

Mr. Kurt Guter
Snell Environmental Group
1120 May Street
Lansing, Michigan 48912

Hydrogeologic Investigation
Granger Landfill Expansion
Section 29, T.5N., R.3W.
Watertown Township
Clinton County, Michigan

Table of Contents

Exhibits
(contained in back pocket)

Appendices

INTRODUCTION

Keck Consulting Services, Inc. was contracted by Snell Environmental Group, Inc. to conduct the soil and hydrogeologic investigation for the Granger Landfill. The following report is a summary of our findings and recommendations for the project.

SCOPE OF WORK

The work to be performed by Keck was to include a complete soils analysis and determine the ground-water flow directions. A copy of the work proposal as agreed upon by SEG and Keck is shown in Appendix A.

The areas to be studied were the pit at the south end of the existing landfill, some areas west of the site and the fields east and southeast of the landfill.

SITE LOCATION

The landfill and proposed expansion area are located in Section 29 of Watertown Township, Clinton County. (See Site Location Map in Appendix B). The site is situated between Interstate 96 and Grand River Avenue approximately one-half mile west of the Grand River/Interstate 96 exchange.

GENERAL SITE GEOLOGY

The sediments overlying the bedrock on the site are the result of glacial action. The site consists primarily of ground moraine which has been cut by braided streams carrying glacial outwash. Ground moraine is material which has been deposited beneath a glacier, consisting of clay matrix which contains a mixture of sand, silt and gravel. The outwash deposits are sands, sand and gravel and silts. The walls in the excavated pit show bedding features typical for braided streams.

Although the glacial history is not complicated the results are very complex. Because the sands were deposited by braided streams their make-up and occurrence throughout the site is extremely varied. This causes variation in the occurrence, depth and thickness of the clay units as well.

Water level on the site is controlled by the drainage ditch which starts in the excavated pit on the south end of the site and runs along the east side of the existing operation. This ditch flows throughout the year and appears to be fed by ground water flowing from the east and west. Numerous seeps occur along the lower portions of the banks. A smaller ditch has recently been installed roughly midway through the east field. It did not contain any water at the time of examination.

Drainage from the site discharges north toward the Openlander Drain which flows into the Looking Glass River.

FIELD WORK

Field work began on October 6, 1980. Boring logs are shown in Appendix C. Exhibit A shows the boring locations.

The first borings were completed in the pit south of the existing fill. Previous data indicated that clay till would be encountered down to bedrock. Auger cuttings, however, showed extremely varied soils throughout that area. Much of the upper soils consisted of sands to sand and gravel with lenses of clay or very fine sand to silt. A hard clay till did occur above bedrock in all borings. Due to the varied nature of the materials, additional borings (more than originally proposed) were made to better define lithologies and ground-water conditions. Water levels measured in the open borehole varied between three and twelve feet, depending on the elevation and materials in the boring. Soil samples were collected at selected sites for testing.

Borings in the field east and west of the site (these areas are topographically higher than the excavated pit) were designed for collection of soil samples to determine suitability of materials for liner and cover. The soils encountered differed from what was anticipated so the scope was changed to reflect the existing conditions. Samples of the upper clay were collected for moisture/compaction testing. Additional clay samples were collected at depth to determine suitability of their use as liner material.

Six monitor wells were installed during the project. These locations are shown on Exhibit A. Logs and survey data for those borings are contained in Appendix C. A shallow monitor well was installed at the location of OW-11. This well is approximately 30 feet deep.

Water level measurements were taken in the open boreholes at least 24 hours after completion. Those elevations are shown on Exhibit B.

SOILS DESCRIPTION

The varied nature of the soil materials reflects the depositional mechanism of ground moraine and outwash. In a generalized soil boring the top unit is a ground moraine deposit. This unit is a tight brown sandy clay till. The unified soil classification (USC) is CL. The next lower unit is the braided stream deposits. These vary greatly (silts to gravels) from location to location. The predominant component of this unit is unsorted sand and gravel which has a USC of SW. Other major components are sand, silt and clay mixtures. There are spotty occurrences of a softer gray clay. This unit does not appear to be continuous as it is cut by the sand deposits. This clay appears to be lacustrine in origin and has a USC of CL. The third major unit is another ground moraine deposit. This is a tight gray sandy clay till which has a USC of CL. This clay till appears to be continuous throughout the site and is the unit occurring above bedrock.

LABORATORY TESTING

Laboratory tests were run on samples of both the brown and gray clay tills in order to determine their suitability for landfill liner material. The test procedures are described in Appendix D.

One criterion of suitability for liner material is that the soil must have a permeability no greater than 1.0×10^{-7} cm/sec when compacted. To determine this, combination moisture compaction/falling head permeability tests were run on the following samples: B-127, sample #2; B-122, sample #1 and B-37, sample #3. The results of these tests, listed in Appendix E show that the brown clay tills (B-127 and B-122) have lower permeabilities. In addition, the brown clay tills are much more accessible. This makes them a better choice for liner material.

Two additional liner requirements are that the soil must have a Unifed Soil Classification of CL, CH and that 25% of the soil must be less than 5 microns in diameter. Atterberg limit tests were run on three samples of the brown clay till (B-127, sample #2; B-34, sample #1; B-39, sample #2) to confirm the visual CL classification (Atterberg test results are shown in Appendix F). The plastic and liquid limits were within the range for a CL clay for all three samples. Hydrometer tests were run on the same three samples. It is apparent from the figures shown in Appendix G, that even though sample composition differs, each sample has well over 25% finer than five microns.

In addition, nature moisture content was measured for a number of samples from the brown clay and two samples of the deeper gray clay (results are shown in Appendix H). Moisture content of 8.2 and 16.2 percent was found for the two gray clay samples while the brown clay had a range of 9.7 to 19.7 percent by weight of water.

GROUND WATER

Ground-water levels in the pit at the south end of the existing fill are within three to twelve feet of the surface. This area currently has a drain cut through it to maintain the water level. This drain is the major influence on the ground-water flow directions in the immediate area of the excavation.

Shallow water levels in the field to the east shows the direction of flow to be toward the major drainage ditch (west). The depth to water in these borings varies between 12 and 26 feet, again depending on topographic location and types of materials.

The water level measured in OW-14d is significantly deeper than the other deep observation wells and is even deeper than the water level in the drainage ditch. This is most likely due to the fine grained soils encountered at depth which make this point invalid for water level measurements. The remaining data on the deep aquifer is not sufficient to accurately assess flow directions, although we would expect them to closely follow the pattern of the shallow aquifer.

ANALYSIS OF RESULTS

The brown clay samples meet all the soils criteria for a Unified Soil Classification of CL. The compaction data shows that required permeability (1×10^{-7} cm/sec) can be reached at compactions of 105 lbs/ft^3 or greater. This compaction was reached with water content in the range of 15 to 17 percent. In order to reach optimum conditions in the field, moisture contents should be in the range of 8 to 13 percent. Permeabilities achieved in the laboratory were on the order of 10^{-8} cm/sec.

The gray clay sample (B-37, sample #3) had good compaction at four to seven percent moisture; it requires, however, greater than 90 percent modified proctor compaction in order to be close to the required permeabilities.

The brown clay is obviously the best material to use for liner material. The natural moisture content, however, was high at the time of testing and will have to be somewhat drier in order to be workable and reach necessary compaction.

High ground water in the area of the pit will necessitate additional controlled drainage and buildup before installing the liner. Controlling the water level will allow the liner to be placed seven feet above the water level.

The ground-water level in the field east of the site is relatively high. To maximize usable area, drainage should be provided to maintain water level. This will permit the liner to be placed seven feet above water level (instead of 12 feet). We strongly recommend the use of the brown clays for liner materials, unless seams of suitable gray clay are found.

RECOMMENDATIONS

Due to the variance of the glacial materials, we recommend a strong program of source control on material used for the liner. Grain size analyses will quickly reflect suitability of the materials. During liner installation, density tests should be run frequently and occasionally checked by collecting a split spoon sample for permeability testing. These tests will allow for maximum efficiency and accuracy during liner construction.

A number of monitor wells currently exist on the site and these will have to be monitored prior to operations beginning in the expansion areas.

If drainage facilities are installed in the field to the east, water levels should be periodically checked to verify their efficiency. We also recommend installation of three bedrock monitor wells prior to beginning operation. These should be located at the south side of the new area, at the northwest corner of the east field and at the west side of the existing fill. These should be of four-inch construction with casing cemented from 10 feet into the rock to the surface. Additional drift monitor wells may be required, depending on the final design of trenches and drainage system.

Should questions arise, please contact our office.

Respectfully submitted,

KECK CONSULTING SERVICES, INC.

Edward E. Everett

Edward E. Everett
Hydrogeologist/Project Manager

Paul E. Blanchard

Paul E. Blanchard
Geologist

REFERENCES

Bowles, Joseph E., 1978. Engineering Properties of Soils and Their Measurement (Second Edition). McGraw-Hill, Inc. pp. 16-17 and 47-61.

Head, K. H., 1980. Manual of Soil Laboratory Testing, Volume 1: Soil Classification and Compaction Tests. John Wiley & Sons, pp. 268-270.

Appendix A

Work Proposal

Granger Landfill Expansion
Hydrogeologic Evaluation
Watertown Township, Clinton County, Michigan

I. Objectives of the Study

A. Determine suitability of the soils for meeting requirements for a hazardous waste disposal facility.

B. Determine hydrogeologic conditions on the site.

1. Occurrence of usable aquifers
2. Groundwater flow directions
3. Background water quality information

C. Utilize existing wells as premanent monitor wells or recommend the additional wells needed to fully monitor the impact of the landfill.

II. Field Work - The field work can be divided into two phases - soils investigation and hydrogeologic evaluation. All locations are according to Snell Environmental Group plan.

A. Soils Investigation - A total of 15 borings are planned specifically to test the soils. All holes are to provide:

- samples every 10 feet down to elevation of 820
- samples every 5 feet for the next 20 feet
- an additional 20 feet will be drilled to locate any aquifers

1. Split-spoon Sampling

   a. 6 deep borings will be split spoon sampled at the specified intervals estimated depth of 90 feet.

2. Sample collection for moisture-compaction tests. To get accurate samples below the sand, 6" surface casing will be installed down to clay. Samples of the clay will be brought up through the casing.

   a. 3 deep borings and 6 shallow borings will be done by this method.

B. Monitor Well Installation

1. 7 observation wells are planned in the drift; 4 shallow and 3 deep.

2. 3 bedrock observation wells are planned. These will be drilled to 150 feet with 4-inch casing grouted from the rock to the surface. These wells will be gamma-ray logged for varification of soil materials.

C. All locations will be surveyed to U.S.G.S. datum and water levels measured where possible.

III. Laboratory Testing

A. Natural Moisture Content will be determined on representative clay samples. Samples collected in the field will be immediately sealed to prevent escape of moisture.

B. Moisture-Compaction-Permeability tests will be run on 6 representative clay samples from auger cuttings.

C. Undisturbed sample permeability tests will be run on the Shelby tube samples.

D. Sieve and hydrometer tests will be run on pertinent clay samples. These will be run by wet sieving the larger sized fraction and hydrometer testing of the fines.

E. Atterberg limit tests will be conducted on clay samples from each boring.

IV. Report Contents

A. All field data including methodologies used

B. Map of Boring Locations

C. Lithologic Cross-Sections

D. Groundwater Flow Map

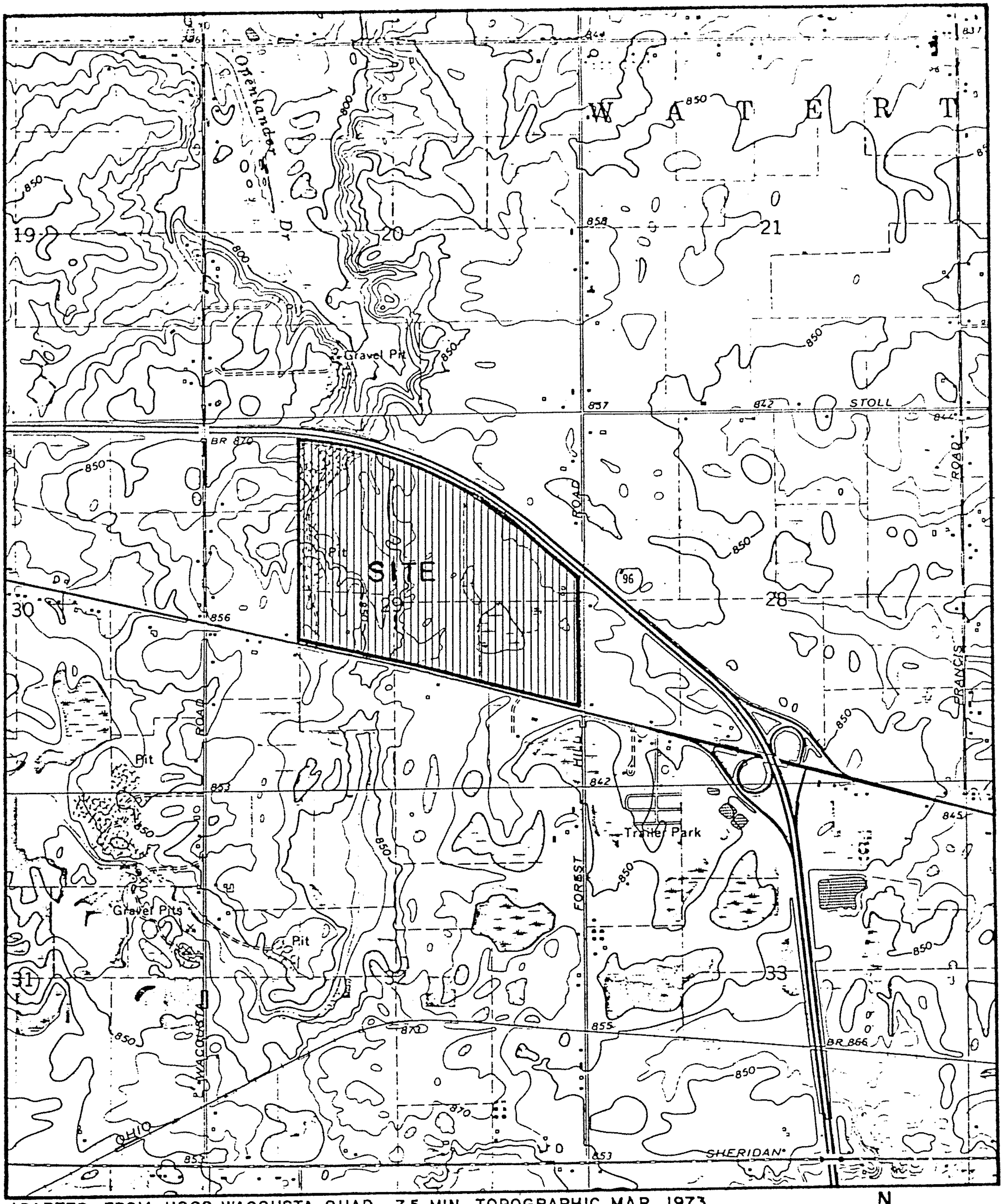
E. Notes, graphs and calculations of Laboratory Work

F. Conclusions

G. Recommendations

Appendix B

Site Location Map



ADAPTED FROM USGS WACOUSTA QUAD. 7.5 MIN. TOPOGRAPHIC MAP 1973

N

SITE LOCATION MAP
GRANGER LANDFILL
WATERTOWN TOWNSHIP
CLINTON COUNTY, MICHIGAN

SCALE 1:24,000

KECK consulting services, inc.

Appendix C

Boring Logs and Survey Data

KECK CONSULTING SERVICES, INC.
"Ground Water Specialists"
4903 Dawn Avenue • East Lansing, Michigan 48823 • (517) 332-8623

SOIL BORING DATA

JOB NUMBER 380 DATE 10/6/80

OWNER Granger Landfill - West

LOCATION: State Michigan County Clinton Twp. Watertown

Section 29 T. 5 N.~~S~~.; R. 3 E.~~W~~.

MINERAL WELL PERMIT NUMBER:

AUGER: 4-inch ☐ 6-inch ☒ Profile ☐ Split-spoon ☐

PLUGGING METHOD:
☒ Natural Materials
☒ Bentonite
☐ Cement

Geologist C. Stagg, K. Wiley Field Ass't G. Ryan

BORING NUMBER B-101 TOTAL DEPTH 40' S.W.L.(BGL) 4'

Sample Number	From 0 to 40 Feet	Lithologic Description
	0 - 1	CLAY; gray, unsaturated
1	1 - 4	SAND; fine-med. grained, clean, well sorted, dry
2	4 - 8	SAND; unsorted, w/clay & gravel, saturated
3	8 - 10	CLAY; gray, w/gravel, saturated
4	10 - 12	SAND & GRAVEL; unsorted, saturated
	12 - 20	LENSES; drilling alternated hard & easy
5	12 - 20	SAND; w/fines, soupy
6	20 - 39	SAND; med.-coarse grained, unsorted, saturated
7	39 - 40	REFUSAL; suspect boulder

Piezometer: ☐ Screen Pipe Total Depth (BGL)

JOB NUMBER ______ DATE ______ PAGE ______

BORING NUMBER B-102 TOTAL DEPTH 20' S.W.L.(BGL) 4'

Sample Number	From 0 to 20 Feet	Lithologic Description
1	0 - 3	CLAY; brown-gray, moist
2	3 - 7	SAND; gray, med. grained, w/minor gravel, saturated
3	7 - 8	CLAY; gray, collars augers
4	8 - 12	SAND & GRAVEL; coarse, unsorted, saturated
5	12 - 15	LENSES; drilling alternated hard & easy
6	15 - 20	SAND; med.-coarse grained, w/gravel, unsorted, saturated

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER B-103 TOTAL DEPTH 39' S.W.L.(BGL) 12'

Sample Number	From 0 to 39 Feet	Lithologic Description
1	0 - 4	CLAY; dk. brown, moist, w/organics
2	4 - 10	CLAY; dk. brown, w/fill material
3	10 - 12	SILT; gray, w/some clay, moist
4	12 - 18	SILT; black, w/organics, very fine sand & clay,
		saturated
5	18 - 24	SAND; fine, silty, saturated
6	24 - 37	SILT; gray, w/very fine sand, saturated
7	37 - 39	CLAY; gray - insufficient quantity to sample
	39 -	REFUSAL; suspect rock or boulder

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

JOB NUMBER ______________ DATE ______________ PAGE ______

BORING NUMBER B-104 TOTAL DEPTH 45' S.W.L.(BGL) 4'

Sample Number	From 0 to 45 Feet	Lithologic Description
1	0 - 2.5	SAND; brown, unsorted, moist
2	2.5 - 4	CLAY; red-brown, mottled, w/high sand content
3	4 - 9	GRAVEL; pebbles, w/unsorted sand
4	9 - 11	CLAY TILL; gray, tight, w/gravel, saturated
5	11 - 30	SAND & GRAVEL; saturated, possible clay lens 19-20'
6	30 - 44	SAND; gray, very fine, w/gravel & silt, saturated
	44 - 45	CLAY; insufficient quantity to sample
	45 -	REFUSAL

Piezometer: ☐ Screen __________ Pipe __________ Total Depth (BGL) __________

BORING NUMBER B-105 TOTAL DEPTH 40' S.W.L.(BGL) 3'

Sample Number	From 0 to 40 Feet	Lithologic Description
1	0 - 3	SAND; w/gravel, rounded, unsorted, clean, moist
2	3 - 4	CLAY TILL; gray, collars augers
3	4 - 8	SAND & GRAVEL; brown, unsorted, w/fines, saturated
4	8 - 12	CLAY TILL; gray, collars augers, saturated
5	12 - 13	SAND & GRAVEL; gray, w/some fines, saturated
6	13 - 14	CLAY TILL; w/sand & gravel, gray, saturated
7	14 - 27	SAND; gray, w/gravel & fines, saturated
8	27 - 31	SAND; gray-brown, w/minor gravel, saturated
9	31 - 39	SAND; unsorted, w/higher gravel content, saturated
10	39 - 40	CLAY TILL; gray, very tight
	40 -	REFUSAL; possibly weathered sandstone

Piezometer: ☐ Screen ________ Pipe __________ Total Depth (BGL) __________

JOB NUMBER ________ DATE ________ PAGE ________

BORING NUMBER B-106 TOTAL DEPTH 12' S.W.L.(BGL) 6'

Sample Number	From 0 to 12 Feet	Lithologic Description
1	0 - 4	CLAY; gray, w/gravel
2	4 - 6	CLAY; gray, w/gravel, moist
3	6 - 8	CLAY; w/sand, silt & gravel, saturated
4	8 - 12	SAND & SILT; w/clay, saturated
	12 -	REFUSAL; suspect boulder

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

BORING NUMBER B-107 TOTAL DEPTH 54' S.W.L.(BGL) 8'

Sample Number	From 0 to 54 Feet	Lithologic Description
1	0 - 3	CLAY; brown-gray, moist
2	3 - 5	CLAY & SAND; dk. gray, saturated
3	5 - 7	SAND; w/clay to cobble size particles, saturated
4	7 - 8	CLAY; gray, w/gravel, moist
5	8 - 9	SAND; w/clay, & gravel, saturated
6	9 - 12	CLAY; brown, w/gravel, moist
7	12 - 20	SILT; w/sand & clay, soupy, grades into sand
8	20 - 42	SAND; rounded, med.-coarse grained, w/fine gravel, sat.
9	42 - 50	CLAY TILL; gray, tight, less tight 46-50'
10	50 - 54	CLAY TILL; gray, very tight
	54 -	REFUSAL; suspect bedrock

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

JOB NUMBER ________________ DATE ________________

BORING NUMBER B-108 TOTAL DEPTH 49' S.W.L.(BGL) 3'

Sample Number	From 0 to 49 Feet	Lithologic Description
1	0 - 2	CLAY; gray-brown, mottled, moist
2	2 - 4	SAND & GRAVEL; w/fines, saturated
3	4 - 7	SAND & GRAVEL; unsorted, saturated
4	7 - 9	SAND; brown, saturated, grading into finer material
	9 - 10	CLAY; thin lens
5	10 - 25	SAND; brown, w/silt & some gravel
6&7	25 - 35	SAND; brown, fine-med. grained, w/minor gravel, sat.,
		grading to cleaner sand
8	35 - 37.5	SAND; brown, fine-med. grained w/fines & gravel.
9	37.5 - 40	SAND; brown, fine-med. grained w/minor gravel, cleaner
		than sample #8
10	40 - 49	CLAY; gray, soft, saturated
11	49 -	CLAY TILL; gray, very tight, dry

Piezometer: ☐ Screen __________ Pipe __________ Total Depth (BGL) __________

BORING NUMBER B-109 TOTAL DEPTH 49' S.W.L.(BGL) 3'

Sample Number	From 0 to 49 Feet	Lithologic Description
1	0 - 2	CLAY; brown, mottled, w/some gravel
2	2 - 4	SAND; brown, unsorted, w/gravel, saturated
3	4 - 9	SAND; gray, fine-med. grained, w/pieces of clay
4	9 - 12	CLAY TILL; gray, saturated
5	12 - 14	SAND; brown, fine grained, w/fine gravel, saturated
6	14 - 16	CLAY TILL; gray, tight
7,8	16 - 32	SAND; gray, fine-med. grained becomes coarser w/depth,
		saturated
9	32 - 39	CLAY; gray, w/high silt & sand content, sticky, sat.
10	39 - 49	CLAY TILL; gray, tight, saturated

Piezometer: ☐ Screen __________ Pipe __________ Total Depth (BGL) __________

JOB NUMBER ____________ DATE ____________

BORING NUMBER B-110 TOTAL DEPTH 48' S.W.L.(BGL) 4.5'

Sample Number	From 0 to 48 Feet	Lithologic Description
1	0 - 2	SAND; brown, fine grained, w/silt, moist
2	2 - 4.5	SAND; brown, med. grained, saturated at 4'
3	4.5 - 7	SILT; gray, w/fine sand & gravel, saturated
4	7 - 17	SILT; gray, w/clay & some fine sand, saturated
5	17 - 22	CLAY; gray, w/some fine sand, saturated
6	22 - 25	CLAY; gray, w/fine sand & gravel, saturated
7	25 - 35	CLAY; gray, w/minor gravel, tighter than #6, saturated
8	35 - 48	CLAY; gray, w/some gravel, soft, saturated

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

BORING NUMBER B-111 TOTAL DEPTH 45' S.W.L.(BGL) ________

Sample Number	From 0 to 45 Feet	Lithologic Description
1	0 - 3	CLAY; gray, w/gravel, very moist
2	3 - 9	CLAY; gray, w/gravel, saturated
3	9 - 14	CLAY; gray, w/higher gravel content, unsaturated
4	14 - 24	CLAY; gray, w/gravel, tight, moist
5	24 - 33	CLAY; gray, stiff, collars augers, saturated
6	33 - 40	CLAY; gray, softer, collars augers, saturated
	40 - 42	CLAY; soupy, insufficient quantity to sample
7	42 - 45	CLAY TILL; gray, tight, collars augers
	45 -	REFUSAL; suspect rock

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

BORING NUMBER B-112 TOTAL DEPTH 42' S.W.L.(BGL) 8'

Sample Number	From 0 to 42 Feet	Lithologic Description
1	0 - 3	CLAY; gray-brown, dry
2	3 - 7	CLAY; gray, w/some gravel, dry
3	7 - 9	CLAY; gray, tight, unsaturated
4	9 - 12	CLAY; w/gravel, unsaturated
5	12 - 18	CLAY; gray, very moist, collars augers
6	18 - 28	CLAY; gray, w/some gravel, saturated
7	28 - 40	CLAY; gray, w/high silt content, saturated
	40 - 42	SUSPECT CLAY; very tight, no sample
	42 -	REFUSAL; suspect rock

Piezometer: ☐ Screen ____ Pipe ____ Total Depth (BGL) ____

BORING NUMBER B-113 TOTAL DEPTH 20' S.W.L.(BGL) ____

Sample Number	From 0 to 20 Feet	Lithologic Description
1	0 - 2	CLAY; gray, unsaturated
2	2 - 10	CLAY; gray, w/some gravel, moist
3	10 - 15	CLAY; gray, w/gravel, very moist
4	15 - 20	CLAY; gray, w/fine sand, saturated

Piezometer: ☐ Screen ____ Pipe ____ Total Depth (BGL) ____

JOB NUMBER ________ DATE ________

BORING NUMBER B-114 TOTAL DEPTH 45' S.W.L.(BGL) ________

Sample Number	From 0 to 45 Feet	Lithologic Description
1	0 - 5	CLAY; gray, w/gravel, tight
2	5 - 7	CLAY; gray, unsaturated, tight
3	7 - 12	CLAY; gray, w/some gravel, moist
4	12 - 16	CLAY; gray, w/some gravel, very moist
5	16 - 18	CLAY; gray, w/some very fine sand, collars augers, saturated
6	18 - 25	SAND; gray, very fine grained, w/some clay, saturated
7	25 - 36	SAND; brown, well sorted, saturated
8	36 - 45	CLAY; gray, w/sand & some gravel, saturated

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

BORING NUMBER B-115 TOTAL DEPTH 67' S.W.L.(BGL) ________

Sample Number	From 0 to 67 Feet	Lithologic Description
1	0 - 3	SAND; fine-coarse grain, brown, moist
2	3 - 6	SAND; fine-coarse grain, w/minor gravel, gray-brown, sat.
3	6 - 10	CLAY; w/high organics, black, very moist
4	10 - 15	CLAY TILL; w/silt-sand, brown-black, tight, very moist
5	15 - 21	SILT; w/minor clay, sticky, saturated
6	21 - 42	CLAY; lacustrine, w/minor silt, gray, saturated
7	42 - 50	SAND; fine grain, brown, saturated
8	50 - 67	CLAY; w/high silt, gray

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

JOB NUMBER ________ DATE ________ PAGE ________

BORING NUMBER B-116 TOTAL DEPTH 50' S.W.L.(BGL) ________

Sample Number	From 0 to 50 Feet	Lithologic Description
1	0 - 6	SAND; fine-coarse grain, w/gravel, brown, moist
2	6 - 16	SAND; fine-coarse grain, trace of gravel, brown, sat.
3	16 - 23	SAND; med. grain, brown, saturated
4&5	23 - 40	CLAY TILL; w/silt, sand, gravel, very tight
6	40 - 49	SAND; very fine grain, gray, saturated
7	49 - 50	CLAY TILL; w/silt, gravel, very tight, refusal @ 50'

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

BORING NUMBER B-117 TOTAL DEPTH 54' S.W.L.(BGL) ________

Sample Number	From 0 to 54 Feet	Lithologic Description
1-2	0 - 16	SAND; fine-med. grain, brown, very moist, saturated
3-4	16 - 22	CLAY TILL; w/silt, sand, gravel, gray, vermoist, tight
5	22 - 43	SAND; fine grain, w/silt, saturated
6-7	43 - 54	CLAY TILL; w/silt, gravel, very moist
		suspect bedrock at 54'

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

BORING NUMBER B-118 TOTAL DEPTH 56' S.W.L.(BGL)

Sample Number	From 0 to 56 Feet	Lithologic Description
1	0 - 4	SAND; fine grain, brown, saturated
2	4 - 6	CLAY; lacustrine, gray, soft, saturated
3	6 - 16	CLAY TILL; w/silt, gravel, gray, saturated
4	16 - 22	SAND; w/high silt, gray, saturated, trace of clay
5	22 - 43	SILT; w/sand, occ. pieces of clay w/fine gravel, sat.
6-7	43 - 56	CLAY TILL; w/silt, gravel
		suspect bedrock at 56'

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

BORING NUMBER B-119 TOTAL DEPTH 73' S.W.L.(BGL)

Sample Number	From 0 to 73 Feet	Lithologic Description
1	0 - 8	CLAY TILL' w/silt, gravel, brown, moist
2	8 - 11	SAND; fine grain, dry, w/occ. gravel
3-4	11 - 17 - 22	SAND; coarse, w/gravel, dry, brown
5	22 - 27	SAND; med. grain, sorted, brown, dry
6	27 - 32	SAND; fine-coarse grain, w/gravel, dk. brown, moist
7-8	32 - 40	SAND; fine-coarse grain, w/gravel, saturated, brown
9	40 - 58	SAND & SILT; gray, saturated
10	58 - 73	CLAY TILL; w/silt, fine gravel, tight

Piezometer: ☐ Screen ______ Pipe ________ Total Depth (BGL) ________

BORING NUMBER B-120 TOTAL DEPTH 70' S.W.L.(BGL) ____

Sample Number	From 0 to 70 Feet	Lithologic Description
1	0 - 12	CLAY TILL; w/silt, gravel, brown, moist
2	12 - 22	SAND; fine-coarse grain, w/gravel, brown, moist
3-4	22 - 42	SAND; fine-coarse grain, w/minor silt, moist
5	42 - 49	SAND; med. grain, sorted, saturated, brown
6	49 - 59	SAND; fine grain, w/pieces of gray clay, saturated
7-8	59 - 70	CLAY TILL; w/silt, gravel, tight, gray, saturated

Piezometer: ☐ Screen ____ Pipe ____ Total Depth (BGL) ____

BORING NUMBER B-121 TOTAL DEPTH 74' S.W.L.(BGL) ____

Sample Number	From 0 to 74 Feet	Lithologic Description
1	0 - 4 - 9	CLAY TILL; brown, silt, sand and gravel, moist
		increasing sand & gravel w/depth
2	9 - 20	SAND & GRAVEL; brown, unsorted, moist
3	20 - 27	SAND & GRAVEL; unsorted, moist
4	27 - 35	SAND; brown, unsorted, unsaturated
5	35 - 37	SAND; brown, fine, very moist
6	37 - 40	CLAY; gray, lacustrine
7	40 - 45	SAND; gray, fine, w/high silt content, saturated
	45 - 47	CLAY; suspect, no sample
8	47 - 70	SAND; gray, w/high silt content & some clay, saturated
9	70 - 74	CLAY TILL; gray, collars augers, tight, saturated

Piezometer: ☐ Screen ____ Pipe ____ Total Depth (BGL) ____

JOB NUMBER ____________ DATE ____________

BORING NUMBER B-122 TOTAL DEPTH 73' S.W.L.(BGL) approx. 32'

Sample Number	From 0 to 73 Feet	Lithologic Description
1-2	0 - 15	CLAY TILL; brown, moist
3	15 - 24	SAND; fine-coarse grain, moist, brown
4	24 - 32	SAND; fine grain, w/pieces of clay
5	32 - 35	SAND; fine grain, saturated, brown, trace of gravel
6	35 - 38	CLAY; lacustrine, gray-brown, soft, moist
7	38 - 45	SAND; fine grain, silt, w/minor clay, gray, saturated
8	45 - 49	SILT; w/fine sand & clay, saturated, gray
9	49 - 62	CLAY; gray, soft, w/fine sand & silt, saturated
10	62 - 73	CLAY TILL; gray, saturated, stiff

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

BORING NUMBER B-123 TOTAL DEPTH 74' S.W.L.(BGL) approx. 13'

Sample Number	From 0 to 74 Feet	Lithologic Description
1	0 - 4	CLAY TILL; brown, w/silt, sand & gravel, moist
2	2 - 16	CLAY; lt. brown, till w/silt, sand & gravel, dryer
		increasing gravel w/depth, saturated @ 13'
3	16 - 22	SAND; brown, coarse, w/gravel, fine to coarse, moist
4	22 - 24	SAND; lt. brown, fine, w/silt, unsaturated
	24 - 31	same as above w/occ. gravel, moist
	31 - 31.5	CLAY; brown, lacustrine
5	31.5 - 36	SAND; brown, fine to coarse, occ. gravel, moist
	36 - 36.5	CLAY; brown, lacustrine
	36.5 - 41	SAND; brown, fine-coarse, very moist
6	41 - 44	CLAY; gray, lacustrine
7	44 - 49.5	SAND; w/silt & clay, gray, w/occ. gravel, soupy, sat.
8	49.5 - 65	CLAY TILL; gray, w/silt & sand, dry, moist

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

JOB NUMBER 380 DATE 10/21/80 PAGE

BORING NUMBER B-124 TOTAL DEPTH 70' S.W.L.(BGL)

Sample Number	From 0 to 70 Feet	Lithologic Description
1	0 - 6	CLAY TILL; w/silt & gravel, brown, moist
2-3	6 - 22	SAND; fine-coarse grain, w/minor gravel
4	22 - 27	CLAY; lacustrine, gray, saturated
5-6	27 - 50	CLAY TILL; w/silt & gravel, gray, saturated, soft, tight
7	50 - 68	SAND; w/high silt, gray, saturated
8	68 - 70	CLAY TILL; w/silt & gravel, tight
		refusal at 70' BGL

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER B-125 TOTAL DEPTH 73' S.W.L.(BGL) approx. 35'

Sample Number	From 0 to 73 Feet	Lithologic Description
1-5	0 - 20	CLAY TILL; w/gravel, silt, brown, moist
6-7	20 - 35	SAND; unsorted, dry, w/gravels, brown
8-9	35 - 65	SAND; fine-coarse grain, w/occ. fine gravel, brown, sat.
10	65 - 73	CLAY TILL; w/silt, gravel, gray, very moist

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

JOB NUMBER ____________ DATE ____________ PAGE ________

BORING NUMBER B-126 TOTAL DEPTH 73' S.W.L.(BGL) ________

Sample Number	From 0 to 73 Feet	Lithologic Description
1-2	0 - 12	CLAY TILL; w/silt & gravel, tight, brown, moist
3-4	12 - 26	SAND; fine-coarse grain, w/gravel, dry, brown
5	26 - 32	SAND; fine-med. grain, w/silt, gray-brown, saturated
6-7	32 - 40	CLAY; lacustrine, soft, gray, saturated
8-9	40 - 60	CLAY; w/silt & gravel, gray, moist, tight
	60 - 73	Late sample - intermittent sands & lacustrine clay lenses

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

BORING NUMBER B-127 TOTAL DEPTH 70' S.W.L.(BGL) ________

Sample Number	From 0 to 70 Feet	Lithologic Description
1-2	0 - 15	CLAY TILL; w/silt & gravel, brown, moist-very moist
3-5	15 - 38	SAND; fine-coarse grain, w/minor gravel, brown, sat. @ 30'
6	38 - 43	CLAY; lacustrine, w/high silt, gray, saturated
7	43 - 46	SAND; fine-coarse grain, w/gravel, brown, saturated
8	46 - 53	CLAY; w/some gravel, brown, saturated
9	53 - 66	SAND; fine grain, w/high silt, gray, saturated
10	66 - 70	CLAY; gray

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

JOB NUMBER ____________ DATE ____________ PAGE ________

BORING NUMBER B-128 TOTAL DEPTH 73' S.W.L.(BGL)________

Sample Number	From 0 to 73 Feet	Lithologic Description
1	0 - 8	CLAY LOAM; brown, w/sand increasing w/depth, moist
2-3	8 - 22	SAND; fine-med. w/minor silt & clay
4	22 - 28	CLAY; lacustrine, gray, moist
	28 - 33	No sample - suspect sand - easy drill
5-8	33 - 73	CLAY TILL; w/silt, fine gravel, brown, moist

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL)________

BORING NUMBER B-129 TOTAL DEPTH 70' S.W.L.(BGL)________

Sample Number	From 0 to 70 Feet	Lithologic Description
1	0 - 11	SAND; clay, silt, gravel, lt. brown, very moist
2	11 - 16	SAND; fine-coarse, gravel, fine-coarse, dk. brown, moist
3	16 - 26	SAND; very fine-coarse, brown, dry, increasing fines
		w/depth
4	26 - 34	CLAY TILL; grades from brown sandy @ 27' to gray, w/silt
		sand, gravel, tight
5	34 - 39	SAME - but tighter
6	39 - 51	SAME
7	51 - 58	EASY DRILL; sand, silt, occ. fine gravel, soupy, gray
8	58 - 60	CLAY; gray, tight, lacustrine
9	60 - 68	SAND; fine, silt, saturated, brown
	68 - 70	CLAY TILL; w/sand, silt, gravel, brown, no sample -
		little on bit

Piezometer: ☐ Screen ______ Pipe ________ Total Depth (BGL) ________

JOB NUMBER ______ DATE ______ PAGE ______

BORING NUMBER B-130 TOTAL DEPTH 70' S.W.L.(BGL) ______

Sample Number	From 0 to 70 Feet	Lithologic Description
1	0 - 6	CLAY; brown, mottled, tight
2	6 - 10	SAND; fine-coarse, brown, very moist
3	10 - 15	SILT; w/fine sand, minor clay, brown, moist
4-5	15 - 23	CLAY; lacustrine, gray, very moist, saturated
6	23 - 32	CLAY; w/silt, fine gravel, saturated, brown
7-8	32 - 63	SAND; fine-coarse grain w/depth, gray, occ. gravel, sat.
	63 - 70	Tight drill - suspect clay

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER B-131 TOTAL DEPTH 70' S.W.L.(BGL) ______

Sample Number	From 0 to 70 Feet	Lithologic Description
1	0 - 5	SAND; unsorted, w/gravel, brown
2	5 - 12	CLAY; sandy w/gravel, moist, brown
3	12 - 20	SILT & CLAY; moist, brown, saturated at 20'
4	20 - 31	SAND; unsorted, brown, saturated
5	31 - 35	CLAY; w/sand & gravel, brown, saturated
6	35 - 43	CLAY, SAND & GRAVEL; brown, saturated
7	43 - 62	SAND; fine, w/clay, some gravel, brown, saturated
8	62 - 70	CLAY TILL; w/some gravel, gray, tight

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

JOB NUMBER ______ DATE 10/22/80 PAGE ______

BORING NUMBER B-132 TOTAL DEPTH 76' S.W.L.(BGL) ______

Sample Number	From 0 to 76 Feet	Lithologic Description
1	0 – 1.5	CLAY; w/sand & gravel, brown, mottled
2	1.5 – 3	CLAY; sandy, black, moist
3	3 – 5	CLAY; w/sand & gravel, brown-black
4	5 – 9	CLAY; w/gravel & sand, brown, saturated
5	9 – 11	CLAY; w/sand, brown, moist
6	11 – 16	CLAY; w/gravel & sand, saturated, gray
7	16 – 29	CLAY TILL; w/sand & gravel, gray, tight
8	29 – 52	SAND; unsorted, w/some gravel, saturated
	52 – 73	CLAY; sandy, lenses of hard & soft, saturated
9	73 – 76	CLAY TILL; tight, gray

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER B-133 TOTAL DEPTH 70' S.W.L.(BGL) ______

Sample Number	From 0 to 70 Feet	Lithologic Description
1	0 – 3	CLAY; sandy, mottled, brown, tight
2	3 – 9	CLAY; w/sand & gravel, brown, saturated
3	9 – 12	CLAY; some gravel, very moist, gray
4	12 – 45	SAND; unsorted, and gravel, gray, saturated
	45 – 63	SAND; unsorted, gray, saturated
5	63 – 70	CLAY TILL

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

JOB NUMBER ________ DATE ________ PAGE ________

BORING NUMBER OW-13 TOTAL DEPTH 47' S.W.L.(BGL) ________

Sample Number	From 0 to 47 Feet	Lithologic Description
1	0 - 3	CLAY; brown, w/gravel, moist
2	3 - 6	CLAY; lt. brown, w/gravel, moist
3	6 - 12	CLAY; brown. w/silt
4	12 - 15	ClAY; gray, w/silt
5	15 - 22	CLAY; gray, collars, w/gravel, moist
6	22 - 35	SAND; w/gravel, unsorted, saturated
7	35 - 42	SAND; fine-med. grained, saturated
8	42 - 47	CLAY; gray, w/gravel, tight
9	47 -	CLAY; brown, tiny piece on bit

Piezometer: ☐ Screen 927-7 Pipe 40' Total Depth (BGL) 39'

BORING NUMBER OW-14 TOTAL DEPTH 78' S.W.L.(BGL) ________

Sample Number	From 0 to 78 Feet	Lithologic Description
1	0 - 4	CLAY; sandy, tight, brown
2	4 - 11	SAND; unsorted, w/gravel, brown
3	11 - 17	SAND; unsorted, w/gravel, brown
4	17 - 25	SAND; unsorted, w/silt, saturated, brown
	25 - 37	CLAY; (lenses)
5	27 - 34	SAND; fine, w/silt, brown, saturated
	34 - 46	CLAY; tight (no sample)
6	46 - 53	SAND; fine, w/silt, gray
	53 - 63	CLAY; no sample
	63 - 70	CLAY; sandy, soupy
7	70 - 78	CLAY TILL; gray, very tight
		no well installed

Piezometer: ☐ Screen s #924
d #924 Pipe 30'
60' Total Depth (BGL) 28.5'
58.2'

JOB NUMBER ______ DATE ______ PAGE ______

BORING NUMBER OW-15 TOTAL DEPTH 54' S.W.L.(BGL) ______

Sample Number	From 0 to 54 Feet	Lithologic Description
1	0 - 4	CLAY; sandy, some gravel, brown, moist
2	4 - 12	CLAY; sandy, w/gravel, brown, moist
3	12 - 29	SAND; unsorted, w/gravel, brown, saturated at 22'
4	29 - 32	CLAY; sandy, brown, saturated
5	32 - 42	SAND; fine, w/some gravel, brown
6	42 - 51	SAND; fine, w/silt, gray, saturated
7	51 - 54	CLAY TILL; gray, tight

Piezometer: ☒ Screen s #924
d #924 Pipe 30'
50' Total Depth (BGL) 28.8'
48.7'

BORING NUMBER B-28 TOTAL DEPTH 65' S.W.L.(BGL) approx. 26'

Sample Number	From 0 to 65 Feet	Lithologic Description
1	0 - 3	CLAY; sandy, brown, very moist
2	3 - 12	CLAY; sandy, moist, brown
3	12 - 15	SAND; unsorted, brown
4	15 - 21	SAND; fine-med., w/silt, lt. brown
5	21 - 25	CLAY; sandy, brown, saturated
6	25 - 31	CLAY; sandy, gray, saturated
7	31 - 38	SAND; unsorted, brown, saturated
8	38 - 46	SAND; fine-med., w/silt & clay, gray
9	46 - 59	CLAY TILL; gray, saturated
10	59 - 70	CLAY TILL; gray, tight

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER B-30 TOTAL DEPTH 70' S.W.L.(BGL)

Sample Number	From 0 to 70 Feet	Lithologic Description
1	0 - 3	CLAY; w/sand & gravel, brown, mottled
2	3 - 8	CLAY; sandy, brown
3	8 - 17	CLAY TILL; gray, mottled
4	17 - 25	SAND; unsorted, some clay, brown
5	25 - 32	SAND; unsorted, w/gravel, brown, saturated
6	32 - 42	SAND; fine-med., brown, saturated
	42 - 48	CLAY; no sample
	48 - 68	SAND; fine-med., saturated
7	68 - 70	CLAY TILL; gray, tight

Piezometer: ☐ Screen _____ Pipe _____ Total Depth (BGL) _____

BORING NUMBER B-31 TOTAL DEPTH 85' S.W.L.(BGL)

Sample Number	From 0 to 85 Feet	Lithologic Description
1	0 - 3	CLAY; sandy, brown, moist
2	3 - 12	CLAY; sandy, brown, very moist
3	12 - 16	CLAY; sandy, gray, moist
4	16 - 21	SAND; unsorted, w/some gravel, brown, moist
5	21 - 26	SAND; med., well sorted, brown
6	26 - 42	SAND; med., saturated
7	42 - 43	CLAY; sandy, red-brown
8	43 - 52	SAND; very fiine, saturated, brown
9	53 - 79	SAND; very fine, w/silt, brown, saturated
10	79 - 80	CLAY; till, tight, gray
	80 - 84	CLAY; sandy, soft
11	84 - 85	CLAY TILL; tight, gray

Piezometer: ☐ Screen _____ Pipe _____ Total Depth (BGL) _____

BORING NUMBER B-32 TOTAL DEPTH 50' S.W.L.(BGL) ____

Sample Number	From 0 to 50 Feet	Lithologic Description
1	0 - 4	CLAY; sandy, moist, brown
2	4 - 11	CLAY; sandy, moist, brown
3	11 - 20	CLAY; sandy, very moist, brown
4	20 - 25	SILT & FINE SAND; some clay, brown, saturated
5	25 - 34	SAND; fine, w/silt, brown, saturated
6	34 - 39	SAND; fine-med., brown, saturated
7	39 - 50	CLAY; silty, w/sand, gray
		Attempted split spoon samples - materials too soft
		Sample brought up clay, sandy, w/gravel, gray, soupy

Piezometer: ☐ Screen ____ Pipe ____ Total Depth (BGL) ____

BORING NUMBER B-33 TOTAL DEPTH 65' S.W.L.(BGL) approx. 26'

Sample Number	From 0 to 65 Feet	Lithologic Description
1	0 - 4	CLAY; sandy, brown
2	4 - 14	CLAY; sandy, brown, moist
3	14 - 26	SAND; unsorted, brown, moist
4	26 - 33	SAND; med.-coarse, brown, saturated
5	33 - 43	CLAY; sandy, w/some gravel, gray
6	43 - 47	CLAY; sandy, w/gravel, gray, saturated
7	47 - 56	SAND; unsorted, w/gravel, brown, saturated
8	56 - 63	SAND; very fine, gray, saturated
	63 - 65	Hard drilling - probably rocks

Piezometer: ☐ Screen ____ Pipe ____ Total Depth (BGL) ____

JOB NUMBER ______ DATE ______ PAGE ______

BORING NUMBER B-34 TOTAL DEPTH 61' S.W.L.(BGL) ______

Sample Number	From 0 to 59 Feet	Lithologic Description
1	0 - 4	CLAY; sandy, brown, moist
2	4 - 12	CLAY; sandy, w/gravel, brown, moist
3	12 - 16	SAND & GRAVEL; brown
4	16 - 21	SAND; med.-coarse, w/fine gravel, brown
5	21 - 26	SAND; unsorted, w/gravel, brown
6,7,8	26 - 40	SAND; unsorted, brown, saturated at 35'
	40 - 61	CLAY; silty, w/sand, some gravel, gray
		Split spoon samples
		39 - 41
		44 - 47
		saturated 49 - 51
		clay (soupy) 54 - 57 no sample
		59 - 61 no sample

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER B-35 TOTAL DEPTH 83' S.W.L.(BGL) 12'

Sample Number	From 0 to 83 Feet	Lithologic Description
1	0 - 5	CLAY; sandy, brown, very moist
2	5 - 10	SAND; unsorted, w/gravel, brown, moist
3	10 - 12	SAND; coarse, brown, very moist
4	12 - 17	SAND; fine-med., some gravel, saturated
5	17 - 22	SAND; fine, saturated
6	22 - 26	SAND; fine, w/clay, saturated, gray
7	26 - 32	SAND; very fine, w/silt, saturated, gray
8	32 - 34	SAND; very fine, w/silt, gray, saturated
9	34 - 45	SAND; very fine, saturated, gray
10	45 - 52	SAND; fine-med., saturated, brown
11	52 - 66	SAND; med.-coarse, brown, saturated
12	66 - 67	CLAY TILL; gray
	67 - 80	CLAY; sandy, soft, gray
13	80 - 83	CLAY TILL; red-brown

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER B-36 TOTAL DEPTH 74' S.W.L.(BGL) ______

Sample Number	From 0 to 74 Feet	Lithologic Description
	0 - 11	SAND; unsorted, brown, moist
	11 - 15	CLAY; sand, w/gravel, brown
	15 - 20	CLAY; sandy, some gravel, brown, saturated
	20 - 31	CLAY; sandy, w/gravel, wet, gray
	31 - 43	SAND; unsorted, brown, saturated
	43 - 50	CLAY; no sample
	50 - 71	SAND; unsorted, brown, saturated
	71 - 74	CLAY TILL; red-brown

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER B-37 TOTAL DEPTH 50' S.W.L.(BGL) 4'

Sample Number	From 0 to 50 Feet	Lithologic Description
1	0 - 6	SILT; gray, saturated @ 4'
2-6	6 - 49	CLAY TILL; gray, saturated, tight, collars augers,
		split spoon sample 7-9'
7	49 - 50	CLAY TILL; gray, very tight

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

JOB NUMBER ______ DATE ______ PAGE ______

BORING NUMBER B-38 TOTAL DEPTH 59' S.W.L.(BGL) 4'

Sample Number	From 0 to 59 Feet	Lithologic Description
1	0 - 2	SAND; brown, w/pieces of gravel
2	2 - 5	CLAY; brown-gray, mottled, collars augers
3	5 - 13	SAND & GRAVEL; brown, unsorted, coarse, saturated
4	13 - 14	GRAVEL; well rounded to subangular, saturated
5-6	14 - 47	SAND; brown, unsorted, w/gravel, soupy
7	47 - 59	CLAY TILL; gray, tight, w/minor gravel & sand
	59 -	REFUSAL; suspect sandstone bedrock

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER B-39 TOTAL DEPTH 88' S.W.L.(BGL) ______

Sample Number	From 0 to 88 Feet	Lithologic Description
1	0 - 7	CLAY; sandy, dk. brown, moist
2	7 - 12	CLAY; sandy, brown, moist
3	12 - 16	CLAY; very sandy, some gravel, brown
4	16 - 22	SAND; unsorted, w/gravel, brown
5	22 - 30	SAND; med., well sorted
6	30 - 38	SAND; fine, saturated, brown
7	38 - 47	SAND; coarse, w/gravel, brown, saturated
8	47 - 79	SAND; unsorted, w/gravel, brown, saturated
9	79 - 88	SAND; fine, w/clay, gray, saturated

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

JOB NUMBER ______ DATE ______ PAGE ______

BORING NUMBER B-41 TOTAL DEPTH 57' S.W.L.(BGL) approx. 12'

Sample Number	From 0 to 57 Feet	Lithologic Description
1	0 - 4	CLAY; sandy, brown, moist
2	4 - 12	CLAY; sandy, brownm moist
3	12 - 25	SAND; unsorted, some gravel, brown, saturated
4	25 - 31	SAND; unsorted, w/fines, brown, saturated
5	31 - 55	SAND; med.-coarse, brown, saturated
6	55 - 57	CLAY TILL; gray, tight

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER ______ TOTAL DEPTH ______ S.W.L.(BGL) ______

Sample Number	From ___ to ___ Feet	Lithologic Description

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

DATE January 8, 1981 **PROJECT** Granger Landfill - Type I

WELL #	GROUND ELEVATION	CASING HEIGHT	CASING ELEVATION	DEPTH TO WATER	WATER-TABLE ELEVATION
OW-11s	860.00	3.53	863.53	18.62	844.91
OW-11d	860.00	3.67	863.67	38.99	824.68
OW-13	862.00	2.95	864.95	24.00	804.95
OW-14s	855.90	3.49	859.39	20.60	838.79
OW-14d	855.90	3.82	859.72	47.31	812.41
OW-15s	856.60	3.16	859.76	27.19	832.57
OW-15d	856.60	3.30	859.90	37.35	822.55

Appendix D

Testing Procedures

Moisture Density Relations of Soils

ASTM D-698

ASTM D-1557

Many civil engineering projects require the use of soils as "fill" material. Whenever soil is placed as an engineering fill, it is nearly always necessary to compact to it a dense state, so as to obtain satisfactory engineering properties which would not be achieved with loosely placed material. Compaction on site is usually effected by mechanical means such as rolling, ramming or vibrating. Control of the degree of compaction is necessary to achieve a satisfactory result at reasonable cost. Laboratory compaction tests provide the basis for control procedures used on site.

Compaction tests furnish the following basic data for soils:

1. The relationship between dry density and moisture content for a given degree of compactive effort.
2. The moisture content for the most efficient compaction - that is, at which the maximum dry density is achieved under that compactive effort.
3. The value of the maximum dry density so achieved.

Item (1) is expressed as a graphical relationship from which items (2) and (3) can be derived. The latter are the moisture and density criteria, against which the compacted fill can be judged if in-situ measurements of moisture content and density are made.

There are several different standard laboratory compaction tests. The test selected for use as the basis for comparison will depend on the nature of the works, the type of soil and the type of compaction equipment used on site.

A test to provide data on the compaction characteristics of soil was first introduced by R. R. Proctor in the USA in 1933, in order to determine a satisfactory state of compaction for soils being used in the construction of larges dams and to provide a means for controlling the degree of compaction during construction. The test made use a hand rammer and a cylindrical mold with a volume of 1/30 ft^3, and became known as the standard "Proctor" compaction test (Proctor, 1933; Taylor, 1948).

At that time it was believed that the Proctor test represented in the laboratory the state of compaction which could be reasonably achieved in the field. But with the subsequent introduction of heavier earth-moving and compaction machinery, especially for the construction of large dams, higher densities became obtainable in practice. A laboratory test using increased energy of compaction was then necessary to reproduce these higher compacted densities, so a test was introduced which used a heavier rammer with the same mold. This intensified procedure became known as the "modified Proctor" test.

Compaction of soils is the process by which the solid soil particles are packed more closely together by mechanical means, thus increasing the dry density (Markwick, 1944). It is achieved through the reduction of the air voids in the soil, with little or no reduction in the water content. This process must not be confused with consolidation, in which water is squeezed out under the action of a continuous static load. The air voids cannot be eliminated altogether by compaction, but with proper control they can be reduced to a minimum. The effect of the amount of water present in a fine-grained soil on its compaction characteristics, when subjected to a given compactive effort, is discussed below.

At low moisture content the soil grains are surrounded by a thin film of water, which tends to keep the grains apart when compacted. The finer the soil grains, the more significant the effect. If the moisture content is increased, the additional water enables the grains to be more easily compacted together. Some of the air is displaced and the dry density is increased. The addition of more water, up to a certain point, enables more air to be expelled during compaction. At that point the soil grains become as closely packed together as they can be (i.e. the dry density is at the maximum) under the application of this compactive effort. When the amount of water exceeds that required to achieve this condition, the excess water begins to push the particles apart, so that the dry density is reduced. At higher moisture contents little or no more air is displaced by compaction, and the resulting dry density continues to decrease.

At each stage the compacted dry density is calculated, and plotted against moisture content. This graph is the "moisture-density relationship" curve. The moisture content at which the greatest value of dry density is reached for the given amount of compaction is the optimum moisture content (OMC) and the corresponding dry density is the maximum dry density. At this moisture content the soil can be compacted most efficiently under the given compactive effort.

The Standard Proctor compaction test (ASTM D-698) uses a 5.5 pound rammer which has a vertical drop of 12 inches. The speciman is compacted in three equal layers in the mold. Each layer is compacted with 25 blows of the rammer. The modified Proctor test (ASTM D-1557) uses a 10 pound rammer which has a vertical drop of 18 inches. In this test the specimen is placed in five equal layers each of which is compacted by 25 blows of the rammer. The sample and cylinder are then weighed and the weight of the cylinder is subtracted, thus giving the weight of the wet soil.

The moisture contents of the compacted samples are determined by weighing, oven-drying and reweighing a portion of the sample. This will give the percent by weight moisture content and the dry density can be calculated from this, the wet sample and the volume of the mold.

Head, K. H., Manual of Soil Laboratory Testing

Grain Size Analyses - Hydrometer Method

ASTM D-422

The hydrometer analysis is a widely used method of obtaining an estimate of the distribution of soil particle sizes from the No. 200 (0.075 mm) sieve to around 0.001 mm. The data is plotted on a semilog plot of percent finer vs. grain diameters and may be combined with the data from a mechanical analysis of the material retained (+) on the No. 200 (or other size) sieve.

The principal value of the hydrometer analysis appears to be obtaining the percent clay since the grain-size distribution curve when more than 12 percent is (-) No. 200 is not used in any soil classification system and there is no particular soil behavior depending on any intrinsic curve shape. Soil behavior for the cohesive soil fraction depends principally on the type and percent of clay mineral, geologic history and water content rather than on the distribution of particle sizes.

The hydrometer analysis utilizes the relationship among the velocity of fall of spheres in a fluid, the diameter of the sphere, the specific weights of the sphere and of the fluid, and the viscosity of the fluid as expressed by the English physicist G. G. Stokes (ca. 1850) in the equation termed Stokes Law:

$$v = \frac{2Y_s - Y_u}{9N}\left(\frac{D}{2}\right)^2$$

where,

v = velocity of fall of the spheres, cm/s

Y_s = specific weight of the sphere (specific weight = density x g = mass/unit volume x gravity = g/cm^3 in cgs system)

Y_f = specific weight of fluid (usually water and see above table)

N = absolute, or dynamic, visocity of the fluid, dyne•s/cm^2 (or g/cm•s)

D = diameter of sphere, cm

g = 980.7 cm/s^2

1 g = 980.7 dynes

Solving the Equation above for D and using the specific weight of water Y'_w, we obtain:

$$D = \frac{18\ Nv}{Y_s - Y'_w} \text{ cm}$$

The range of soil particle diameters D for this equation to be valid is approximately

$$0.0002 \text{ mm} \leq D \leq 0.2\text{mm}$$

since larger grains cause excessive fluid turbulence and very small grains are subject to Brownian movement (i.e., subject to particle forces of attraction and repulsion).

The procedure involves mixing 50 grams of soil with a dispersing agent such as sodium hexametaphosphate. After soaking for 16 hours this mixture is thoroughly stirred and then placed in a hydrometer jar. Readings are taken at specified intervals by using a hydrometer (generally an ASTM 152H hydrometer).

The hydrometer displays the specific gravity of the soil-water suspension at the center of the bulb. Any soil grains larger than those still in suspension between the surface and the bulb center will have fallen below the center of the bulb and this constantly decreases the specific gravity of the suspension at the center of the hydrometer. The depth the hydrometer sinks is dependent on the specific gravity of the suspension and therefore on the temperature of the suspension.

Equations and tables have been developed to convert the hydrometer test data to percent finer and equivalent grain size diameter.

$$\text{Percent Finer} = \frac{Rc\ a}{Ws} \times 100\%$$

where,

Rc = corrected hydrometer reading

a = factor dependent on specific gravity of the soil

Ws = original weight of sample is suspension

$$D = K \quad L/t$$

where,

D = diameter in mm

K = factor dependent on temperature and specific gravity of soil

L = distance from center of hydrometer bulb to surface

t = elapsed time

Bowles, Joseph E., Engineering Properties of Soil and Their Measurements

Atterberg Limits

ASTM D-423 and D-424

The liquid and plastic limits are two of five "limits" proposed by A. Atterberg, a Swedish agricultural scientist (ca. 1911). The liquid and plastic limits are widely used, primarily for soil indentification and classification.

The liquid limit of soil is the water content, expressed as a percentage of the weight of the oven-dried soil, at the boundary between the liquid and plastic states. In order to place definite reproducible values on the limit, it was proposed that the liquid limit be arbitrarily defined as that water content at which a pat of soil placed in a brass cup, cut with a standard grove and then dropped from a height of 1 cm will undergo a closure of 12.7 mm (1/2 inch) when dropped 25 times. The drops, or blows, should occur at a rate of 2 per second.

It is nearly impossible to find the exact water content for which 25 blows will close the groove 1/2 inch. However, if one makes a semilogarithmic plot of water content versus number of blow counts the points for any one soil tend to fall in a straight line. With this phenomenon established, it becomes relatively easy to find the liquid limit indirectly. All one has to do is obtain three to six points at different water contents together with the corresponding blow counts (obviously distributed on both sides of the blow count of 25 for best results), plot these data to a semilogarithmic scale, and from the blow count of 25 read from the resulting curve projection the water content (liquid limit) for the soil.

The plastic limit of a soil is the water content, expressed as a percentage of the mass of oven-dried soil, at the boundary between the plastic and semi-solid states. The water content at this boundary is arbitrarily defined as the lowest water content at which the soil can be rolled into threads 1/8 inch (3.2 mm) in diameter without the threads breaking into pieces.

The Plasticity Index is defined as the liquid limit minues the plastic limit. It defines the plastic range of the soil.

Bowles, Joseph E., Engineering Properties of Soils and Their Measurment.

LABORATORY FALLING HEAD PERMEABILITY TEST

Introduction

The falling head permeability test is generally used to test less permeable soils (fine sand to fat clay) with k values less than 10^{-3} cm/sec. The test can be performed on either undisturbed or remolded samples.

Sample Preparation

Undisturbed samples can be collected in a split spoon sample with or without a shelby tube. If the sample is in a shelby tube the sample length and diameter must be measured and the tube ends fitted with inflow and outflow tubes. Split spoon samples collected without a shelby tube can be prepared by measuring the sample length and diameter, outfitting the sample with inflow and outflow tubes and placing this arrangement in heat shrinkable tubing.

Disturbed samples, e.g. auger cuttings, must be remolded to be tested. This can be accomplished by packing the sample at its natural moisture content into a mold according to the Standard Proctor Method (ASTM D658). The mold, modified for permeability testing, is diagrammed in Figure 2. A remolded samples gives results which at best are an approximation of the natural condition. Packing by the Standard Proctor Method gives consistency to the test but it can not restore the sample to its natural state.

Procedure

1. Prepare the same as above.
2. Connect the sample to the standpipe.
3. Allow the sample to saturate
   a. the sample has saturated when water runs out the outflow tube
   b. for tight samples saturation can be sped up by attaching an air compressor to the standpipe
4. Fill the standpipe, record the starting time (t) and measure the initial head which is the distance between the initial water level and the outflow tube (h_o).
5. After the water level has dropped in the standpipe measure the head at time t (h_t).
6. Compute the permeability according to the following equation.

$$K = \frac{d_t^2 L}{d_s^2 t} \cdot \ln \frac{h_o}{h_t}$$

where:

k = permeability (cm/sec)

d_t = inside diameter of the standpipe (cm)

d_s = diameter of soil column (cm)

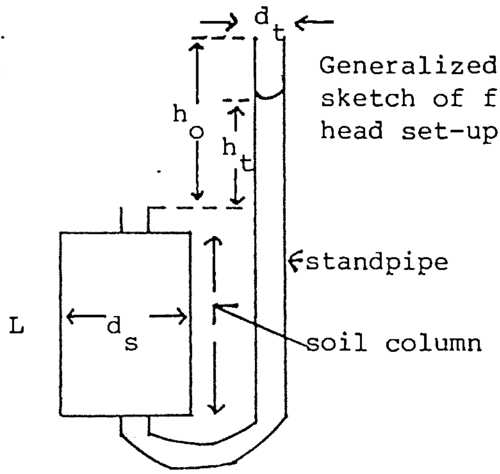
L = length of soil column (cm)

t = time (seconds)

ln = natural log

h_o = initial head

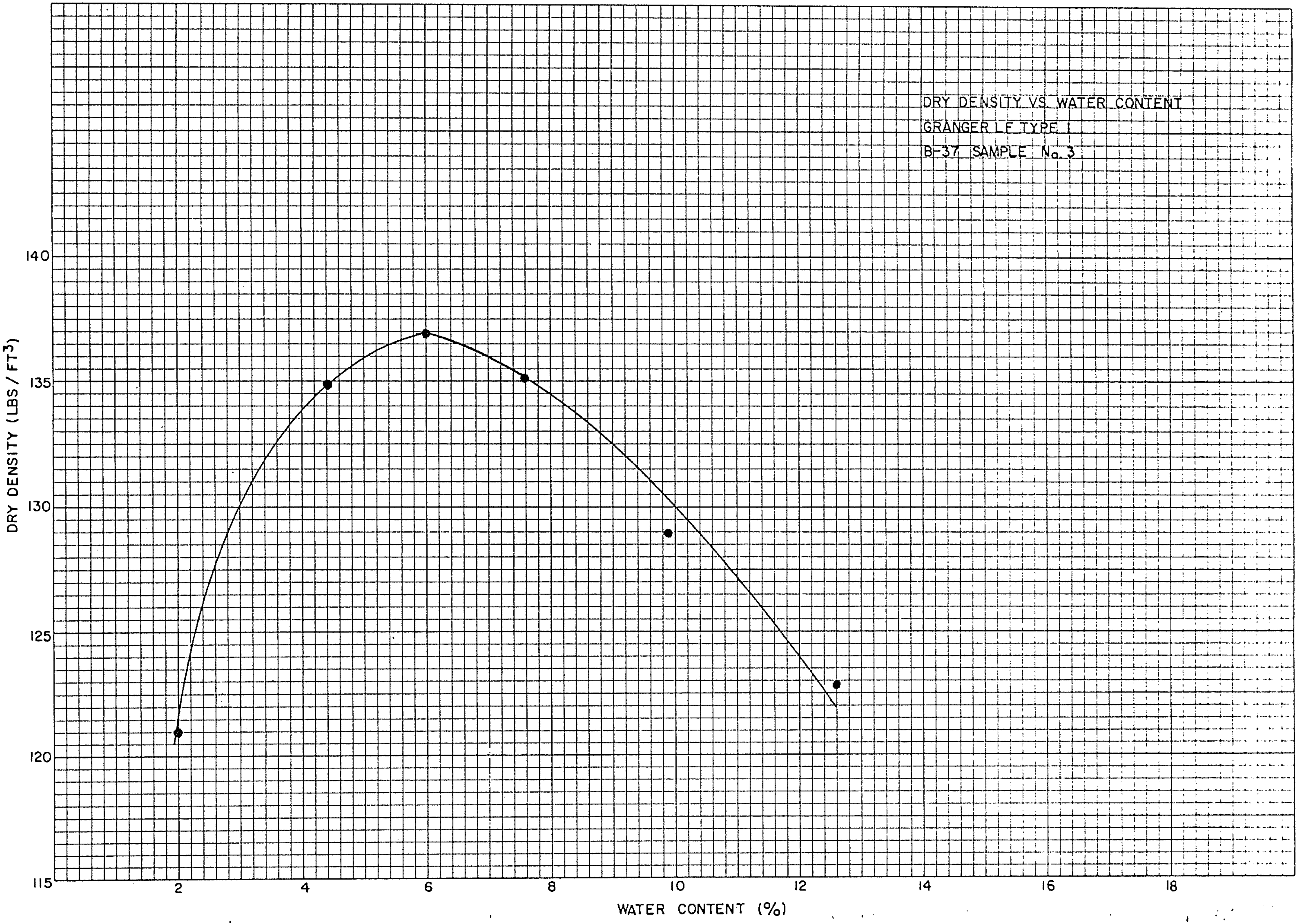
h_t = head at time t

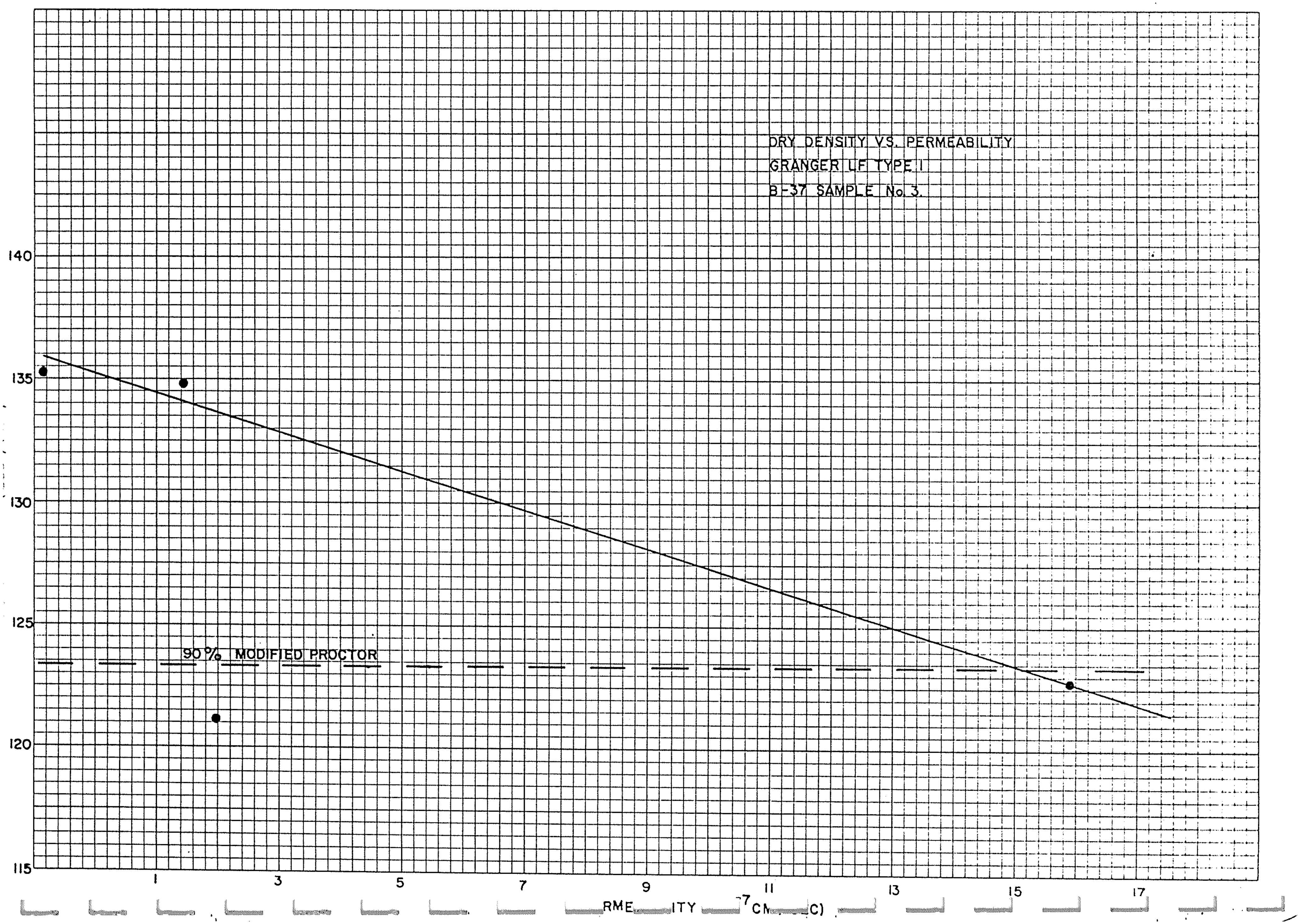


Generalized sketch of falling head set-up

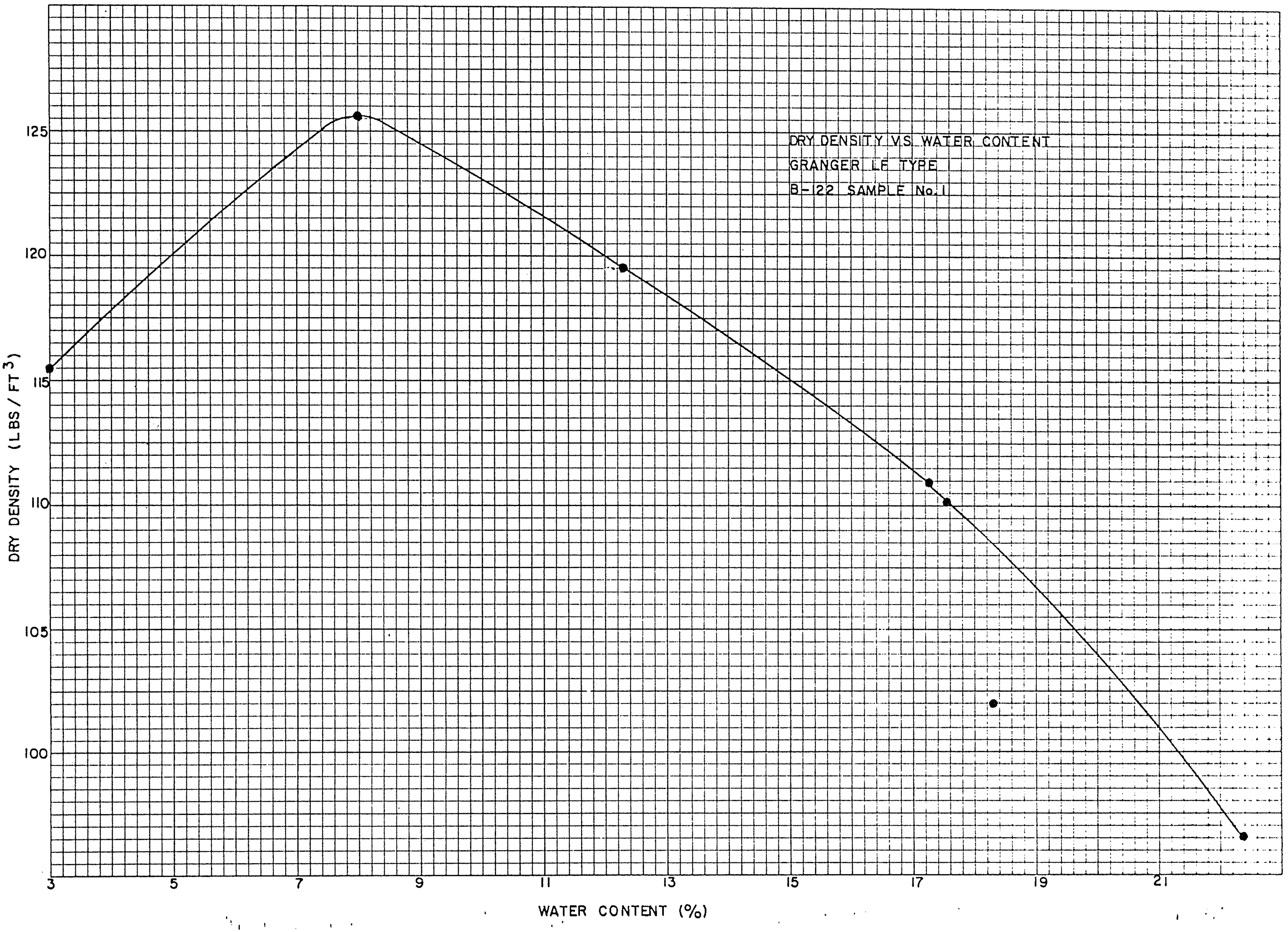
Appendix E

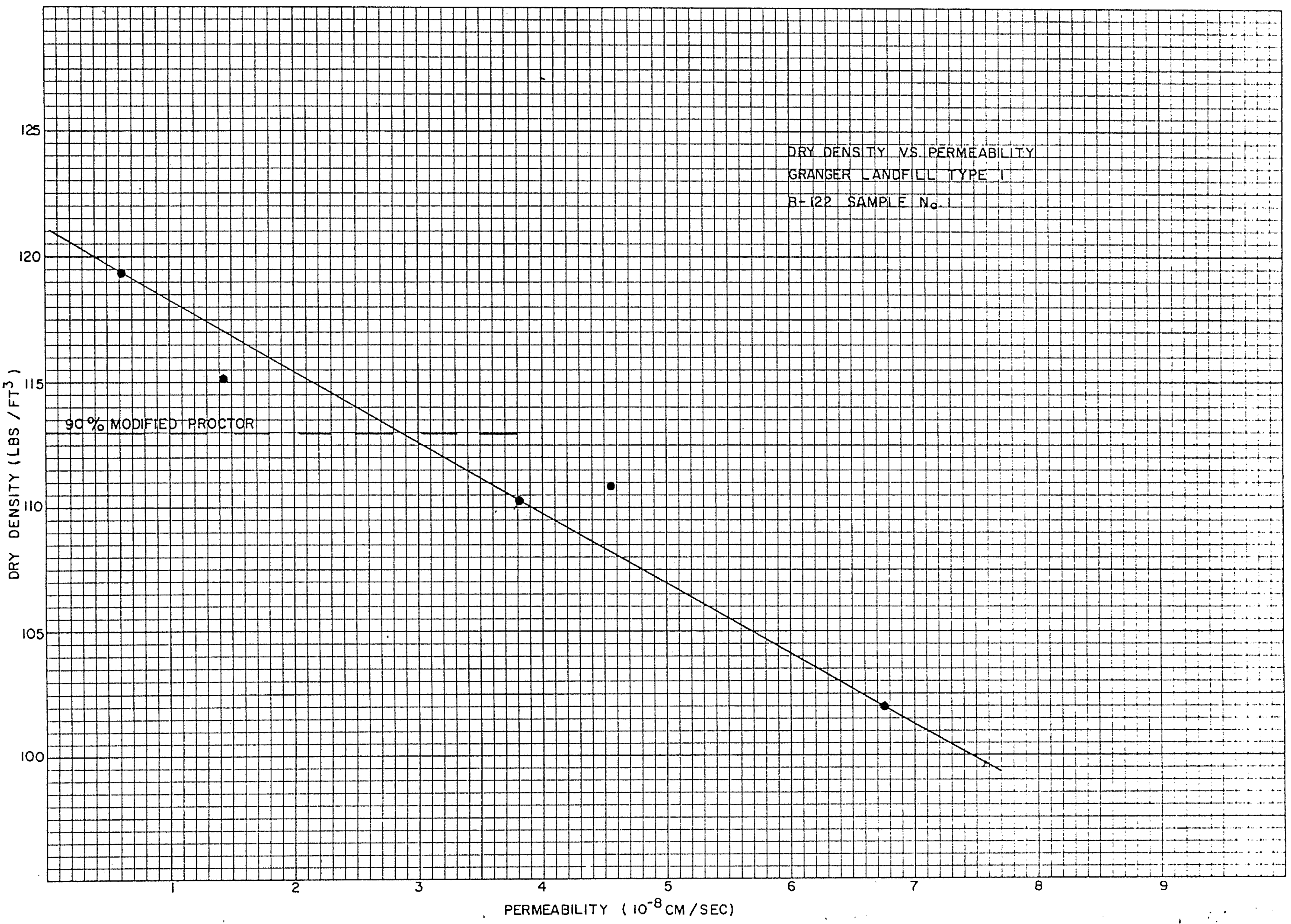
Moisture/Compaction Permeability Test Results

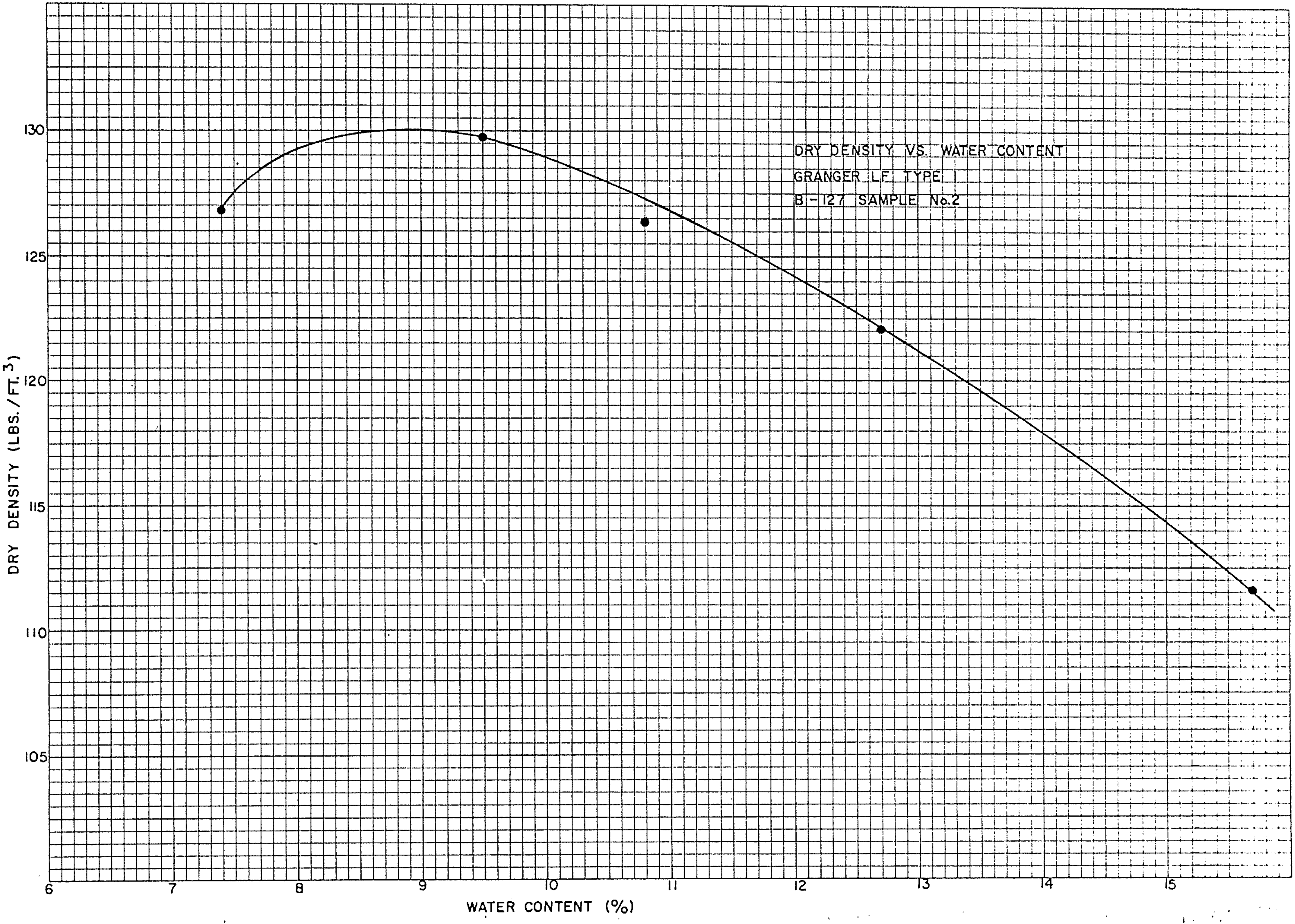

DRY DENSITY VS. WATER CONTENT
GRANGER LF TYPE I
B-37 SAMPLE No. 3
DRY DENSITY (LBS / FT3)
140
135
130
125
120
115
2
4
6
8
10
12
14
16
18
WATER CONTENT (%)

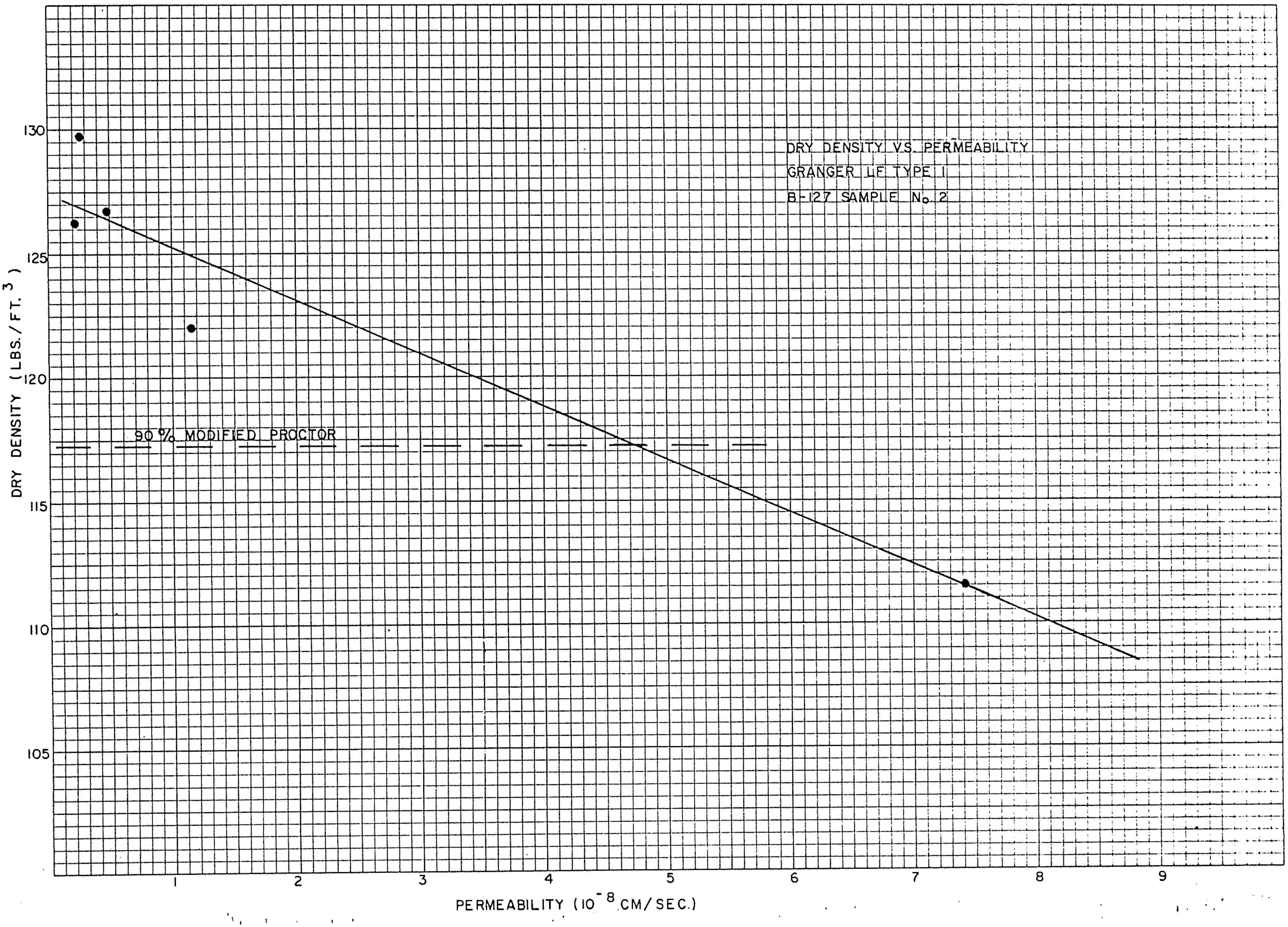


DRY DENSITY VS. PERMEABILITY
GRANGER LF TYPE I
B-37 SAMPLE No. 3.


DRY DENSITY V.S. WATER CONTENT
GRANGER LF TYPE
B-122 SAMPLE No. I
DRY DENSITY (LBS / FT 3)
125
120
115
110
105
100
3
5
7
9
11
13
15
17
19
21
WATER CONTENT (%)


DRY DENSITY VS. PERMEABILITY
GRANGER LANDFILL TYPE I
B-122 SAMPLE No. I
90 % MODIFIED PROCTOR
DRY DENSITY (LBS / FT3)
125
120
115
110
105
100
PERMEABILITY (10-8 CM/SEC)
1
2
3
4
5
6
7
8
9


DRY DENSITY VS. WATER CONTENT
GRANGER LF TYPE
B-127 SAMPLE No.2
DRY DENSITY (LBS./FT.³)
130
125
120
115
110
105
WATER CONTENT (%)
6
7
8
9
10
11
12
13
14
15


DRY DENSITY VS. PERMEABILITY
GRANGER LF TYPE I
B-127 SAMPLE No. 2
90 % MODIFIED PROCTOR
DRY DENSITY (LBS./FT. 3)
130
125
120
115
110
105
PERMEABILITY (10 -8 CM/SEC.)
1
2
3
4
5
6
7
8
9

Moisture Compaction Data
Modified Proctor Test
ASTM D 1557
Granger Landfill Type 1

B 122 Sample 1

Moisture Content (%)	Dry Density (lbs/ft^3)
3.0	115.5
8.0	125.7
12.3	119.4
17.3	110.9
17.6	110.2
18.3	102.0
22.4	96.5

OMC - 8.0%

Maximum Dry Density - 125.7

B 127 Sample 2

Moisture Content (%)	Dry Density (lbs/ft^3)
7.4	126.8
9.5	129.8
10.8	126.3
12.7	122.1
15.7	111.6

OMC - 8.9%

Maximum Dry Density - 130.3

B 37 Sample 3

Moisture Content (%)	Dry Density (lbs/ft^3)
2.0	121.1
4.4	134.8
7.6	135.2
9.9	128.9
12.6	122.8

OMC - 6%

Maximum Dry Density - 137.0

Permeability Test Data
Falling Head Test
Granger Landfill Type 1

B 122 Sample 1

Dry Density (lbs/ft^3)	Permeability (cm/sec)
119.4	6.07×10^{-8}
115.2	1.46×10^{-8}
110.9	4.56×10^{-8}
110.2	3.81×10^{-8}
102.0	6.73×10^{-8}

B 127 Sample 2

Dry Density (lbs/ft^3)	Permeability (cm/sec)
129.8	2.77×10^{-9}
126.8	4.80×10^{-9}
126.3	2.06×10^{-9}
122.1	1.16×10^{-8}
111.6	7.42×10^{-8}

B 37 Sample 3

Dry Density (lbs/ft^3)	Permeability (cm/sec)
135.2	9.62×10^{-9}
134.8	1.43×10^{-7}
128.9	No Reading
122.8	1.59×10^{-6}
121.1	1.97×10^{-7}

Appendix F

Atterburg Limits

KECK consulting services Inc.
1099 W. GRAND RIVER
WILLIAMSTON MI.

ATTERBERG LIMITS DETERMINATION

PROJECT Granger Landfill Type 1 JOB NO. 380

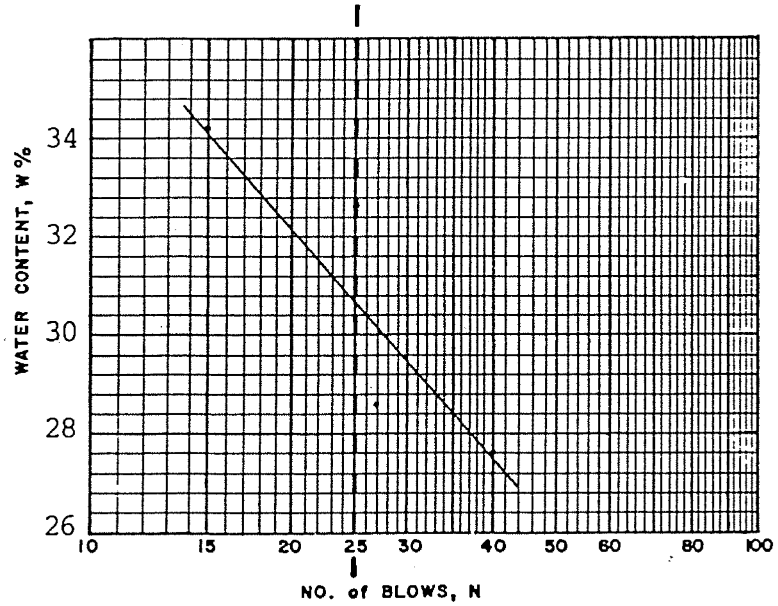
LOCATION OF PROJECT Clinton County BORING NO. 34 SAMPLE NO. 2

DESCRIPTION OF SOIL CL

DEPTH OF SAMPLE 4-12' TESTED BY M.D. DATE

LIQUID LIMIT DETERMINATION

CAN NO.	6	7	8	9		
WT. of WET SOIL & CAN	28.5	28.65	27.45	27.45		
WT. of DRY SOIL & CAN	24.5	24.5	23.15	23.0		
WT. of CAN	10.0	10.0	10.0	10.0		
WT. of DRY SOIL	14.5	14.5	13.15	13.0		
WT. of MOISTURE	4.0	4.15	4.30	4.45		
WATER CONTENT, W%	27.6	28.6	32.7	34.2		
NO. of BLOWS, N	40	27	25	15		



PLASTIC LIMIT DETERMINATION

CAN NO.	9	
WT. of WET SOIL & CAN	26.6	
WT. of DRY SOIL & CAN	24.35	
WT. of CAN	10.0	
WT. of DRY SOIL	14.35	
WT. of MOISTURE	2.25	
WATER CONTENT, W% = w_p	15.7	

LIQUID LIMIT = 30.9
PLASTIC LIMIT = 15.7
PLASTICITY INDEX I_p = 15.2

KECK consulting services Inc.
1099 W. GRAND RIVER
WILLIAMSTON MI.

ATTERBERG LIMITS DETERMINATION

PROJECT Granger Landfill Type 1 JOB NO. 380

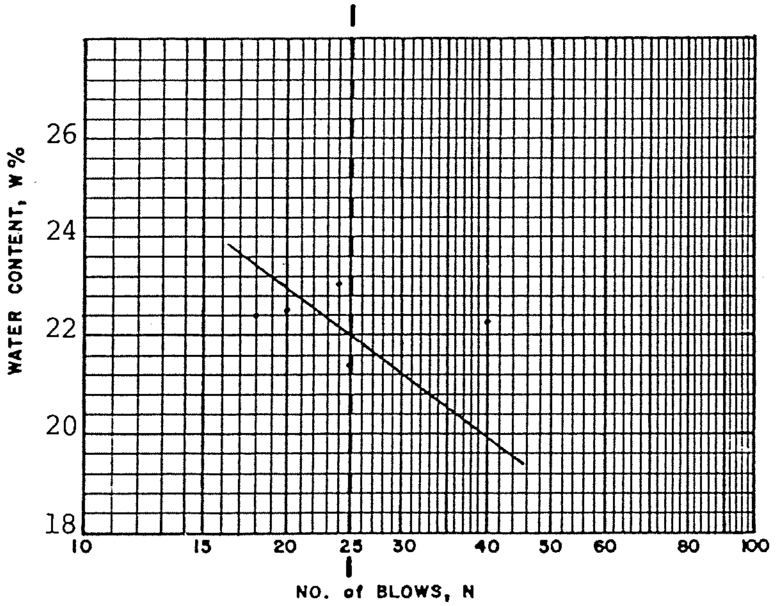
LOCATION OF PROJECT Clinton County BORING NO. 39 SAMPLE NO. 2

DESCRIPTION OF SOIL CL

DEPTH OF SAMPLE 7-12' TESTED BY M.D. DATE

LIQUID LIMIT DETERMINATION

CAN NO.	1	2	3	4	5	
WT. of WET SOIL & CAN	29.3	31.0	26.0	27.4	29.2	
WT. of DRY SOIL & CAN	25.9	27.15	23.0	24.2	25.7	
WT. of CAN	10.0	10.0	10.0	10.0	10.0	
WT. of DRY SOIL	15.9	17.15	13.0	14.2	15.7	
WT. of MOISTURE	3.4	3.85	3.0	3.2	3.5	
WATER CONTENT, W%	21.4	22.4	23.1	22.5	22.3	
NO. of BLOWS, N	25	18	24	20	40	



PLASTIC LIMIT DETERMINATION

CAN NO.	5	
WT. of WET SOIL & CAN	15.25	
WT. of DRY SOIL & CAN	14.65	
WT. of CAN	10.0	
WT. of DRY SOIL	4.65	
WT. of MOISTURE	0.60	
WATER CONTENT, W% = w_p	12.9	

LIQUID LIMIT = 22.0
PLASTIC LIMIT = 12.9
PLASTICITY INDEX I_p = 9.1

KECK consulting services inc. 1099 W. GRAND RIVER
WILLIAMSTON MI.

ATTERBERG LIMITS DETERMINATION

PROJECT Granger Landfill Type 1 JOB NO. 380

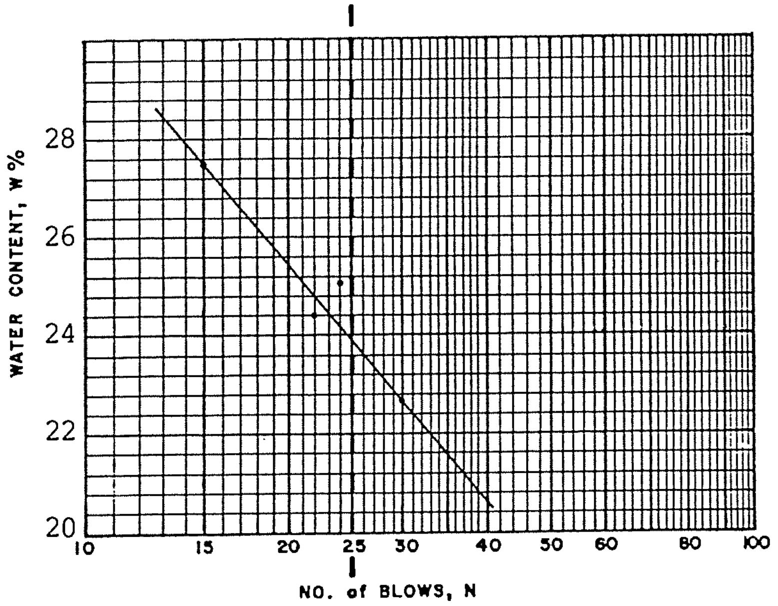
LOCATION OF PROJECT Clinton County BORING NO. 127 SAMPLE NO. 2

DESCRIPTION OF SOIL CL

DEPTH OF SAMPLE 3-15' TESTED BY M.D. DATE

LIQUID LIMIT DETERMINATION

CAN NO.	1	2	3	4		
WT. of WET SOIL & CAN	27.6	31.65	29.2	31.95		
WT. of DRY SOIL & CAN	23.8	27.65	25.35	27.65		
WT. of CAN	10.0	10.0	10.0	10.0		
WT. of DRY SOIL	13.8	17.65	15.35	17.65		
WT. of MOISTURE	3.8	4.0	3.85	4.3		
WATER CONTENT, W%	27.5	22.7	25.1	24.4		
NO. of BLOWS, N	15	30	24	22		



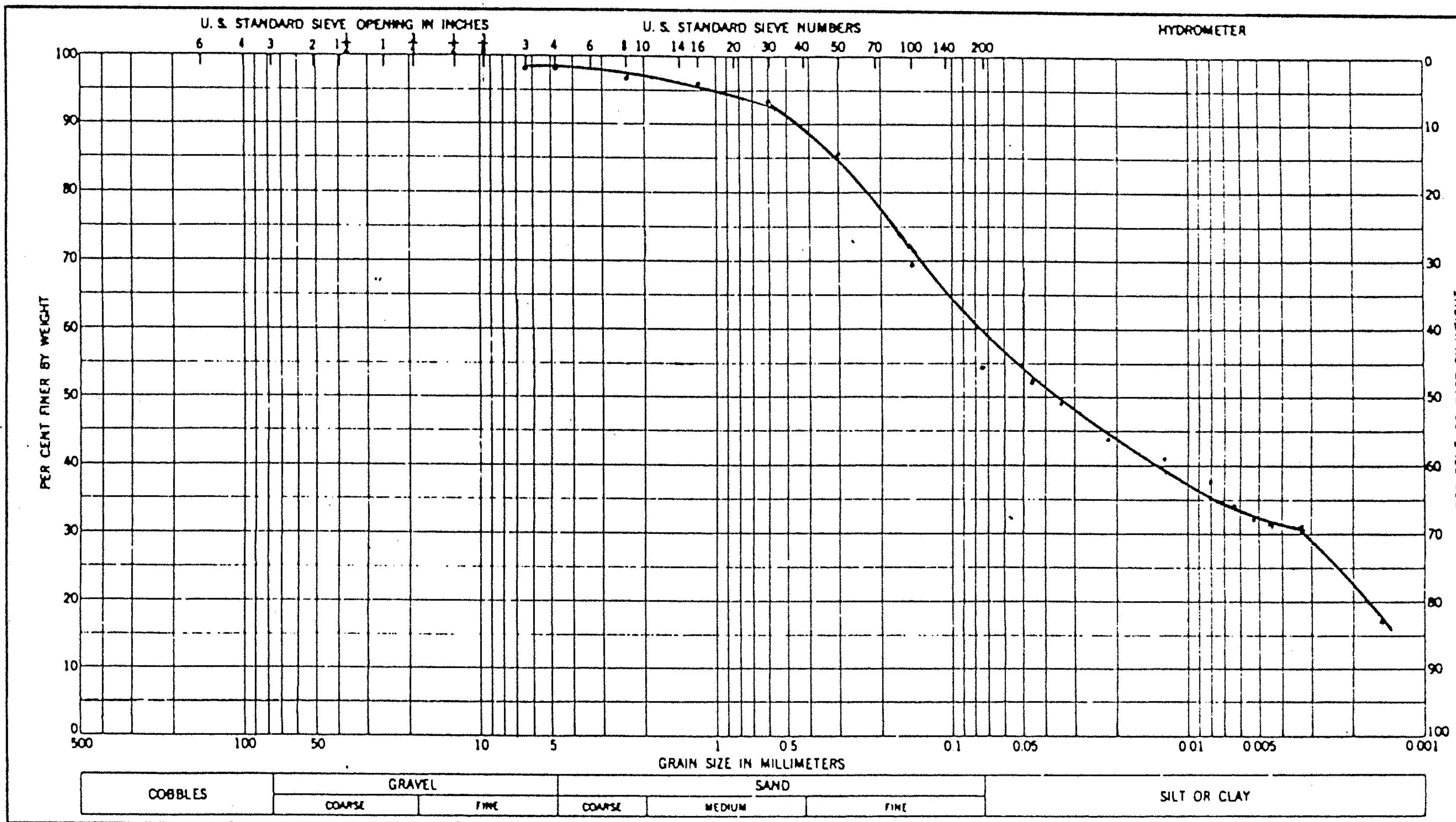
PLASTIC LIMIT DETERMINATION

CAN NO.	5	
WT. of WET SOIL & CAN	22.95	
WT. of DRY SOIL & CAN	21.2	
WT. of CAN	10.0	
WT. of DRY SOIL	11.2	
WT. of MOISTURE	1.75	
WATER CONTENT, W % = w_p	15.6	

LIQUID LIMIT = 24.0
PLASTIC LIMIT = 15.6
PLASTICITY INDEX I_p = 8.4

Appendix G

Sieve-Hydrometer Tests



Boring No.	Sample No.	Elev. or Depth	Classification	Nat w %	LL	PL	PI
B-39	2	7'-12'	CL		22.0	12.9	9.1

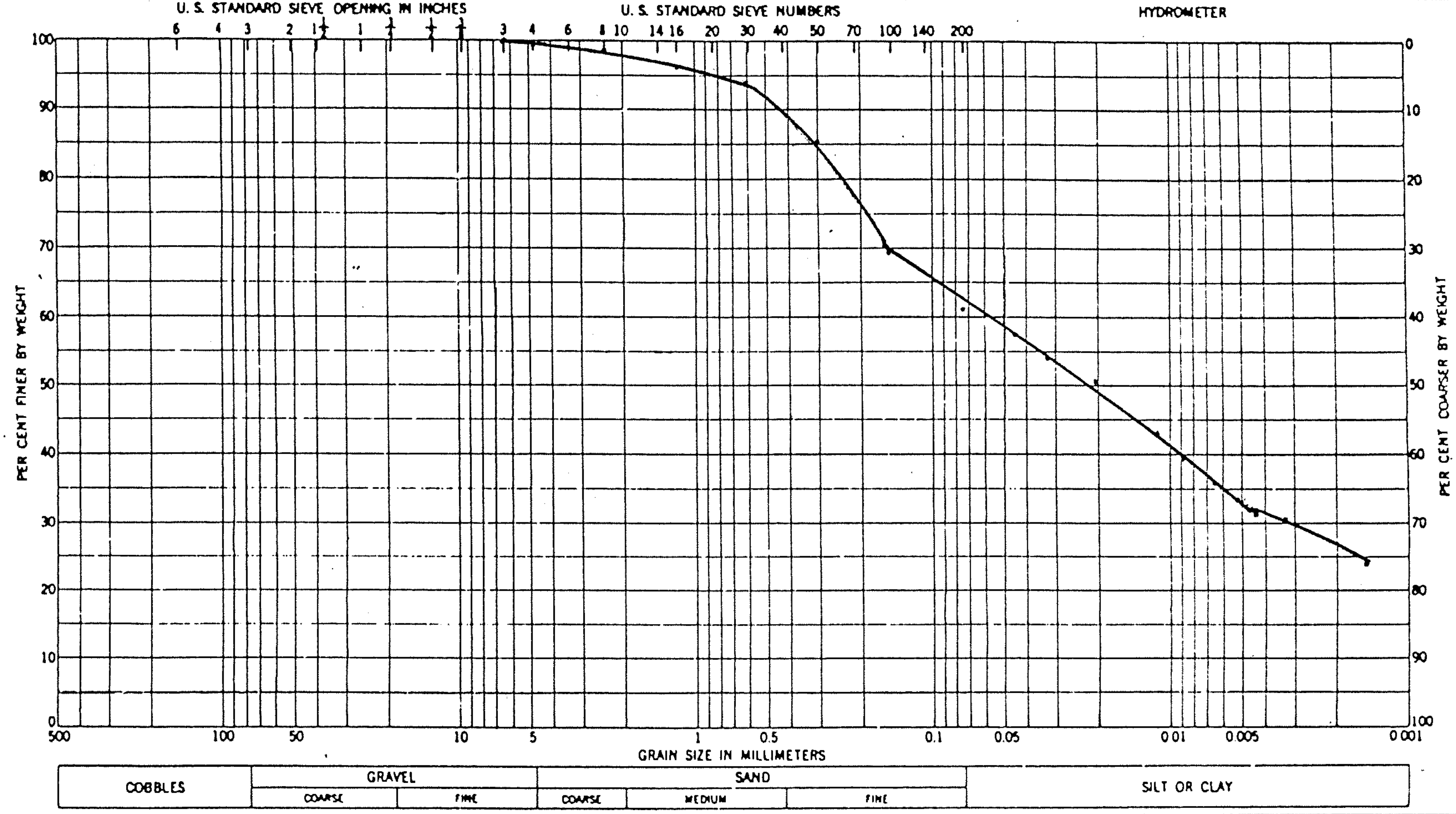
Project GRANGER LF TYPE 1

File No.

Date

REPORT OF SOIL ANALYSIS

3781M



Boring No.	Sample No.	Elev. or Depth	Classification	Nat w %	LL	PL	PI
B - 127	2	3 - 15'	CL	12.9	24.0	15.6	8.4

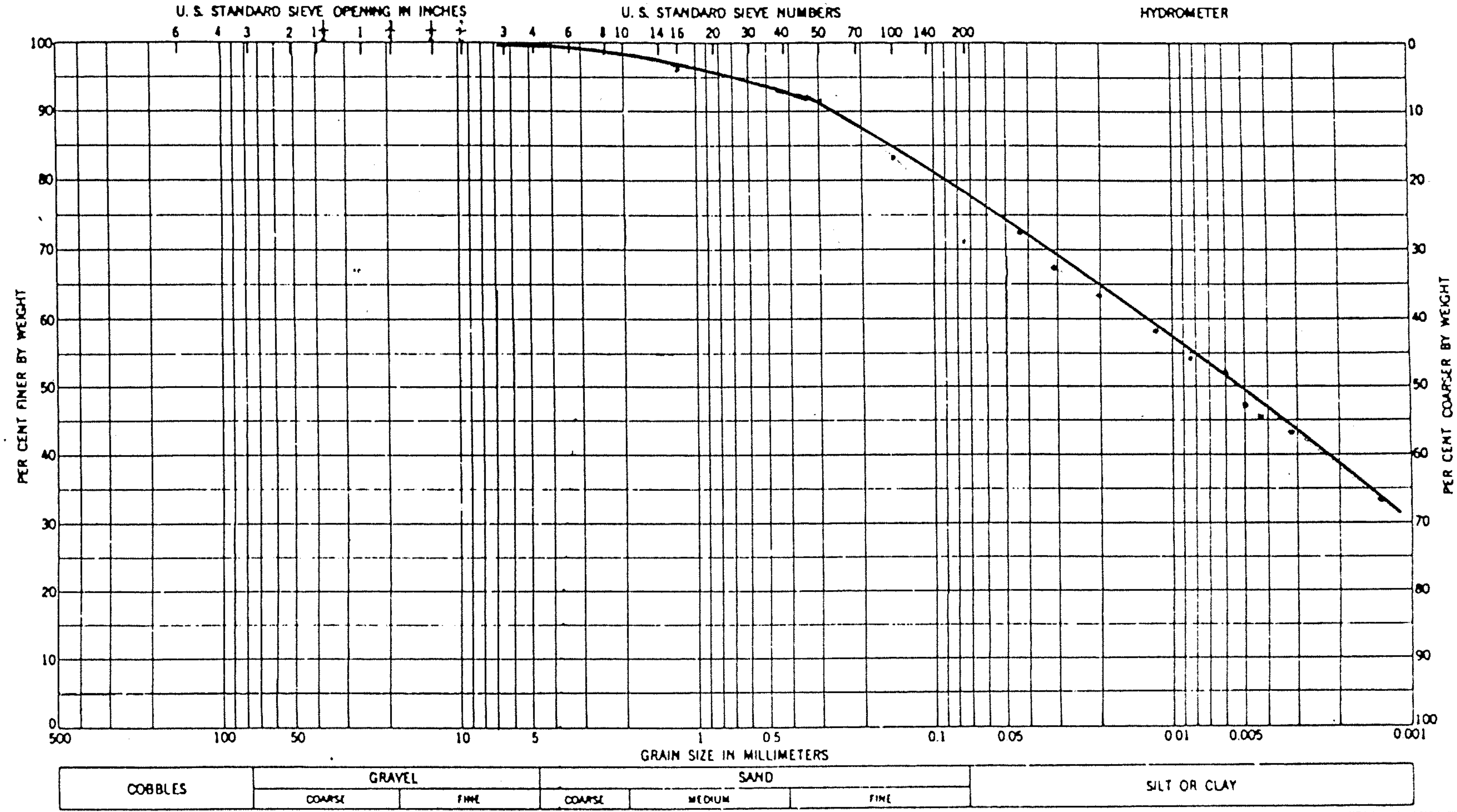
Project GRANGER LF TYPE 1

File No.

Date

REPORT OF SOIL ANALYSIS

3781M



Boring No.	Sample No.	Elev. or Depth	Classification	Nat w %	LL	PL	PI
B - 34	2	4 - 12'	CL		30.9	15.7	15.2

Project GRANGER LF TYPE 1

File No.

Date

REPORT OF SOIL ANALYSIS

GRAIN SIZE ANALYSIS-MECHANICAL

Project Granger Landfill - Type I Job No. 380

Location of Project Clinton County Boring No. B-34 Sample No. 2

Description of Soil CL Depth of Sample 4 - 12'

Tested By M.D. Date of testing 12/19/80

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 sieve	200
No. 4 sieve	500
3/4 in.	1500

Wt. of dry sample + container	92.0
Wt. of container	9.5
Wt. of dry sample, W_s	82.5

Sieve analysis and grain shape

Sieve no.	Diam. (mm)	Wt. retained	% retained	% passing
3	6.4	.1	.1	99.9
4	4.8	.1	.1	99.9
8	2.4	1.5	1.8	98.2
16	1.2	2.8	3.4	96.6
30	0.6	4.2	5.1	94.9
50	0.3	7.3	8.8	91.2
100	0.15	13.6	16.5	83.5
200	0.075	18.9	29.9	70.1
Pan		82.5	100	0

% passing = 100 − $\sum$ % retained.

GRAIN SIZE ANALYSIS-HYDROMETER METHOD

Project Granger Landfill - Type I Job No. 380

Location of Project Clinton County Boring No. 34 Sample No. 2

Description of Soil CL Depth of Sample 4 - 12'

Tested By M.D. Date of Testing 12/16/80

Hydrometer analysis

Hydrometer no. ASTM 152H G_s of solids = 2.65 a = 1.0

Dispersing agent sodium metaphosphate Amount 4% solution Wt. of soil, W_s 50g

Zero correction 0 Meniscus correction +1

Date	Time of reading	Elapsed time, min	Temp., °C	Actual Hyd. reading R_a	Corr. Hyd. reading R_c	% Finer	Hyd. Corr. only for meniscus, R	L from Table 6-5	$\frac{L}{t}$	K from Table 6-4	D, mm
12/16	10:56	1	20	40	40	80	41	9.6	9.6	.0137	.042
12/16	10:57	2	20	37	37	74	38	10.1	5.05	.0137	.031
12/16	11:00	5	20	35	35	70	36	10.4	2.08	.0137	.020
12/16	11:10	15	19.9	32	31.97	63.9	33	10.9	.727	.0137	.012
12/16	11:25	30	19.8	30	29.94	59.9	31	11.2	.373	.0137	.0084
12/16	11:55	60	19.7	29	28.91	57.8	30	11.4	.190	.0137	.0060
12/16	12:25	90	19.5	26	25.85	51.7	27	11.9	.132	.0137	.0050
12/16	12:55	120	19.3	25	24.79	49.6	26	12.0	.100	.0138	.0044
12/16	2:55	240	18.5	24	23.60	47.2	25	12.2	.051	.0139	.0031
12/17	10:55	1440	18.2	19	18.54	37.1	20	13.0	.009	.0410	.0013

$R_c = R_{actual}$ − zero correction + C_T % finer = $R_c(a)/W_s$ $D = K\sqrt{L/t}$

GRAIN SIZE ANALYSIS-MECHANICAL

Project Granger Landfill - Type I Job No. 380

Location of Project Clinton County Boring No. B-127 Sample No. 2

Description of Soil CL Depth of Sample 3 - 15'

Tested By M.D. Date of testing 12/19/80

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 sieve	200
No. 4 sieve	500
3/4 in.	1500

Wt. of dry sample + container	124.2
Wt. of container	9.5
Wt. of dry sample, W_s	114.7

Sieve analysis and grain shape

Sieve no.	Diam. (mm)	Wt. retained	% retained	% passing
3	6.4	0	0	100.0
4	4.8	.6	.5	99.5
8	2.4	2.1	1.8	98.2
16	1.2	4.0	3.5	96.5
30	0.6	6.7	5.8	94.2
50	0.3	16.8	14.7	85.3
100	0.15	34.8	30.3	69.7
200	0.075	44.2	38.5	61.5
Pan		114.7	100.0	0

% passing = 100 − $\sum$ % retained.

GRAIN SIZE ANALYSIS-HYDROMETER METHOD

Project Granger Landfill - Type I Job No. 380

Location of Project Clinton County Boring No. 127 Sample No. 2

Description of Soil CL Depth of Sample 3 - 15'

Tested By M.D. Date of Testing 12/16/80

Hydrometer analysis

Hydrometer no. ASTM 152H G_s of solids = 2.65 a = 1.0

Dispersing agent sodium metaphosphate Amount 4% solution Wt. of soil, W_s 50g

Zero correction 0 Meniscus correction +1

Date	Time of reading	Elapsed time, min	Temp., °C	Actual Hyd. reading R_a	Corr. Hyd. reading R_c	% Finer	Hyd. Corr. only for meniscus, R	L from Table 6-5	$\frac{L}{t}$	K from Table 6-4	D, mm
12/16	11:36	1	20	32	32	64	33	10.9	10.9	.0137	.045
12/16	11:37	2	20	30	30	60	31	11.2	5.6	.0137	.032
12/16	11:40	5	20	28	28	56	29	11.5	2.3	.0137	.021
12/16	11:50	15	20	24	24	48	25	12.2	.813	.0137	.012
12/16	12:05	30	20	22	22	44	23	12.7	.423	.0137	.0089
12/16	12:35	60	19.9	20	19.97	39.9	21	12.9	.215	.0137	.0064
12/16	1:05	90	19.9	19	18.97	37.9	20	13.0	.144	.0137	.0052
12/16	1:35	120	19.8	18	17.94	35.9	19	13.2	.110	.0137	.0045
12/16	3:35	240	19.6	17	16.88	33.8	18	13.3	.055	.0137	.0032
12/16	11:35	1440	18.4	14	13.58	27.2	15	13.8	.010	.0139	.0014

$R_c = R_{actual} -$ zero correction $+ C_T$ % finer $= R_c(a)/W_s$ $D = K\sqrt{L/t}$

GRAIN SIZE ANALYSIS - MECHANICAL

Project Granger Landfill - Type I Job No. 380

Location of Project Clinton County Boring No. B-39 Sample No. 2

Description of Soil CL Depth of Sample 7 - 12'

Tested By M.D. Date of testing 12/19/80

Soil Sample Size (ASTM D1140-54)

Nominal diameter of largest particle	Approximate minimum Wt. of sample, g
No. 10 sieve	200
No. 4 sieve	500
3/4 in.	1500

Wt. of dry sample + container	12.5
Wt. of container	9.5
Wt. of dry sample, W_s	116.0

Sieve analysis and grain shape

Sieve no.	Diam. (mm)	Wt. retained	% retained	% passing
3	6.4	1.7	1.5	98.5
4	4.8	1.7	1.5	98.5
8	2.4	3.1	2.7	97.3
16	1.2	4.6	4.0	96.0
30	0.6	7.2	6.2	93.8
50	0.3	16.6	14.3	85.7
100	0.15	34.9	30.1	69.9
200	0.075	52.3	45.1	54.9
Pan		116	100	0

% passing = 100 − $\sum$ % retained.

GRAIN SIZE ANALYSIS-HYDROMETER METHOD

Project Granger Landfill - Type I Job No. 380

Location of Project Clinton County Boring No. 39 Sample No. 2

Description of Soil CL Depth of Sample 7 - 12'

Tested By M.D. Date of Testing 12/16/80

Hydrometer analysis

Hydrometer no. ASTM 152H G_s of solids = 2.65 a = 1.0

Dispersing agent sodium metaphosphate Amount 4% solution Wt. of soil, W_s 50g

Zero correction 0 Meniscus correction +1

Date	Time of reading	Elapsed time, min	Temp., °C	Actual Hyd. reading R_a	Corr. Hyd. reading R_c	% Finer	Hyd. Corr. only for meniscus, R	L from Table 6-5	$\frac{L}{t}$	K from Table 6-4	D, mm
12/16	9:11	1	20	30	29	58	31	11.2	11.2	.0137	.046
12/16	9:12	2	20	28	27	54	29	11.5	5.75	.0137	.033
12/16	9:15	5	20	25	24	48	26	12.0	2.40	.0137	.021
12/16	9:30	15	19.9	24	22.97	45.9	25	12.2	.813	.0137	.012
12/16	9:47	37	19.8	22	20.94	41.9	23	12.5	.338	.0137	.0080
12/16	10:10	60	19.7	20	18.91	37.8	21	12.9	.215	.0137	.0064
12/16	10:40	90	19.5	19	17.85	35.7	20	13.0	.144	.0137	.0052
12/16	11:10	120	19.3	19	17.79	35.6	20	13.0	.108	.0138	.0045
12/16	1:10	240	18.5	18	16.60	33.2	19	13.2	.055	.0139	.0033
12/17	9:10	1440	17.8	11	9.46	18.9	12	14.3	.010	.0140	.0014

$R_c = R_{actual}$ − zero correction + C_T % finer = $R_c(a)/W_s$ $D = K\sqrt{L/t}$

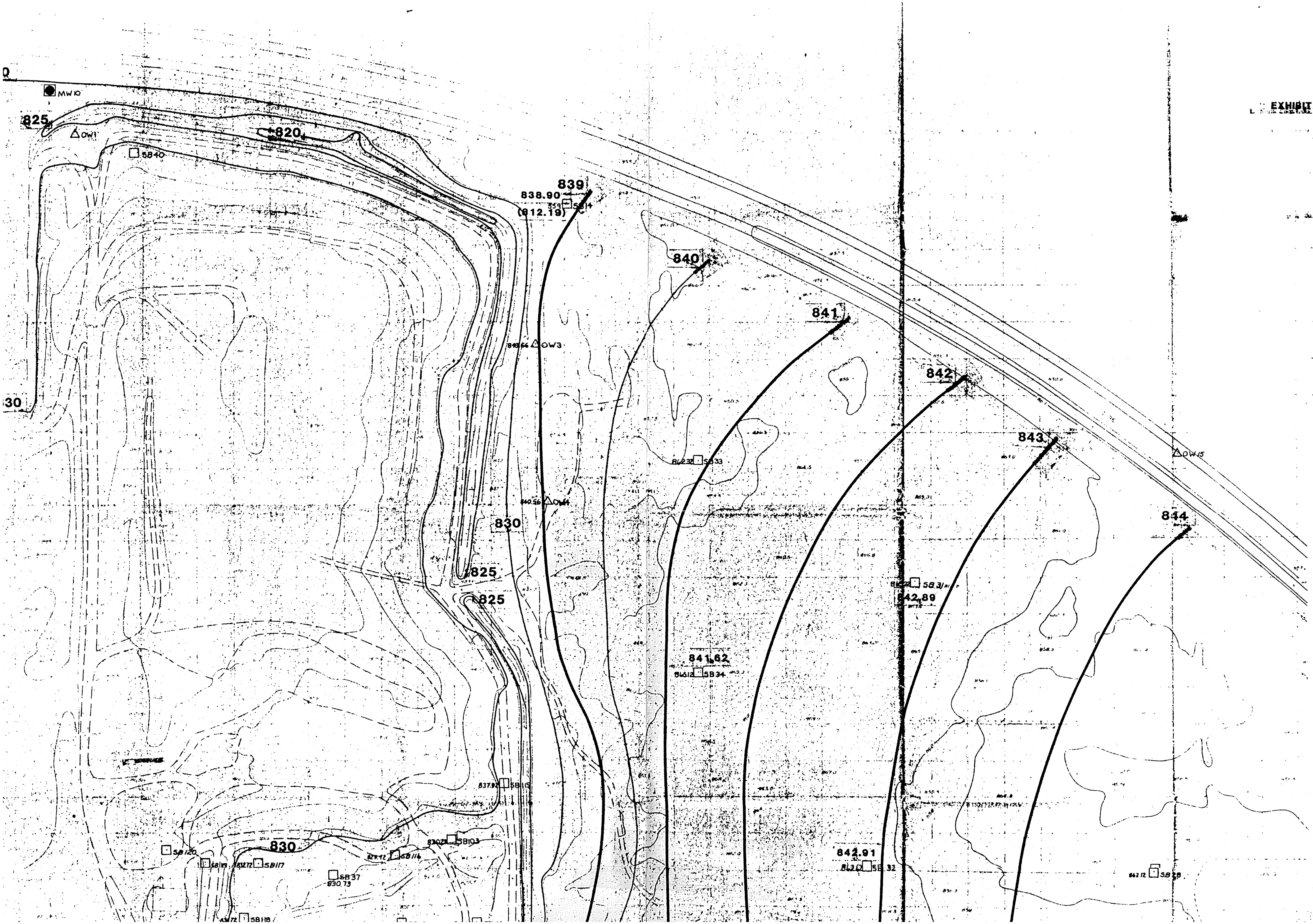
Appendix H

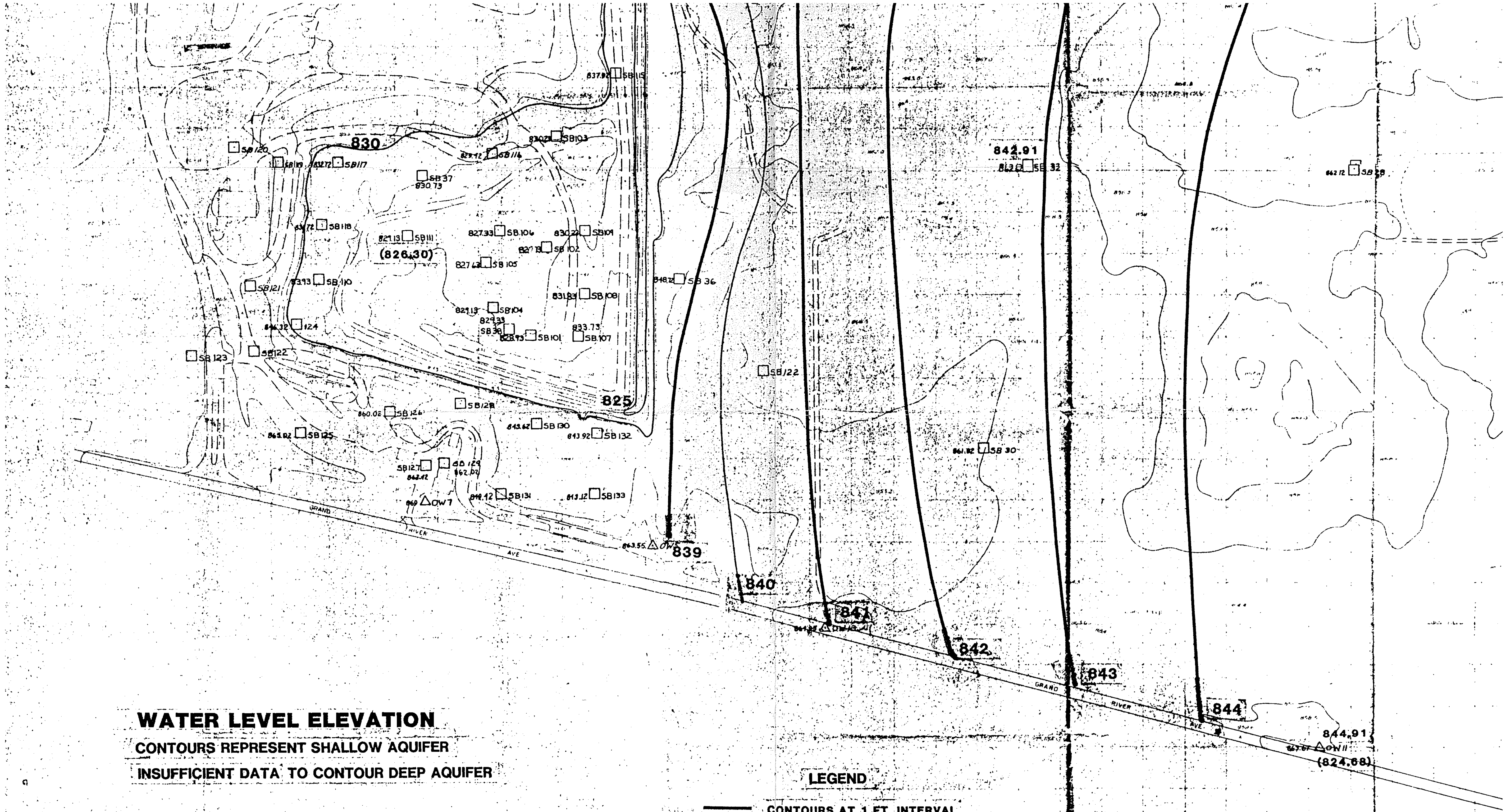
Natural Moisture Content

Natural Moisture Contents

Boring #	Sample #	Interval (feet)	Moisture Content (%)
B-34	Split Spoon #1	39 - 41	8.2
B-34	Split Spoon #2	44 - 47	16.2
B-37	2	8 - 9	11.5
B-112	3	7 - 9	9.7
B-114	2	5 - 7	11.4
B-122	1	0 - 3	19.7
B-127	1	0 - 3	12.9
B-127	2	3 - 15	18.1
B-128	1	0 - 8	19.4
B-131	2	5 - 12	14.4
B-132	2	1.5 - 3	13.3
B-132	3	3 - 5	19.4
B-133	1	0 - 3	18.0

EXHIBIT B


MW10
825
OW1
820
SB40
839
838.90
(812.19)
SB14
840
841
OW3
842
843
OW15
SB33
OW4
830
825
825
844
SB 31
842.89
841.62
SB34
837.92
SB115
SB120
SB119
SB117
830
SB114
SB103
SB37
830.73
SB118
842.91
SB 32
SB 38
30



WATER LEVEL ELEVATION

CONTOURS REPRESENT SHALLOW AQUIFER

INSUFFICIENT DATA TO CONTOUR DEEP AQUIFER

LEGEND

━━	CONTOURS AT 1 FT. INTERVAL
——	CONTOURS AT 5 FT. INTERVAL
844.28	SHALLOW WELL STATIC WATER LEVEL
(824.83)	DEEP WELL STATIC WATER LEVEL

Granger Land Development Co.

6025 Aurelius Road Lansing, Michigan Phone: 393-2130

Prepared by

Date:

Snell Environmental Group
1120 May Street Lansing, Michigan

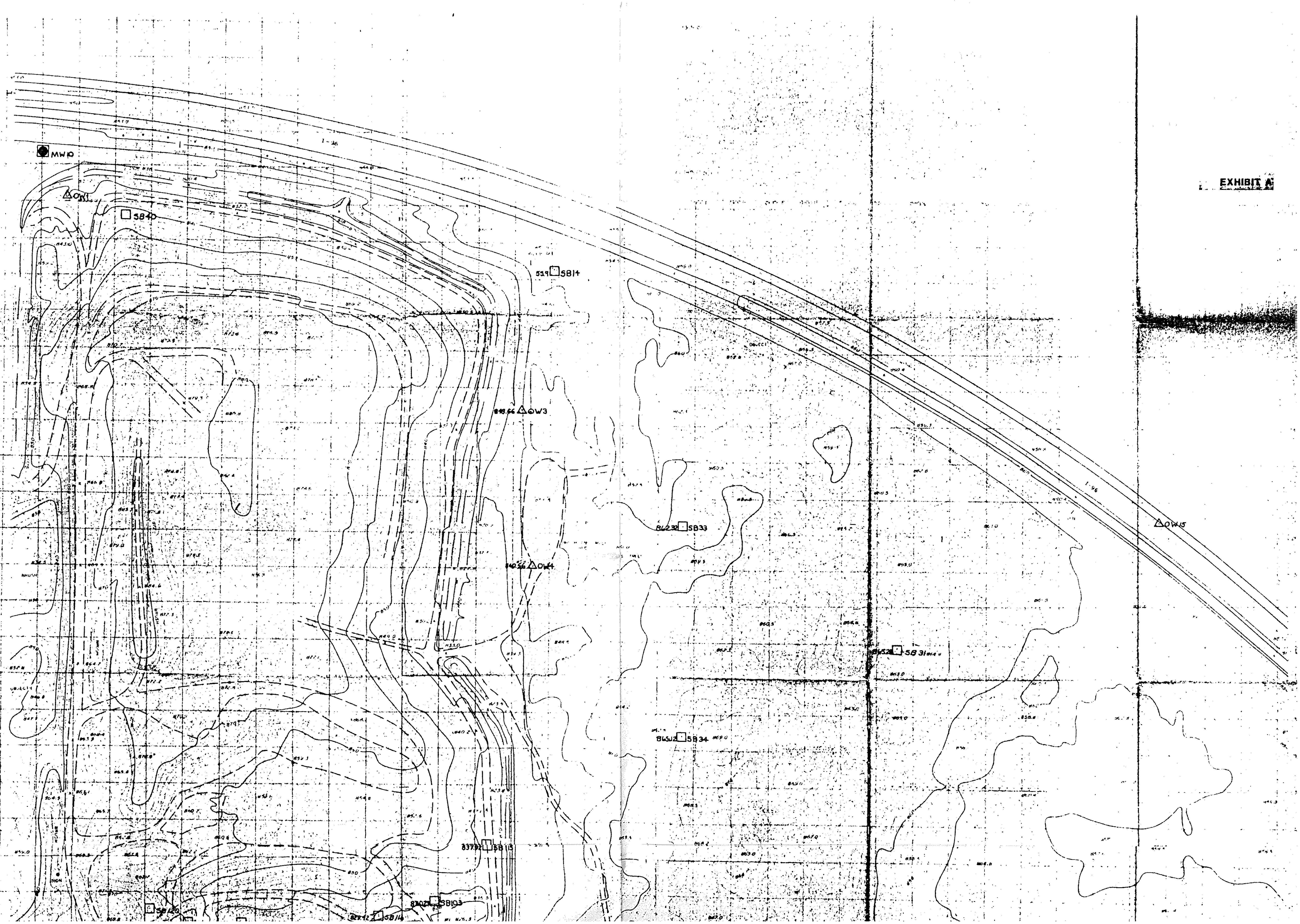
North

0 50 100 200 300

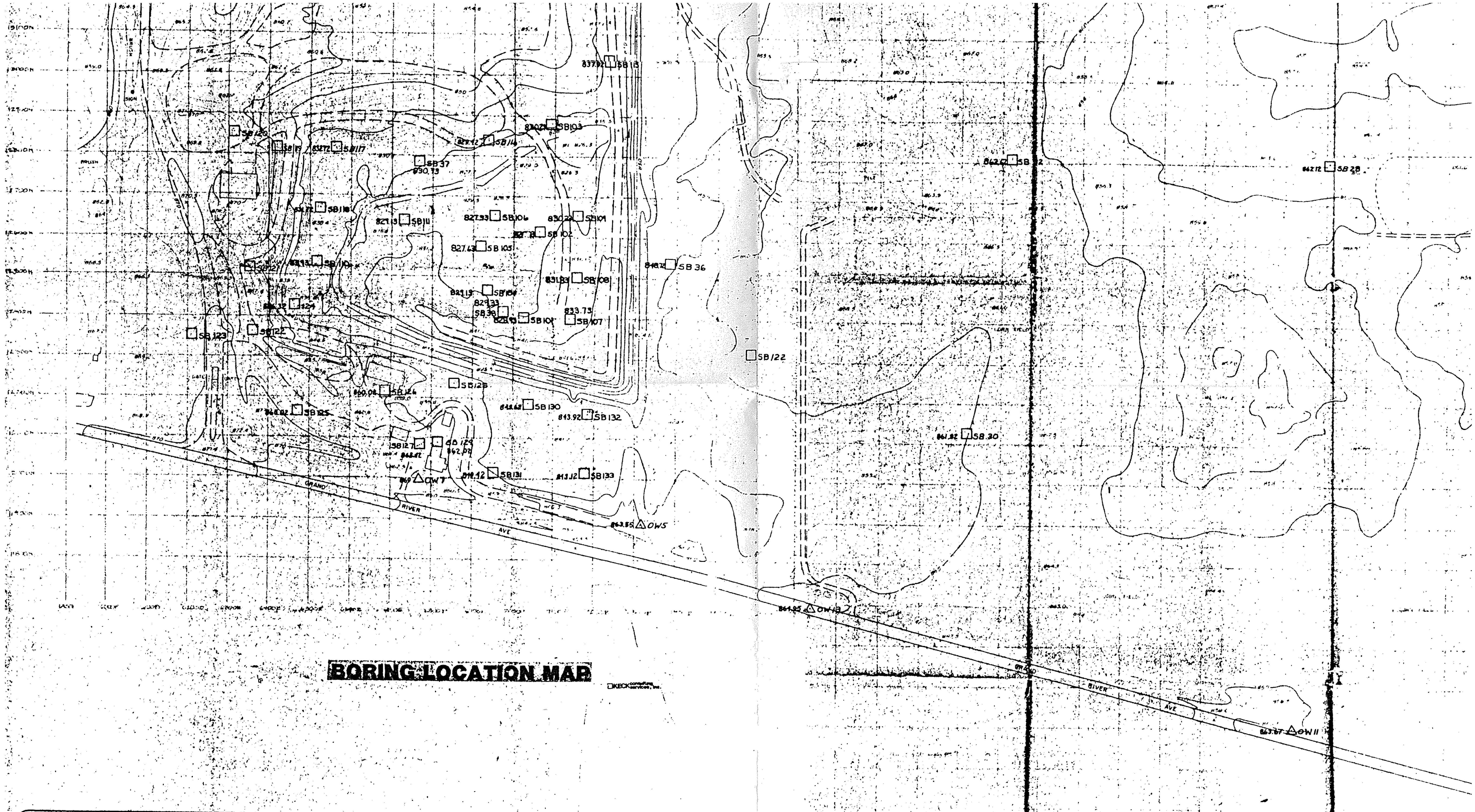
Scale: 1" = 100'

Topographic features compiled photogrammetrically by
Northern Aerial Survey Inc.
HASTINGS, MICHIGAN
DATE OF PHOTOGRAPHY: NOV. 18, 1979
SEPT. 10, 1980

EXHIBIT A



MW10
OW1
SB40
I-96
559 SB14
849.66 OW3
862.30 SB33
840.56 OW4
OW15
845.28 SB31
845.02 SB34
837.92 SB15
830.21 SB103
829.12 SB14
SB120
BRUSH
SIGN



BORING LOCATION MAP

KBECK consulting services, inc.

Granger Land Development Co.

6025 Aurelius Road Lansing, Michigan Phone: 393-2130

Prepared by

Snell Environmental Group
1120 May Street Lansing, Michigan

Date:

North

Scale: 1" = 100'

0 50 100 200 300

Topographic features compiled photogrammetrically by
Northern Aerial Survey Inc.
HASTINGS, MICHIGAN
DATE OF PHOTOGRAPHY: NOV. 10, 1978
SEPT. 10, 1980

**Keck Consulting Services, Inc. 1981.
"Hydrogeological Investigation, Modification of Existing Facility, Granger Landfill, Section 29, T.5N, R.3W, Watertown Township, Clinton, County, Michigan."**

APPENDIX IV

Hydrogeologic Investigation
Modification of Existing Facility
Granger Landfill

Section 29, T.5N., R.3W.,
Watertown Township
Clinton County, Michigan
August 11, 1981

Figures

Appendices

Reference

U.S. Department of the Interior, Geological Survey, 1973. "Water-Supply Development and Management Alternatives for Clinton, Eaton, and Ingham Counties, Michigan," WSP 1969, by Vanlier, K.E. and Wood, W.W., and Brunett, J.O.

INTRODUCTION

This report is issued as a supplement to an earlier study released by this office on January 13, 1981 and titled "Hydrogeologic Investigation, Granger Landfill Expansion, Section 29, T.5N., R.3W., Watertown Township, Clinton County, Michigan." The earlier report addressed existing conditions at the entire Granger facility. This supplement is intended to specifically discuss the southern section of the existing landfill and modifications proposed for this area to bring it into compliance with Michigan's Act 64, P.A. 1979 (the Hazardous Waste Management Act) as a hazardous waste disposal facility.

GEOLOGY

Bedrock

The site is mapped as being underlain by the Saginaw Formation, a sequence of primarily sandstone and shale with some thin beds of coal and limestone. The relative proportions of shale and sandstone vary with location. Borings conducted as part of our earlier investigation indicate that the bedrock/drift interface occurs at an elevation of 780-790 feet msl.

Glacial Deposits

The glacial sediments existing at the site are mapped as ground moraine, eroded and filled at some locations with glacial outwash. The ground moraine is composed of till -

unsorted, ice-laid sediments which are often predominantly clay with varying amounts of gravel, sand and silt. Outwash deposits, conversely, are water-laid, generally sorted and composed of primarily sand and gravel. Drift thickness at the site ranges from approximately 30 to 90 feet.

The logs of the numerous soil borings placed in the study area reflect this depositional setting. The locations of these borings are shown in Figure 2 and the logs are included in Appendix A. The exact locations of soil borings 112 through 115 were obliterated by construction activity before they could be surveyed. They were located approximately in the center of the existing pit in the area bounded by grid lines 12600N, 12300N, 6600E and 6900E. Many of the borings revealed primarily clay while others penetrated considerable thicknesses of sand. There is no clear-cut trend to the proportions of sand and clay seen in the borings. Sandy soils appear to be more common in the northeast and north areas of the site. The southwest and central areas show more clay but there are marked exceptions to both of these trends.

HYDROGEOLOGY

Bedrock

Depending primarily upon the thickness of sandstone present at a given location, the Saginaw Formation can be a prolific source of ground water. It furnishes the bulk of the ground water withdrawn in the Lansing metropolitan area. A 1973 study by the U.S. Geological Survey of water-supply development for the Tri-County area indicated regional ground-water flow to the north in the Saginaw. This regional pattern is significantly influenced locally by withdrawals for Lansing and other municipal and industrial supplies. The actual direction of flow beneath the site must still be verified. Monitor wells completed in the Saginaw will be required for this determination and are planned to finalize the monitoring program for the entire facility. Ground-water flow direction in the bedrock will be determined at that time.

The Saginaw exists under confined conditions. The 1973 study indicates a potentiometric surface in the Saginaw of approximately 800 feet msl at that time. It is possible that this surface is now somewhat lower owing to pumpage since then.

Glacial Drift

The dominant ground moraine deposits in the area are generally poor sources of ground water. The outwash deposits existing at some locations probably yield adequate supplies for domestic use. Available domestic well logs for the area around the facility were obtained from the Michigan Department of Natural Resources and are presented in Appendix A. Their locations are shown in Figure 1.

Of the 35 logs available, only one is for a well completed in the drift. Well 31-1 is completed in sand and gravel at 136 feet bgl and apparently penetrated predominantly clayey sediments to that depth. The remainder of the wells are completed in the Saginaw.

As explained in the earlier report, shallow ground-water flow in the immediate vicinity of the site is primarily controlled by a drainage ditch which runs along the east edge of the proposed disposal area and drains its interior. This drain has been in place for some time and effectively controls ground-water levels in the immediate area of the pit. Water flows to the north through the drain, discharging to Openlander Drain which, in turn, flows into the Looking Glass River.

Existing unsaturated thicknesses at the site are insufficient to meet the requirements of Act 64 without modification. The modifications proposed for the site include a leachate collection system overlying a liner of five feet of compacted clay. This primary liner will be separated from a secondary liner of compacted clay by one foot of sand containing drainage tiles. A ground-water control system will be installed four feet beneath the secondary liner and should control groundwater levels adequately to assure maintenance of the required seven feet of clearance between the water table and base of fill.

CLAY LINER

As detailed in the engineering plans for this facility, a double liner system of compacted clay is proposed. The primary liner of five feet of compacted clay will be underlain with a second, back-up liner of two feet of compacted clay.

The January, 1981 report discussed the results of liner material testing at some length. There were two fairly distinct clay types found at the site, a brown clay till near the surface and a gray clay at greater depths. Laboratory testing indicated that the brown clay tills meet the requirements of Act 64 for liner material in terms of both permeability and Unified Soil Classification. The gray clay required greater compactive effort to achieve the required permeabilities.

The brown clay till appears to be the better choice for liner material. It is possible to attain the dry density required with the material at its field moisture content of 15 to 17 percent but better results can be achieved with less effort if the clay is dried to 8 to 13 percent moisture, closer to the optimum moisture content determined in the laboratory.

GROUND-WATER MONITORING

Monitoring of ground-water quality should be conducted in both the glacial drift and the bedrock. The proposed engineering modifications afford two excellent opportunities for ground-water quality monitoring. The sand buffer between the primary and secondary liners will be the first site where any problems with the primary liner will appear. Also, any leachate escaping the liner system should appear in the ground-water control system before it reaches any monitor wells. The presence of leachate in the effluents from either of these systems would reveal any problems early enough to institute effective remedial measures. Seven wells have already been completed in the drift at the locations shown in Figure 3. These coupled with monitoring the effluent from the liner and ground-water control systems should permit adequate determination of the quality of any water reaching the water table from the landfill area.

At least three monitor wells will be completed in the bedrock. Proposed locations are the southeast corner of the property and the northwest and northeast corners of the existing landfill area as shown in Figure 3. These wells are intended to serve the entire disposal facility. Due to the lack of site specific information on ground-water flow in the bedrock, an additional well may be required after the first three have been installed and the direction of flow determined.

RECOMMENDATIONS

A strong quality control program should be conducted for all phases of liner construction. Of primary importance is source control of the proposed liner clays to ensure suitability of the materials used. Such control should include frequent pre-construction sampling for laboratory testing including grain-size analysis and Atterberg limits for soils classification. This testing would indicate if additional moisture-compaction-permeability testing would be warranted by a significant change in material.

Tests to be conducted on the liner during construction should include frequent field determinations of in-situ moisture content and dry density for verification of required compaction.

Additional ground-water monitor wells should be installed. At least three monitor wells should be installed in the bedrock at the locations previously discussed. Depending upon the flow direction revealed by these wells, an additional bedrock well may be required.

The drift and bedrock monitor wells should be sampled at the frequency and analyzed for the parameters dictated by Act 64. The effluent from the ground-water control system should be sampled at the same intervals as the wells. Any water produced from the sand buffer between the liners should be analyzed, at least for indicator parameters; if water is frequently present in this zone, it will be important to determine its source.

Should there be questions regarding this report, please contact our office.

Respectfully submitted,

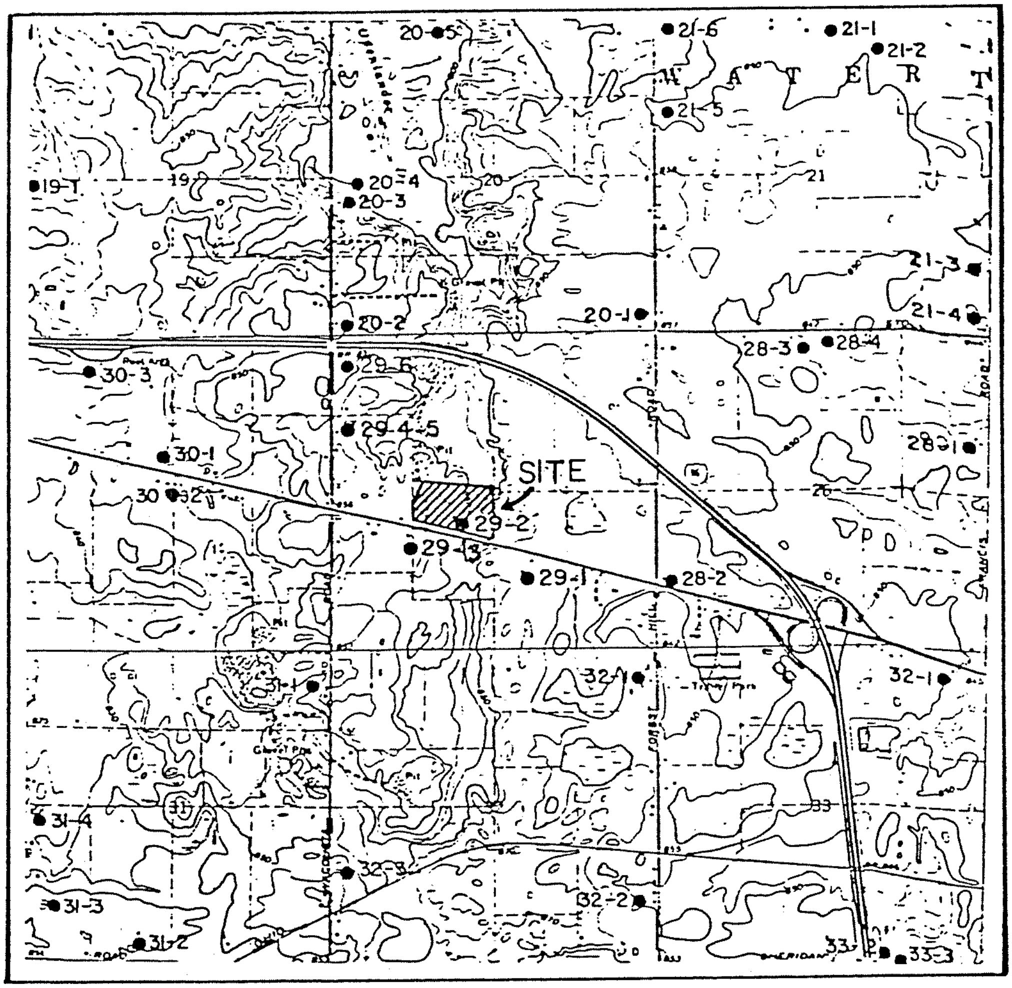
KECK CONSULTING SERVICES, INC.

Joseph W Sheahan

Joseph W. Sheahan
Hydrogeologist

Figure 1

Site and Domestic Water Well Locations



ADAPTED FROM USGS WACOUSTA TOPOGRAPHIC QUADRANGLE

SITE & DOMESTIC WATER WELL LOCATION
GRANGER LAND DEVELOPMENT CO.
PROPOSED HAZARDOUS WASTE FACILITY
WATERTOWN TWP., CLINTON CO., MI.

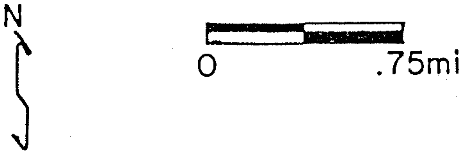


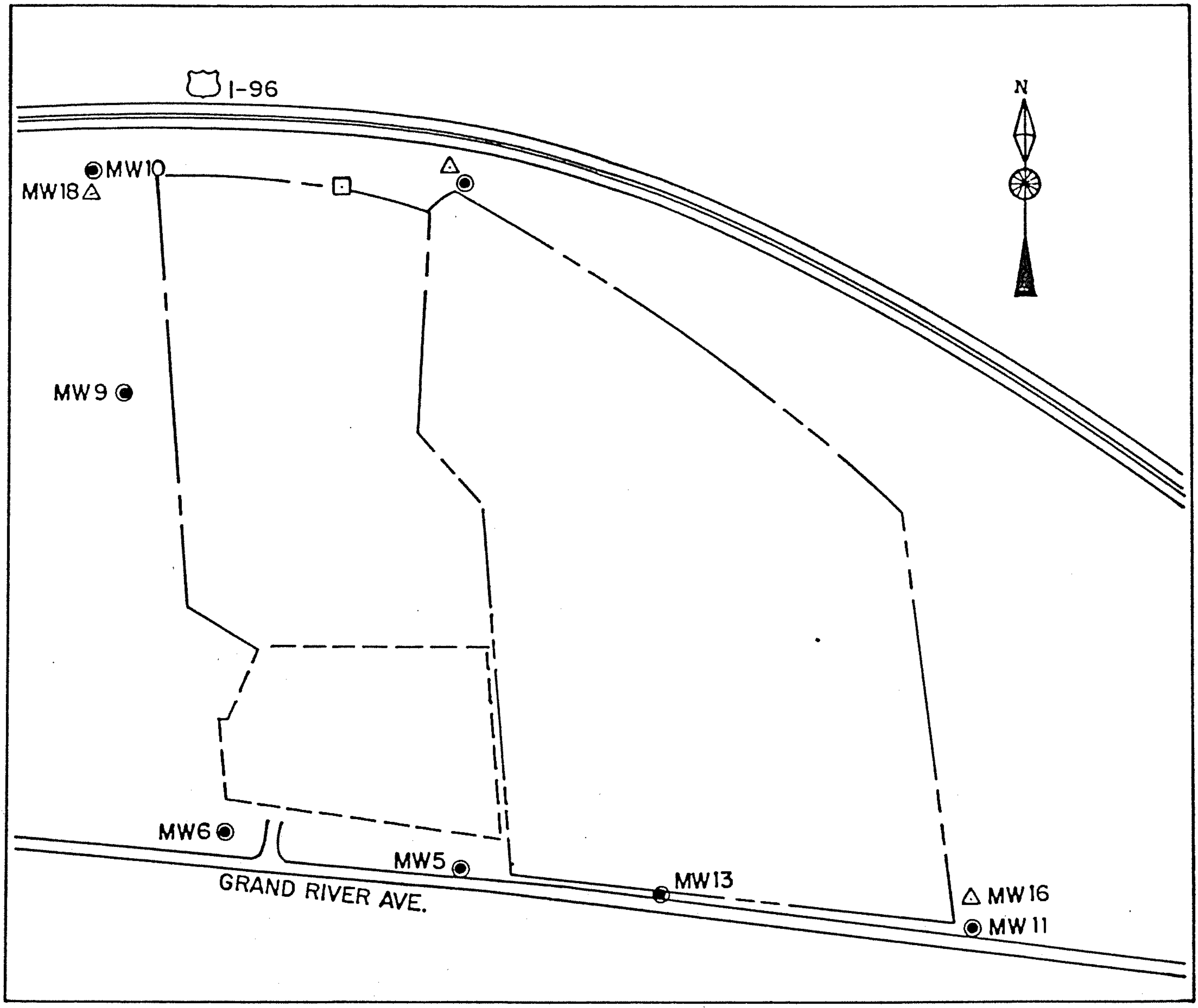
FIGURE 2

SOIL BORING AND OBSERVATION WELL LOCATIONS

Figure 3

Monitor Well Locations

FIGURE 3



MODIFICATION OF EXISTING FACILITY
GRANGER LANDFILL
SECTION 29, WATERTOWN TOWNSHIP
CLINTON COUNTY, MICHIGAN

LEGEND

— — — — EXISTING SOLID WASTE BOUNDARY (TYPE II)
——— — PROPOSED SOLID WASTE BOUNDARY (TYPE II)
- - - - -·- — HAZARDOUS WASTE BOUNDARY
● — EXISTING MONITOR WELL
△ — PROPOSED BEDROCK MONITOR WELL
⊡ — SURFACE WATER SAMPLING LOCATION

☐KECK consulting services, Inc.
8/11/81

APPENDIX I

Boring Logs and Lithologic Profiles

BORING LOGS WITHIN LAST PERMIT CYCLE

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	**PROJECT NUMBER:**	257-0739
PROJECT LOCATION:	Watertown Township	**BORING/WELL NUMBER:**	P-28r
LOGGED BY:	Michael C. Serafini, CPG	**DATE:**	1/14/2020
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	**TOTAL DEPTH DRILLED:**	34'
SCREEN TYPE:	2" x 5' PVC, #10 slot	**CASING TYPE:**	2" PVC
GRAVEL PACK TYPE:	K&E WP-1	**GROUT TYPE:**	Bent. Slurry (BS) Holeplug (HP)
CASING GUARD TYPE:	Granger Guard	**WELL DEVELOPMENT TYPE:**	Surge and Pump
SCREENED INTERVAL:	28-33'	**GRAVEL PACK INTERVAL:**	25-33'
GROUT INTERVAL:	HP 22-25' BS 6-22' Ctngs. & HP 2-6'	**DEPTH TO WATER:**	~25 feet
GROUND ELEVATION:	NA	**TOP OF CASING ELEVATION:**	864.57'

DEPTH/INTERVAL	**LITHOLOGIC DESCRIPTION**
0~5.5'	**Clay Brown:** brown, light brown, and gray mottling, silty clay matrix, moist, soft to firm
~5.5~8'	**Clay Till:** medium brown becoming grayish brown with depth, silty clay matrix with trace sand content,
	trace pebble content as very fine to medium-sized gravel, low moisture, stiff
~8-8.9'	**Clayey Sand:** reddish brown, fine to coarse grained with some clay binder, moist
8.9~16'	**Sand & Gravel:** light brown to tan, very fine to very coarse-grained sand with very fine to very coarse-sized
	gel, all in varying percentages throughout the interval, low moisture
~16~20'	**Interbedded Sand & Silt:** tan, very fine to medium-grained sand interbedded with light brown silt, sand has
	low moisture content whereas silt is wet
~20~24'	**Sand & Gravel:** tan, predominantly fine to medium-grained sand with trace coarse to very coarse content,
	the upper portion of the interval has thin gravel interbedding, gravel is very fine to fine sized
~24~26'	**Sandy Silt:** light brown, silt with some very fine to fine-grained sand, saturated at ~25'
26-28.4'	**Sand & Gravel:** tan, fine to medium-grained sand with trace coarse content with very fine to medium-sized
	gravel, saturated
28.4-34'	**Interbedded Silt & Sand:** tan to light brown, silt and sandy silt interbedded with very fine-grained sand
	saturated
34'	**End of Borehole**

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	**PROJECT NUMBER:**	257-0739
PROJECT LOCATION:	Watertown Township	**BORING/WELL NUMBER:**	MW-40r
LOGGED BY:	Michael C. Serafini, CPG	**DATE:**	1/13/2020
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	**TOTAL DEPTH DRILLED:**	34'
SCREEN TYPE:	2" x 5' PVC, #10 slot	**CASING TYPE:**	2" PVC
GRAVEL PACK TYPE:	K&E WP-1	**GROUT TYPE:**	Bent. Slurry (BS) Holeplug (HP)
CASING GUARD TYPE:	Granger Guard	**WELL DEVELOPMENT TYPE:**	Surge and Pump
SCREENED INTERVAL:	29-34'	**GRAVEL PACK INTERVAL:**	24.8-34'
GROUT INTERVAL:	HP 22-24.8' BS 6-22' Ctngs. & HP 2-6'	**DEPTH TO WATER:**	~27 feet
GROUND ELEVATION:	NA	**TOP OF CASING ELEVATION:**	865.41'

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-5.5'	**Clay Brown:** brown, light brown, and gray mottling, silty clay matrix, moist, firm to stiff
5.5-14.3'	**Clay Till:** medium brown becoming grayish brown with depth, silty clay matrix with trace sand content,
	trace pebble content as very fine to medium-sized gravel, low moisture, stiff
14.3-27'	**Sand:** brown, very fine to fine grained with trace medium to coarse content, trace very fine gravel, observed
	sand and gravel lenses from 28-28.6', saturated at ~27'
27~32'	**Silt:** tan, saturated
~32-33.4'	**Sand:** tan, very fine to fine grained, saturated
33.4'	**End of Borehole**

Split-Spoon Sample Information

Interval	Blow Counts	Percent Recovery
8-10'	3,6,9,11	90%
13-15'	5,10,14,17	100%
18-20'	3,6,9,11	80%
23-25'	2,5,7,9	80%
28-30'	2,2,2,3	70%
30-32'	3,3,3,3	65%
32-34'	2,1,2,8	70%

NA: Not Available/Not Applicable

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	**PROJECT NUMBER:**	257-0739
PROJECT LOCATION:	Watertown Township	**BORING/WELL NUMBER:**	MW-44dr
LOGGED BY:	Michael C. Serafini, CPG	**DATE:**	1/10/2020
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	**TOTAL DEPTH DRILLED:**	44'
SCREEN TYPE:	2" x 5' PVC, #10 slot	**CASING TYPE:**	2" PVC
GRAVEL PACK TYPE:	K&E WP-1	**GROUT TYPE:**	Bent. Slurry (BS) Holeplug (HP)
CASING GUARD TYPE:	Granger Guard	**WELL DEVELOPMENT TYPE:**	Surge and Pump
SCREENED INTERVAL:	37-42'	**GRAVEL PACK INTERVAL:**	35-42'
GROUT INTERVAL:	HP 33-35' BS 6-33' Cuttings & HP 2-6'	**DEPTH TO WATER:**	~26 feet
GROUND ELEVATION:	NA	**TOP OF CASING ELEVATION:**	865.41'

DEPTH/INTERVAL	**LITHOLOGIC DESCRIPTION**
0-5.5'	**Clay Brown:** brown, light brown, and gray mottling, silty clay matrix, moist, firm to stiff
5.5-15.8'	**Clay Till:** medium brown becoming grayish brown with depth, silty clay matrix with trace sand content,
	trace pebble content as very fine to medium-sized gravel, low moisture, stiff
15.8~18'	**Sand:** brown, very fine to fine grained with trace medium to coarse content, trace very fine gravel, moist, "dirty"
~18~22'	**Sand & Gravel:** light brown to tan, very fine to very coarse-grained sand with very fine to coarse-sized gravel
	all in varying percentages throughout the interval, ~1" silt lense at 21', moist
~22-26.6'	**Sand:** tan, very fine to fine grained, increasing moisture with depth, saturated at ~26 feet
26.6-28.7'	**Sand & Gravel:** light brown to tan, very fine to very coarse-grained sand with very fine to coarse-sized gravel
	all in varying percentages throughout the interval, saturated
28.7~32'	**Silt:** tan, saturated
~32-36'	**Sand:** tan, very fine to fine grained, saturated
36-39.2'	**Clayey Silt:** tan, silt with some clay content, somewhat cohesive, very moist to wet
39.2-42.5'	**Interbedded Sand , Silt, & Clayey Silt:** light brown, very fine to fine-grained sand interbedded with tan silt,
	saturated
42.5-43.4'	**Clay:** gray, "lacustrine like," moist firm
43.4'	**End of Borehole**

PROJECT NAME:	Granger Watertown Township	**PROJECT NUMBER:**	257-0739
PROJECT LOCATION:	Watertown Township	**BORING/WELL NUMBER:**	MW-44dr

DEPTH/INTERVAL	**LITHOLOGIC DESCRIPTION**

Split-Spoon Sample Information

Interval	Blow Counts	Percent Recovery
4-6'	2,,6,8	75%
6-8'	3,7,10,12	100%
8-10'	4,8,13,15	100%
10-12'	5,8,12,16	0%
12-14'	3,5,7,12	100%
14-16'	4,5,7,8	100%
16-18'	3,4,3,2	0%
18-20'	1,2,1,3	75%
20-22'	2,2,2,2	85%
22-24'	1,2,3,4	10%
24-26'	3,4,7,8	10%
26-28'	4,3,2,2,	85%
28-30'	1,2,1,3	100%
30-32'	2,3,3,3	80%
32-34'	2,3,3,2	60%
34-36'	0,0,2,6	100%
36-38'	3,4,5,9	60%
38-40'	4,4,8,11	75%
40-42'	3,2,2,3	75%
42-44'	4,4,5,8	70%

NA: Not Available/Not Applicable

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	LMW-2r2
LOGGED BY:	Michael C. Serafini	DATE:	1/7/2020
DRILLING METHOD:	6 1/4" ID Hollow Stem Auger	TOTAL DEPTH DRILLED:	60.5'
SCREEN TYPE:	4" ID x 5' PVC #10 slot	CASING TYPE:	4" ID PVC
GRAVEL PACK TYPE:	K&E #1	GROUT TYPE:	Holeplug (hp)/Bent. Slurry (bs)
CASING GUARD TYPE:	NA	WELL DEVELOPMENT TYPE:	NA
SCREENED INTERVAL:	55.5-60.5'	GRAVEL PACK INTERVAL:	51-60.5'
GROUT INTERVAL:	hp 0-10' bs 10-51'	DEPTH TO WATER:	
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-12'	**Clay:** brown, silty/sandy and most to 2', then from 2-6' brown, silty/sandy and low moisture, from 6-8' gray grading to grayish brown and stiff, and from 8-12' gray to dark gray, silty matrix with trace pebbles
12-13.5'	**Sandy Silt:** brownish gray, silt with sand, somewhat cohesive, wet
13.5-60.5'	**Garbage:** black, refuse and soil mix, cutting return is wet to saturated throughout interval
61.75-63'	**Clay Till:** brownish gray, silty/sandy clay matrix with trace sand and small gravel, stiff low moisture content
63'	**End of Borehole**
	LMW-2r2 was installed as a replacement for LMW-2. The log presented above is for adjacent well LMW-2r. LMW-2 was over drilled and abandoned with 6 1/4" ID HSAs to a depth of 49' when well materials were recovered from the well. The augers were then advanced to 60.5' which is the measured depth of LMW-2.
	NA: Not Applicable/Not Available

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	230-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	GMW-10
LOGGED BY:	Michael C. Serafini, CPG	DATE:	3/2/2006
DRILLING METHOD:	7 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	35'
SCREEN TYPE:	4"x10', # 10 slot PVC	CASING TYPE:	4" PVC
GRAVEL PACK TYPE:	#6 Sand	GROUT TYPE:	Holeplug (HP)
CASING GUARD TYPE:	Granger Guard	WELL DEVELOPMENT TYPE:	NA
SCREENED INTERVAL:	13.5-23.5'	GRAVEL PACK INTERVAL:	11.6-35'
GROUT INTERVAL:	HP: 2.5-11.6'	DEPTH TO WATER:	~21'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-5'	**Clay:** brown, silty/sandy clay matrix, moist
5-12'	**Clay:** light brown, very silty clay matrix with some sand and trace pebbles, moist
12~25'	**Sand:** brown, very fine to coarse grained, by 17 feet cutting return is very fine to fine grained with silt, then by 20 feet the return is very fine to very coarse sand with some very fine to coarse gravel, then by 23 feet the return is very fine sand and silt, saturated at ~21'
~25-35'	**Clay Till:** gray, silty/sandy clay matrix, trace pebbles as very fine to fine gravel, moist
35'	**End of Borehole**
	The entire borehole was logged based on drill cutting return and changes in drill pressure.
	The intervals depicted are only estimates based on interpretation of field observations.
	Depth to water was determined in the field by measuring through the hollow stem auger.
	NA: Not Available/Applicable

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	GP-1
LOGGED BY:	Michael C. Serafini, CPG	DATE:	10/2/2006
DRILLING METHOD:	Direct Push	TOTAL DEPTH DRILLED:	19.6'
SCREEN TYPE.	NA	CASING TYPE:	NA
GRAVEL PACK TYPE:	NA	GROUT TYPE:	Bentonite Holeplug
CASING GUARD TYPE:	NA	WELL DEVELOPMENT TYPE:	NA
SCREENED INTERVAL:	NA	GRAVEL PACK INTERVAL:	NA
GROUT INTERVAL:	0.25-13.5'	DEPTH TO WATER:	~14'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-0.3'	**Clay Loam:** dark brown, silty, moist
0.3-3'	**Clay:** dark brown to medium brown, silty clay matrix, trace sand and pebble content, low cohesion, dry and brittle
3-4'	**Clay:** brownish gray, silty clay matrix, trace sand and pebble content, low cohesion, dry and brittle
4-5.6'	**Clay:** mottled brown and dark brown, silty/sandy clay matrix, low moisture, stiff, somewhat brittle
5.6-7.2'	**Clay:** mottled brown, gray and rust, silty/sandy clay matrix, trace pebbles, somewhat moist, firm
7.2-9.4'	**Clay Till:** grayish brown, very silty clay matrix with some sand content, sand content increases with depth, pebbles as very fine to coarse gravel in size, soft to firm
9.4-9.4-13.5'	**Clay Till:** brownish gray to gray, silty clay matrix, trace sand content, pebbles as very fine to coarse sized gravel, low moisture, firm to stiff
13.5-14'	**Clay Till:** brown, silty clay matrix, trace pebbles, low moisture, firm
14-19.6'	**Sand & Gravel:** very fine to very coarse sand with very fine to medium sized gravel in varying percentages, saturated, measured water level in open borehole at 9.6'
19.6' End of Borehole	**Sample Recovery Data**

Interval	**Recovery**
0-4'	**83%**
4-8'	**100%**
8-12'	**100%**
12-14'	**100%**
14-16'	**50%**
16-18'	**40%**
18-20'	**80%**

NA: Not Available/Applicable

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	GP-2
LOGGED BY:	Michael C. Serafini, CPG	DATE:	10/2/2006
DRILLING METHOD:	Direct Push	TOTAL DEPTH DRILLED:	12'
SCREEN TYPE:	NA	CASING TYPE:	NA
GRAVEL PACK TYPE:	NA	GROUT TYPE:	Bentonite Holeplug
CASING GUARD TYPE:	NA	WELL DEVELOPMENT TYPE:	NA
SCREENED INTERVAL:	NA	GRAVEL PACK INTERVAL:	NA
GROUT INTERVAL:	0-9.5'	DEPTH TO WATER:	~9'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-0.2'	**Clay Loam:** dark brown, silty, moist
0.2-4'	**Clay:** brown, very silty/sandy clay matrix, trace pebble content, generally low cohesion, dry and brittle
4-6'	**Clay:** mottled brown, with some gray and rust, silty/sandy clay matrix, root zone, dry, stiff, crumbles easily
6-8'	**Clay:** mottled gray with some rust and brown, very silty clay matrix with some sand content, very moist, soft
8-8.1'	**Clayey Sand & Silt:** gray, wet
8.1-10.2	**Silty Sand & Gravel:** rust, silt, very fine to very coarse sand mixed with varying percentages of very fine to coarse sized gravel, highest gravel content in lower foot of interval, lower half of interval is saturated, measured water level in open borehole at ~9' below grade
10.2-12'	**Clay Till:** dark gray, silty clay matrix, trace sand content, some pebbles, moist firm
12' End of Borehole	

Sample Recovery Data

Interval	**Recovery**
0-4'	**100%**
4-8'	**100%**
8-12'	**100%**

NA: Not Available/Applicable

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	GP-3
LOGGED BY:	Michael C. Serafini, CPG	DATE:	10/2/2006
DRILLING METHOD:	Direct Push	TOTAL DEPTH DRILLED:	12'
SCREEN TYPE:	NA	CASING TYPE:	NA
GRAVEL PACK TYPE:	NA	GROUT TYPE:	Bentonite Holeplug
CASING GUARD TYPE:	NA	WELL DEVELOPMENT TYPE:	NA
SCREENED INTERVAL:	NA	GRAVEL PACK INTERVAL:	NA
GROUT INTERVAL:	0-11'	DEPTH TO WATER:	~11.5'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-4'	**Clay:** varying degrees of brown, very silty/sandy clay matrix, trace pebble content of all sizes, dry, brittle
	tip of sampler has tan, dry silt
4-4.8'	**Clay:** dark brown, very silty clay matrix, very dry, powders easily
4.8-6.7'	**Clay:** mottled dark brown and black grading to dark brown, gray and rust mottling with depth, silty clay matrix with
	some sand, stiff, root zones in upper interval, low moisture in upper interval, then increase in moisture content
	with depth
6.7-7.4'	**Sand & Gravel:** brown, very fine to very coarse grained sand mixed with very fine to medium sized gravel,
	moist, measure 0' of water accumulation in open borehole at 8.1' below grade
7.4-8.1'	**Clay:** brown with some rust zones, sandy clay matrix with some silt content, trace pebbles, moist, firm
8.1-9.3'	**Clay:** mottled brown, gray rust and salmon, silty clay matrix,, moist, soft to firm
9.3-10.7'	**Clay Till:** gray, silty clay matrix, trace sand content, pebbles as very fine to coarse sized, gravel, low
	moisture, firm to stiff
10.7-11.5'	**Clay Till:** brown, silty clay matrix, trace pebbles, low moisture, firm
11.5-12'	**Silty Sand & Gravel:** rust, silt, very fine to very coarse sand mixed with varying percentages of very fine to
	coarse sized gravel, saturated, measured water level in open borehole at ~ 10.2'
12' End of Borehole	

Sample Recovery Data

Interval	Recovery
0-4'	100%
4-8'	100%
8-12'	100%

NA: Not Available/Applicable

STRATA
ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	GP-4
LOGGED BY:	Michael C. Serafini, CPG	DATE:	10/2/2006
DRILLING METHOD:	Direct Push	TOTAL DEPTH DRILLED:	12'
SCREEN TYPE:	NA	CASING TYPE:	NA
GRAVEL PACK TYPE:	NA	GROUT TYPE:	Bentonite Holeplug
CASING GUARD TYPE:	NA	WELL DEVELOPMENT TYPE:	NA
SCREENED INTERVAL:	NA	GRAVEL PACK INTERVAL:	NA
GROUT INTERVAL:	0-10.75'	DEPTH TO WATER:	~9.5'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-0.3'	**Clay Loam:** dark brown, silty
0.3-4'	**Clayey Silt:** brown, very silty with some cohesion, very dry, powders easily
4-4.3'	**Silt:** tan, very dry, trace very fine sand
4.3-5.5'	**Clay:** mottled rust, brown with some gray, silty/sandy clay matrix, moist, stiff
5.5-6.2'	**Clayey Silt Loam:** dark brown with trace sand
6.2-7.1'	**Silty Clay:** dark grayish brown, silty clay matrix, loamy, root zone evident, soft, moist
7.1-7.9'	**Clay:** black, silty/sandy clay matrix, loamy, root zone evident, organic-like odor, wet, very soft
7.9-8'	**Sand & Gravel:** brown, saturated
8'-9.5'	**Clayey Sand & Gravel:** black, very fine to coarse grained sand with very fine to coarse sized gravel, wet
9.5-9.8'	**Sand:** gray, very fine to fine grained, silty, saturated
9.8-10.6'	**Clay:** gray, silty clay matrix, high clay content, moist, firm
10.6-11.1'	**Sand:** gray, very fine to very coarse grained, trace very fine gravel, saturated, measured water level at ~7.7'
11.1-12'	**Clay Till:** gray, very silty/sandy clay matrix, high pebble content, moist, firm
12' End of Borehole	**Sample Recovery Data**

Interval	**Recovery**
0-4'	**100%**
4-8'	**100%**
8-12'	**100%**

NA: Not Available/Applicable

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-51
LOGGED BY:	Michael C. Serafini, CPG	DATE:	3/13/2007
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	78'
SCREEN TYPE:	2" x 5' PVC, #10 slot	CASING TYPE:	2" PVC
GRAVEL PACK TYPE:	Global #6 Silica	GROUT TYPE:	Bentonite Slurry
CASING GUARD TYPE:	Granger Guard	WELL DEVELOPMENT TYPE:	Surge and Pump
SCREENED INTERVAL:	66-71'	GRAVEL PACK INTERVAL:	59-71'
GROUT INTERVAL:	HP: 2-59'	DEPTH TO WATER:	NA
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-0.1'	**Topsoil:** dark brown, clay loam
0.1-2.7'	**Silt/Sand/Clay Mix:** brown, fill material, low cohesion
2.7-4.2'	**Sand:** light brown, very fine to fine grained, some silt, trace clay content, trace very fine to fine sized gravel, compact
4.2-6.9'	**Clay:** brownish gray, silty/sandy clay matrix, some pebbles as very fine to medium sized gravel, firm
6.9-8.4'	**Sand:** grayish tan, very fine to fine grained with some silt, trace very fine, fine and very coarse sized gravel
8.4-8.7'	**Clay:** grayish brown, silty/sandy clay matrix, some pebbles as very fine to medium sized gravel, firm
8.7-10.4'	**Clay:** brown, silty clay matrix, trace sand content, trace pebbles as very fine gravel, moist, firm good cohesion
10.4-10.8'	**Silt:** light brown, silt with trace very fine to fine grained sand
10.8-12'	**Clay:** gray, silty clay matrix, variable cohesion, root zones, wood fragments
12-13.5'	**Silt/Sand/Clay Mix:** brownish gray, mixture of the three with varying degrees of cohesion, trace very fine to medium sized gravel, moist
13.5-19.4'	**Clay:** brownish gray, silty/sandy clay matrix with trace pebbles as very fine to very coarse sized gravel, wood chunks and root zones evident from 16-19.4', moist, soft to firm within interval

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-51

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
19.4-28'	**Clay:** brown, rust and gray mottled, silty/sandy clay matrix in upper interval with a decrease in sand content with depth, trace pebbles as very fine to coarse sized gravel, moist firm
28-30.8'	**Clay Till:** brown with occasional gray mottling, very silty clay matrix, trace sand, trace pebbles as very fine to very coarse gravel, low moisture, stiff
30.8-36.4'	**Sand:** tan, fine sand interbedded with very fine to very coarse sand mixed with very fine to medium sized gravel from 30.8-32', then very fine to coarse grained sand from 32-32.7', then grades to fine to medium sand to ~34' and rust in color, from 34 to 36.4 the sand is tan, very fine to coarse grained with trace very fine to fine sized gravel, interval grades from dry to moist with depth
36.4-36.8'	**Silt:** rusty brown, very moist
36.8'-39'	**Sand:** tan, very fine to fine grained and dry from 36.8-37.9', then becomes very fine to coarse grained and moist throughout the rest of the interval
39-40'	**Silt:** light brown, trace very fine sand content, wet
40-42.5'	**Sand:** tan, very fine to fine grained, from 42.7-42.9' there is a rust colored sand and gravel lense, saturated
42.5-44'	**Silt:** tan grading to grayish, saturated
44-44.8'	**Sand:** light brown, very fine to medium grained, saturated
44.8-45.2'	**Clayey Silt:** gray, wet
45.2-47.2'	**Interbedded Sand & Gravel:** light brown, varying percentages of very fine to very coarse sand with very fine to medium sized gravel interbeds, saturated
47.2-62.9'	**Clay Till:** gray, silty/sandy clay matrix, some pebbles as anywhere from very fine to very coarse sized gravel and cobbles, moist, firm
62.9-70.1'	**Sand:** grayish tan, very fine to fine grained with several, thin (1" thick) gray, silty clay lenses throughout the interval, saturated
70.1-75.5'	**Interbedded Sand & Gravel:** grayish tan, very fine sand zones interbedded with zones of very fine to very coarse sand and very fine to very coarse sized gravel, saturated
75.5-77.2'	**Clay Till:** brownish gray, silty/sandy clay matrix, some pebbles as anywhere from very fine to coarse sized gravel, moist, firm
77.2'	**End of Borehole**

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-51

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION		
	Split-Spoon Sample Information		
	Interval	**Blow Counts**	**Percent Recovery**
	0-2'	**0,5,8,12**	**100%**
	2-4'	**10,13,15,16**	**100%**
	4-6'	**3,10,10,8**	**70%**
	6-8'	**10,21,29,24**	**100%**
	8-10'	**4,7,7,8**	**70%**
	10-12'	**6,9,9,8**	**70%**
	12-14'	**3,4,5,8**	**75%**
	14-16'	**3,4,6,5**	**80%**
	16-18'	**0,2,2,3**	**100%**
	18-20'	**4,6,6,6**	**100%**
	20-22'	**3,3,5,5**	**100%**
	22-24'	**4,10,14,17**	**100%**
	24-26'	**7,13,15,18**	**0%**
	26-28'	**9,13,16,22**	**100%**
	28-30'	**4,8,8,9**	**100%**
	30-32'	**3,9,10,11**	**100%**
	32-34'	**2,5,8,9**	**80%**
	34-36'	**2,7,9,10**	**90%**
	36-38'	**2,6,9,12**	**95%**
	38-40'	**2,5,9,10**	**85%**
	40-42'	**4,7,9,7**	**35%**
	42-44'	**2,7,10,9**	**100%**
	44-46'	**3,5,6,12**	**100%**
	46-48'	**1,6,5,6**	**100%**
	48-50'	**1,4,7,9**	**90%**
	50-52'	**2,5,7,9**	**90%**
	52-54'	**4,6,9,14**	**100%**
	54-56'	**2,5,10,40**	**90%**
	56-58'	**4,6,9,12**	**100%**
	58-60'	**5,12,13,15**	**80%**
	60-62'	**7,12,16,22**	**100%**
	62-64'	**4,5,9,16**	**100%**
	64-66'	**3,4,4,5**	**65%**
	66-68'	**11,9,10,12**	**70%**
	68-70'	**5,4,4,6**	**75%**
	70-72'	**4,4,4,5**	**65%**
	72-74'	**2,3,5,5**	**85%**
	74-76'	**8,12,17,19**	**100%**
	76-78'	**7,9,12,14**	**60%**
	NA: Not Available/Not Applicable		

STEARNS DRILLING COMPANY

6974 Hammond SE
Dutton, Michigan 49316-9116
616/698-7770
X 616/698-9886

Job No. 07-11556-2

LOG OF TEST BORING NO. MW51

Sheet: 1 of 3

Project: Granger Landfill

Location: Lansing, MI

Date Completed: 3/13/07

Crew Chief: D. Krause
Drill Rig: CME 1050
Boring Method: 4.25" HSA

Hole Plugged With: quick grout

GROUNDWATER:
Encountered @ 48.50 ft.
After completion ft.
After 15 hrs. 47.30 ft.
page: ft.
Boring Caved at: ft.

MONITOR WELL DATA:
Pipe/Type: 2" PVC
Length: 75'
Above Ground: 4'
Cap: J-plug

Screen/Type: 2" PVC
Size: 2" x 5'
Slot: 0.010
Set @: 71' - 66'
Backfilled: sand packed 7' - 60'

Bentonite Seal: none
Grout/Type: quick grout
Depth: 60' to surface
Protective Casing: used procasing
Materials Cleaned: all equipment
Development: twister pumped
1 hour while performing decon

REMARKS:

LEGEND:
Count/Blows per 6"
/140# hammer x 30" drop
SS-2" Split Spoon Sampler
LS-Brass Liner Sample
ST-Shelby Tube Sample
SNR-Sample not recovered
LB-Large Bore

Sample Type	REC	Blow Count	Depth Feet	SOIL DESCRIPTION	T W
		0	0.3	Topsoil	
SS	20"	8		Brown sandy silt, trace clay; moist	
		5			
		12			
		10			
SS	24"	13		Sand	
		15			
		16			
		3			
SS	18"	10	5	Brown sandy clay; dry	
		10			
		8			
		10			
SS	24"	21	7.0		
		28		Brown fine to coarse sand and fine gravel, some silt	
		24			
		4			
SS	18"	7	9.0		
		7		Brown sandy clay; moist	
		8	10		
		6			
SS	18"	9	11.0		
		9		Gray silty sand, little clay	
		8			
		3			
SS	20"	4			
		5			
		8			
		3			
SS	18"	4	15		
		6			
		5			
		0			
SS	18"	2			
		2		Gray silty sand, little clay; trace of wood; very moist	
		3			
		4			
SS	20"	6	19.0		
		6		Brown mottled sandy clay	
		6	20		
		3			
SS	20"	3			
		5			
		5	22.0		
		4		Brown mottled silty clay; some fine to medium sand	
SS	24"	10			
		14			
		17			
		7			
SS	SNR	13	25		
		15			
		18			
		9			
SS	2"	13			
		16			
		22			
		4			
SS		8			
		8			
		9	30		

STEARNS DRILLING COMPANY

6974 Hammond SE
Dutton, Michigan 49316-9116
616/698-7770
X 616/698-9886

Job No. 07-11556-2

LOG OF TEST BORING NO. MW51

Sheet: 2 of 3

Project: Granger Landfill

Location: Lansing, MI

Date Completed: 3/13/07

Crew Chief: D. Krause
Drill Rig: CME 1050
Boring Method: 4.25" HSA

Hole Plugged With: quick grout

GROUNDWATER:
Encountered @ 48.50 ft.
After completion ft.
After 15 hrs. 47.30 ft.
page: ft.
Boring caved at: ft.

MONITOR WELL DATA:
Pipe/Type: 2" PVC
Length: 75'
Above Ground: 4'
Cap: J-plug

Screen/Type: 2" PVC
Size: 2" x 5'
Slot: 0.01
Set @: 71' - 66'
Backfilled: sand packed 7' - 60'

Bentonite Seal: none
Grout/Type: quick grout
Depth: 60' to surface
Protective Casing: used procasing
Materials Cleaned: all equipment
Development: twister pumped

REMARKS:

LEGEND:
Count/Blows per 6"
/140# hammer x 30" drop
SS-2" Split Spoon Sampler
LS-Brass Liner Sample
ST-Shelby Tube Sample
SNR-Sample not recovered
LB-Large Bore

Sample Type	REC	Blow Count	Depth Feet	SOIL DESCRIPTION	T W
		3		Brown mottled silty clay; some fine to medium sand	
SS	20"	9	31.0		
		10		Brown coarse to fine sand and little fine gravel	
		11			
		2			
SS	16"	5			
		8			
		9			
		2			
SS	17"	7	35		
		9			
		10	36.0		
		2		Brown fine sand, some silt; moist	
SS	18"	6			
		9			
		12			
		2			
SS	16"	5			
		9			
		10	40		
		4			
SS	8"	7		Brown fine to medium sand; some silt; wet	
		9			
		7			
		2			
SS	16"	7			
		10	43.5		
		9		Brown silt with fine sand	
		3	44.5		
SS	22"	5	45	Brown fine to medium sand	
		6	45.5		
		12		Brown silt with fine sand	
		1			
SS	22"	6			
		5	47.2		
		6		Gray to brown silty clay, some fine to coarse sand; trace fine gravel	
		1			
SS	20"	4			
		7			
		9	50		
		2		Gray silty clay, some fine to coarse sand; trace fine gravel	
SS	22"	5			
		7			
		9			
		4			
SS	24"	6			
		9			
		14			
		2			
SS	24"	5	55		
		10			
		40/3"			
		4			
SS	24"	6			
		9			
		12			
		5			
SS	15"	12			
		13			
		15	60		

STEARNS DRILLING COMPANY

6974 Hammond SE
Dutton, Michigan 49316-9116
616/698-7770
X 616/698-9886

Job No.	07-11556-2

LOG OF TEST BORING NO. MW51

Sheet: 3 of 3	
Project:	Granger Landfill
Location:	Lansing, MI
Date Completed:	03/13/07
Crew Chief:	D. Krause
Drill Rig:	CME 1050
Boring Method:	4.25" HSA
Hole Plugged With:	quick grout

GROUNDWATER:

Encountered @	48.50	ft.
After completion		ft.
After 15 hrs.	47.30	ft.
page:		ft.
Boring caved at:		ft.

MONITOR WELL DATA:

Pipe/Type:	2" PVC
Length:	75'
Above Ground:	4'
Cap:	J-plug
Screen/Type:	2" PVC
Size:	2" x 5'
Slot:	0.01
Set @	71' - 66'
Backfilled:	sand packed 7' - 60'
Bentonite Seal:	none
Grout/Type:	quick grout
Depth:	60' to surface
Protective Casing:	used procasing
Materials Cleaned:	all equipment
Development:	twister pumped

REMARKS:

LEGEND:
Count/Blows per 6"
w/140# hammer x 30" drop
SS-2" Split Spoon Sampler
LS-Brass Liner Sample
ST-Shelby Tube Sample
SNR-Sample not recovered
LB-Large Bore

Sample Type	REC	Blow Count	Depth Feet		SOIL DESCRIPTION	T W
SS	24"	7			Gray silty clay, some fine to coarse sand	
		12				
		16				
		22				
SS	20"	4				
		5	63.0			
		9			Brown fine to medium sand, little silt	
		16				
SS	16"	3				
		4	65		sand	
		4	65.2		Brown clay layer	
		5			Brown fine silty sand	
SS	18"	11				
		9				
		10				
		12				
SS	16"	5				
		4				
		4				
		6	70			
SS	16"	4			Brown coarse to fine sand with some silt	
		4	71.0			
		4			Brown fine to coarse sand	
		5	72.0			
SS	18"	2	72.5		Brown coarse to fine sand	
		3			Brown fine to medium sand; little silt	
		5	73.7			
		5			Brown coarse to fine sand, some silt; some fine to medium gravel	
SS	16"	8				
		12	75			
		17				
		19	76.0			
SS	20"	7			Gray clay; trace fine to coarse sand	
		9				
		12				
		14	78.0			
					E. O. B. @ 78.0'	
			80			
			85			
			90			

Tim Krause

From: Mike Serafini [serafini@acd.net]
Sent: Tuesday, June 02, 2015 9:20 AM
To: Tim Krause
Subject: MID and Landfill Monitor Well Maintenance

Tim,

The following outlines the maintenance work completed on the wells at the referenced sites. Please note that we lowered the casing on some of the wells and they will need to be resurveyed.

<u>Well #/Maintenance</u>
MW-40: Relabeled well, marked TOC reference point
MW-44d: Relabeled well, marked TOC reference point
MW-35: Relabeled well, marked TOC reference point
P-36: Relabeled well, marked TOC reference point
P-37: Relabeled well, marked TOC reference point
P-30: Relabeled well, marked TOC reference point
MW-19: Relabeled well, marked TOC reference point
PW-48: Labeled well
PW-46: Labeled well
MW-43s: Relabeled well, marked TOC reference point
MW-43d: Relabeled well, marked TOC reference point
PW-49: Labeled well
MW-9r: Relabeled well, marked TOC reference point, added 2.5 bags of sand, and centered well in guard
MW-15s: Relabeled well, marked TOC reference point
MW-15d: Relabeled well, marked TOC reference point
P-29r: Relabeled well, marked TOC reference point, added 2 bags of sand and centered well in guard
P-28: Relabeled well, marked TOC reference point
MW-45: Relabeled well, marked TOC reference point
MW-18: Relabeled well, marked TOC reference point
MW-10: Labeled well and marked TOC reference point
MW-20r: Relabeled well, marked TOC reference point
MW-24dr: Relabeled well, marked TOC reference point
MW-23sr: Relabeled well, marked TOC reference point
MW-21sr: Relabeled well, marked TOC reference point
MW-22dr: Relabeled well, marked TOC reference point
MW-25r: Relabeled well, marked TOC reference point, added 2 bars of sand, and centered well in guard
MW-14sr: Relabeled well, marked TOC reference point, added 2 bags of sand, and centered well in guard
MW-14dr: Relabeled well, marked TOC reference point, added 2 bags of sand, and centered well in guard
MW-17: Relabeled well, marked TOC reference point
MW-42s: Relabeled well, marked TOC reference point
MW-42d: Relabeled well, marked TOC reference point
MW-47: Relabeled well, marked TOC reference point, added 2 bags of sand, and centered well in guard
MW-41r: Relabeled well, marked TOC reference point, added 4 bags of Holeplug, added 3.5 bags of sand, centered well in guard, and cut casing lower
MW-6r: Relabeled well, marked TOC reference point
W-11d: Relabeled well, marked TOC reference point
MW-16: Relabeled well, marked TOC reference point
MW-11sr: Relabeled well, marked TOC reference point, added 4 bags of sand, and centered well in guard

MW-13r: Relabeled well, marked TOC reference point, added 1 bag of Holeplug, added3 bags of sand, and centered well in guard
P-33: Relabeled well, marked TOC reference point
P-31: Relabeled well, marked TOC reference point
P-32: Relabeled well
MW-7: Relabeled well, marked TOC reference point
MW-5: Relabeled well, marked TOC reference point
MW-51: Relabeled well, marked TOC reference point, added 2 bags of sand, centered well in guard, cut casing lower

The wells presented in bold print need to have their top of casing (TOC) elevations resurveyed. Specifically, MW-41r and MW-51 need to be resurveyed. Have the surveyor survey to the black mark on the rim of the casing surface.

Thanks,

Mike

Michael C. Serafini, CPG
Principal
STRATA ENVIRONMENTAL SERVICES, INC.
538 W. Ash Street, Mason, MI 48854
Office: (517) 676-6900 Fax: (517) 676-8834
Cell: (517) 819-1383 E-mail: serafini@acd.net

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-41r2
LOGGED BY:	Michael C. Serafini	DATE:	7/14/2015
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	64'
SCREEN TYPE:	2"x5', # 10 slot PVC	CASING TYPE:	2" PVC
GRAVEL PACK TYPE:	K&E #1	GROUT TYPE:	Holeplug (HP) Bent. Slurry (BS) Cuttings/Bentonite (CB)
CASING GUARD TYPE:	Granger Guard	WELL DEVELOPMENT TYPE:	Surge
SCREENED INTERVAL:	59-64'	GRAVEL PACK INTERVAL:	55.2-64'
GROUT INTERVAL:	HP: 2-4' CB: 4-25' BS: 25-55.2	DEPTH TO WATER:	~55'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-2'	**Clay:** grayish brown, silty/sandy clay matrix, moist
2-12'	**Sand:** brown, silty with some very to coarse grained material, "dirty", moist, by 5' very fine to very coarse grained with some silt and very fine gravel
12-19'	**Clay Till:** brown, silty/sandy clay matrix with trace pebbles as very fine to coarse gravel, moist, change in drill pressure at 19 feet
19-21'	**Sand:** brown, silty with some very to coarse grained material, "dirty", moist
21~32'	**Sand:** light brown, very fine to medium grained, some silt and trace very fine gravel, moist, based on cutting return the formation is saturated at the lower portion of the interval, cutting return was poor while advancing the augers from 33 feet down, when cuttings did return, they were "soupy" from down-hole mixing
~32-55'	**Clay Till:** gray, silty/sandy clay matrix, trace pebbles as very fine to fine gravel, soft in upper interval and becoming firm in lower portion of interval, moist, estimated depth to top of formation based on change in color of "soupy" cutting return
55-58'	**Silt:** grayish color, silt, somewhat cohesive, saturated
58-60'	**Interbeded Sand & Silt:** grayish tan, very fine grained sand interbeded with thin lenses of gray silt, saturated
60-64'	**Sand:** tan, very fine to fine grained, trace medium, saturated
64'	**End of Borehole**

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-41R

DEPTH/INTERVAL

SPLIT-SPOON SAMPLE INFORMATION

Sample Interval	Blow Counts	% Recovery
60-62'	2,2,3,4	75%

The borehole was logged from 0-50 feet based on drill cutting return and changes in drill pressure. The intervals depicted are only estimates based on interpretation of field observations.

NA: Not Available/Applicable

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-42dr
LOGGED BY:	Michael C. Serafini, CPG	DATE:	1/6/2016
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	74'
SCREEN TYPE:	2" x 5' PVC, #10 slot	CASING TYPE:	2" PVC
GRAVEL PACK TYPE:	K&E WP-1	GROUT TYPE:	Bent. Slurry (BS) Holeplug (HP)
CASING GUARD TYPE:	Granger Guard	WELL DEVELOPMENT TYPE:	Surge and Pump
SCREENED INTERVAL:	69-74'	GRAVEL PACK INTERVAL:	67-74'
GROUT INTERVAL:	HP: 65-67' BS 2-65'	DEPTH TO WATER:	~56' (Top of saturated formation)
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-4'	**Clay Fill:** brown
4-8'	**Interbedded Clay & Sand:** brown and gray silty/sandy clay interbedded with brown, very fine to medium
	grained sand
8-10'	**Clay:** brown, silty matrix, soft, moist
10-19.8'	**Clay Till:** medium brown, silty/sandy clay matrix, some pebbles as very fine to coarse sized gravel, frim with
	low moisture in upper part of interval and becomes stiff with depth
19.8-30'	**Sand:** tan, very fine to fine grained with some medium, several thin (<2" thick) gravel seams within interval,
	saturated by 32 feet
30-36'	**Interbedded Sand and Gravel:** tan, very fine to very coarse grained sand, interbedded with very fine to
	medium sized gravel, saturated
36-56	**Clay Till:** gray, silty/sandy clay matrix, some pebbles as very fine to coarse sized gravel, soft and very moist
	in upper several feet of the interval then becoming firm with decrease moisture content with depth.
56-74'	**Sand:** grayish tan becoming more gray with depth, very fine to fine grained with some medium, within
	the interval there several thin (<2") clay lenses, saturated
74'	**End of Borehole**

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-42dr

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION		
	Split-Spoon Sample Information		
	Interval	Blow Counts	Percent Recovery
	4-6'	1,6,6,10	70%
	6-8'	1,2,3,4	60%
	8-10'	1,2,2,4	85%
	10-12'	2,5,8,11	100%
	12-14'	2,5,10,16	90%
	14-16'	7,14,20,23	100%
	16-18'	6,10,16,17	100%
	18-20'	5,11,15,17	100%
	20-22'	5,10,15,15	85%
	22-24'	3,5,6,8	70%
	24-26'	2,8,13,17	60%
	26-28'	5,7,10,10	100%
	28-30'	7,10,11,15	100%
	30-32'	10,7,8,8	100%
	32-34'	6,8,6,6	70%
	34-36'	3,4,7,9	100%
	36-38'	1,1,2,4	100%
	38-40'	1,3,4,4	100%
	40-42'	3,5,7,7	0%
	42-44'	5,6,6,9	100%
	44-46'	2,3,3,5	100%
	46-48'	3,10,11,12	100%
	48-50'	3,6,9,9	100%
	50-52'	3,5,7,8	100%
	52-54'	5,6,7,9	100%
	54-56'	3,5,7,12	100%
	56-58'	8,12,18,17	80%
	58-60'	10,11,15,16	65%
	60-62'	2,3,6,5	75%
	62-64'	2,2,3,5	100%
	64-66'	1,2,3,5	100%
	66-68'	1,3,5,6	100%
	68-70'	4,8,9,17	100%
	70-72'	3,10,23,38	100%
	72-74'	5,11,12,14	100%
	NA: Not Available/Not Applicable		

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	P-29r2
LOGGED BY:	Michael C. Serafini, CPG	DATE:	1/18/2017
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	48'
SCREEN TYPE:	2" x 5' PVC, #10 slot	CASING TYPE:	2" PVC
GRAVEL PACK TYPE:	K&E WP-1	GROUT TYPE:	Bent. Slurry (BS) Holeplug (HP)
CASING GUARD TYPE:	Granger Guard	WELL DEVELOPMENT TYPE:	Surge and Pump
SCREENED INTERVAL:	40-45'	GRAVEL PACK INTERVAL:	37-48'
GROUT INTERVAL:	HP & Cuttings: 2-8' BS 8-37'	DEPTH TO WATER:	~40' (screened formation)
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-5.6'	**Clay:** grayish brown, silty/sandy clay matrix, soft to firm, moist
5.6-8.6'	**Clay:** black, silty/sandy clay matrix with some non-discernable organics and pieces of wood and 0.2' of light brown, very fine-grained sand at the end of the interval
8.6-12'	**Clay:** light brown, silty/sandy clay matrix, gray silt fill inside clay "fractures", firm, moist
12-17'	**Clay Till:** light brown, predominantly silty clay matrix with some sand content, trace pebbles as very fine to coarse-sized gravel, stiff to hard
17-46.6'	**Interbedded Sand & Gravel:** tan to grayish throughout the interval , predominantly very fine to fine-grained sand with some medium to coarse grained material and silt mixed with and/or interbedded with very fine to coarse sized gravel, all in varying percentages throughout interval, thin yellowish tan and/or tan silt lenses were identified from 17-17.4', 20.5-20.8', 26-26.8', 32.7-33.5', 41.2-42', and 43.1-43.2', formation is saturated at approximately 40'
46.6-47.3'	**Clay Till:** medium brown, silty clay matrix with some sand content, trace very fine to coarse-sized gravel, soft, very moist
47.3-48'	**Clay Till:** gray, silty clay matrix with some sand content, trace very fine to coarse-sized gravel, very soft, very moist
48	**End of Borehole**

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	P-29r2

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION

Split-Spoon Sample Information

Interval	Blow Counts	Percent Recovery
4-6'	4,5,4,11	100%
6-8'	9,6,10,14	0%
8-10'	5,4,3,3	100%
10-12'	3,4,7,10	100%
12-14'	3,5,10,12	100%
14-16'	5,8,12,14	100%
16-18'	5,9,10,11	100%
18-20'	4,5,11,10	55%
20-22'	4,6,11,13	60%
22-24'	2,4,4,7	60%
24-26'	7,6,9,7	65%
26-28'	3,6,9,9	75%
28-30'	3,4,9,14	90%
30-32'	4,8,13,14	85%
32-34'	4,9,10,15	75%
34-36'	8,13,13,10	65%
36-38'	3,5,10,11	70%
38-40'	3,5,10,12	90%
40-42'	4,8,11,11	100%
42-44'	4,4,12,13	100%
44-46'	3,3,5,7	100%
46-48'	3,6,4,4	100%

NA: Not Available/Not Applicable

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-43dr
LOGGED BY:	Michael C. Serafini, CPG	DATE:	1/17/2017
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	62'
SCREEN TYPE:	2" x 5' PVC, #10 slot	CASING TYPE:	2" PVC
GRAVEL PACK TYPE:	K&E WP-1	GROUT TYPE:	Bent. Slurry (BS) Holeplug (HP)
CASING GUARD TYPE:	Granger Guard	WELL DEVELOPMENT TYPE:	Surge and Pump
SCREENED INTERVAL:	55-60'	GRAVEL PACK INTERVAL:	52-60'
GROUT INTERVAL:	HP & Cuttings: 2-8' BS 8-52'	DEPTH TO WATER:	~55 feet (screened formation)
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-4'	**Clay:** brown, silty clay matrix, moist
4~5.5'	**Sand:** light brown, fine to medium grained, some very fine to fine-sized gravel in the upper 0.2 feet
5.5~7.5'	**Sandy Clay/Clayey Sand:** brown, some gravel content, moist
7.5-8.5'	**Silt:** tan
8.5-20.6'	**Sand:** tan to light brown with depth, the formation is predominantly very fine to fine grained with interbeds containing some increased silt content and/or medium to coarse grained sand, between 12 and 14 feet there is significant very fine to fine-sized gravel content, formation is saturated at approximately 16'
20.6-32.5'	**Clay Till:** light brown grading to brownish gray then gray by 26', predominantly a silty clay matrix with some sand content which increases with depth, trace pebbles as very fine to fine-sized gravel, soft to firm, moist
32.5-37.5'	**Silt:** gray, some very fine sand content in upper foot of interval, very moist to wet
37.5~42'	**Clay:** gray, silty clay matrix with some very fine-grained sand content, upper 0.5 feet is very soft and wet, whereas the remainder of the interval is hard, brittle and low moisture content
42-45.2'	**Clay Till:** gray, silty/sandy clay matrix, trace pebbles as very fine to fine-sized gravel, moist, firm
45.2-55.3'	**Interbedded Sand, Clay Till, & Silty Clay:** gray, sand interbeds are general very fine grained with varying amounts of silt content, the sand layers are saturated, the clay till layers are as in the preceding interval, the clay layers have a silty matrix, moist, ranges from soft to firm to stiff throughout the interval
55.3-58.2'	**Sand:** grayish tan, very fine to fine grained with some silt content, saturated

58.2-62'	**Silt:** gray, some very fine-grained sand content, saturated, the last 0.2' is a stiff silty gray clay
62'	**End of Borehole**

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-43dr

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION		
	Split-Spoon Sample Information		
	Interval	**Blow Counts**	**Percent Recovery**
	4-6'	**1,2,1,1**	**65%**
	6-8'	**1,1,1,2**	**70%**
	8-10'	**3,3,2,3**	**80%**
	10-12'	**2,3,4,6**	**45%**
	12-14'	**3,3,4,4**	**70%**
	14-16'	**2,3,3,3**	**70%**
	16-18'	**2,5,4,3**	**100%**
	18-20'	**1,2,3,3**	**100%**
	20-22'	**1,1,2,3**	**100%**
	22-24'	**1,2,2,2**	**50%**
	24-26'	**3,2,4,4**	**100%**
	26-28'	**2,2,3,4**	**100%**
	28-30'	**1,2,4,4**	**100%**
	30-32'	**1,3,6,15**	**100%**
	32-34'	**3,7,10,15**	**85%**
	34-36'	**4,9,12,14**	**50%**
	36-38'	**5,11,7,4**	**100%**
	38-40'	**3,6,11,13**	**100%**
	40-42'	**2,5,12,15**	**60%**
	42-44'	**4,6,8,9**	**100%**
	44-46'	**3,3,5,2**	**80%**
	46-48'	**2,8,5,4**	**80%**
	48-50'	**2,4,12,25**	**80%**
	50-52'	**28,17,11,10**	**80%**
	52-54'	**4,5,9,12**	**100%**
	54-56'	**3,2,3,5**	**100%**
	56-58'	**2,4,6,7**	**85%**
	58-60'	**4,4,4,7**	**85%**
	60-62'	**2,5,9,8**	**100%**
	NA: Not Available/Not Applicable		

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-45r
LOGGED BY:	Michael C. Serafini, CPG	DATE:	3/14/2019
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	46'
SCREEN TYPE:	2" x 5' PVC, #10 slot	CASING TYPE:	2" PVC
GRAVEL PACK TYPE:	K&E WP-1	GROUT TYPE:	Bent. Slurry (BS) Holeplug (HP)
CASING GUARD TYPE:	Granger Guard	WELL DEVELOPMENT TYPE:	Surge and Pump
SCREENED INTERVAL:	40-45'	GRAVEL PACK INTERVAL:	37.5-45'
GROUT INTERVAL:	HP 33-37.5' BS 2-33'	DEPTH TO WATER:	~25 feet
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-4'	**Clay:** brown, moist
4-6'	**Interbedded Clay, Sand & Gravel:** brown silty clay interbedded with lenses of sand and gravel, wet
6-25.4'	**Clay Till:** brown grading to brownish gray then gray by 10 feet silty clay matrix in upper interval but is silty/sandy matrix throughout most of the interval, some pebble content as very fine to coarse-sized gravel, upper six feet of interval is soft to firm and very moist, remainder of interval firm to stiff with low moisture content
25.4~26'	**Sand:** grayish tan, very fine grained with silt, saturated
~26-30'	**Silt:** gray, silt with some very fine grained sand content, saturated
30-35.3'	**Sand:** grayish tan, predominantly very fine to fine grained with some medium content, trace very fine-sized gravel, saturated
35.3~38'	**Silt:** gray, saturated
~38-42'	**Silty Sand:** grayish tan to gray with depth, very fine grained sand and silt, saturated
42-46'	**Silt:** gray, saturated
46'	End of Borehole

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-45r

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION

Split-Spoon Sample Information

Interval	Blow Counts	Percent Recovery
4-6'	3,8,10,13	75%
6-8'	7,9,9,5	55%
8-10'	5,8,4,6	80%
10-12'	1,3,4,4	100%
12-14'	5,3,5,7	75%
14-16'	6,9,10,9	60%
16-18'	4,6,7,10	100%
18-20'	4,6,7,11	100%
20-22'	4,6,8,12	100%
22-24'	3,5,6,7	100%
24-26'	4,5,8,13	90%
26-28'	21,6,8,12	60%
28-30'	4,4,7,9	100%
30-32'	0,0,1,2	50%
32-34'	2,2,2,3	50%
34-36'	3,6,11,17	75%
36-38'	5,5,11,16	75%
38-40'	4,7,12,18	100%
40-42'	5,8,13,20	100%
42-44'	0,4,9,10	100%
44-46'	2,2,3,5	100%

NA: Not Available/Not Applicable

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-43sr
LOGGED BY:	Michael C. Serafini, CPG	DATE:	3/14/2019
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	20'
SCREEN TYPE:	2" x 5' PVC, #10 slot	CASING TYPE:	2" PVC
GRAVEL PACK TYPE:	K&E WP-1	GROUT TYPE:	Bent. Slurry (BS) Holeplug (HP)
CASING GUARD TYPE:	Granger Guard	WELL DEVELOPMENT TYPE:	Surge and Pump
SCREENED INTERVAL:	15-20'	GRAVEL PACK INTERVAL:	13-20'
GROUT INTERVAL:	HP and dry Quik Grout® 4-13'	DEPTH TO WATER:	~16 feet
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-4'	**Clay:** brown, silty clay matrix, moist
4~5.5'	**Sand:** light brown, fine to medium grained, some very fine to fine-sized gravel in the upper 0.2 feet
5.5~7.5'	**Sandy Clay/Clayey Sand:** brown, some gravel content, moist
7.5-8.5'	**Silt:** tan
8.5-19.3'	**Sand:** tan to light brown with depth, the formation is predominantly very fine to fine grained with interbeds containing some increased silt content and/or medium to coarse grained sand and some very fine to fine sized gravel content, formation is saturated at approximately 16'
19.3-19.8'	**Silt:** medium brown, saturated
19.8-20'	**Clay Till: medium** brown, predominantly a silty clay matrix with some sand content, trace pebbles as very fine to fine-sized gravel, soft, moist
20'	End of Borehole

Split-Spoon Sample Information

Interval	Blow Counts	Percent Recovery
16-18'	3,4,6,8	75%
18-20'	1,1,4,4	100%

NA: Not Available/Not Applicable

Note: Borehole was logged from 0-16 feet during drilling of adjacent MW-43dr

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-43sr

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-16r
LOGGED BY:	Michael C. Serafini, CPG	DATE:	3/18/2019
DRILLING METHOD:	4 1/4" HAS & 4 1/8" Roller Cone (RC)	TOTAL DEPTH DRILLED:	112' (0-89.5' HSA 89.5-112' RC)
SCREEN TYPE:	2" x 5' PVC, #10 slot	CASING TYPE:	2" PVC
GRAVEL PACK TYPE:	K&E WP-1	GROUT TYPE:	Bent. Slurry (BS) Holeplug (HP)
CASING GUARD TYPE:	Granger Guard	WELL DEVELOPMENT TYPE:	Surge and Pump
SCREENED INTERVAL:	107-112'	GRAVEL PACK INTERVAL:	101-112'
GROUT INTERVAL:	HP 3-8' BS 8-101'	DEPTH TO WATER:	NA
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
1-3'	**Clay:** medium brown, silty, very soft, very moist
3-5.5'	**Clay Till:** mottled brown, gray and rust, silty clay matrix, trace pebbles: very fine to medium sized
	gravel, moist, soft becoming firm with depth
5.5-14.7'	**Clay Till:** brown grading to brownish gray then gray with depth, silty clay matrix with some sand content,
	some pebbles as very fine to medium-sized gravel, firm to stiff, moist
14.7-19.2'	**Silt:** tan grading to grayish brown then gray then back to brown, saturated at ~ 16 feet
19.2-22.7'	**Sand:** tan, very fine to fine grained with some medium content and silt, 0.1' silty clay lense at ~21'), saturated
22.7-26.5'	**Silt:** tan/brown silt rapidly becoming gray with depth, clayey with depth, wet to saturated
26.5-41'	**Clay Till:** brownish gray then rapidly becoming gray with depth, silty/sandy clay matrix with some pebble
	content as very fine to coarse-sized gravel, upper five feet of interval is very moist and soft with the remainder
	of the interval being firm and moist
41-42'	**Sand:** gray, very fine to medium grained, with some silt and trace Very fine to fine-sized gravel, "dirty", moist
42-55.2'	**Clay Till:** brownish gray then rapidly becoming gray with depth, silty/sandy clay matrix with some pebble
	content as very fine to coarse-sized gravel, soft to firm becoming firm to stiff with depth, decreasing moisture
	content with depth
55.2-60'	**Interbedded Silt, Clay, Clay Till, & Sand:** grayish tan to gray, interbedded formation with varying
	percentages of material, saturated
60~68'	**Sand:** grayish tan to gray, very fine grained with some silt content, saturated
~68-72'	**Silt:** gray silt, some parts clayey, some very fine-grained sand content, saturated

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-16r

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
72-75.5'	**Clay Till:** pinkish gray grading to brownish gray and gray, silty/sandy clay matrix with some very fine to fine-sized gravel, stiff, moist
75.5-82'	**Interbedded Clayey Silt, Clayey Sand & Sandy Clay:** gray, ranges from dry to saturated within the interval
82-89.5'	**Clay Till:** gray, silty/sandy clay matrix, pebbles as very fine to very coarse-sized gravel, stiff to hard, lower moisture content, pebbles more annular to sub angular, limestone inclusion in the pebbles (Lodgment Till)
89.5-103'	**Weathered Bedrock:** gray, limestone clay till mix with some shale and gravel content, wet
103-112'	**Sandstone:** light gray, fine grained with silt content, saturated
112'	End of Borehole

Split-Spoon Sample Information

Interval	Blow Counts	Percent Recovery
9-11'	4,6,9,12	100%
12-14'	3,7,10,12	95%
14-16'	2,9,18,19	80%
16-18'	2,5,7,9	60%
18-20'	2,8,11,14	85%
20-22'	4,8,11,20	75%
22-24'	3,8,8,13	75%
24-26'	3,4,5,5	100%
26-28'	2,3,4,5	70%
28-30'	2,3,5,6	100%
30-32'	0,8,11,15	75%
32-34'	0,3,5,8	100%
34-36'	4,5,7,10	100%
36-38'	3,3,5,10	90%
38-40'	3,3,3,5	100%
40-42'	2,4,17,28	75%
42-44'	7,8,13,14	100%
44-46'	6,6,6,9	100%
46-48'	3,6,6,8	100%
48-50'	3,5,8,9	100%
50-52'	1,5,12,17	75%
52-54'	4,6,11,17	100%
54-56'	4,6,8,9	100%
56-58'	0,2,3,4	60%
58-60'	4,5,5,5	50%
60-62'	6,6,5,8	75%
62-64'	3,4,7,17	100%
64-66'	8,15,19,25	100%
66-68'	NA	75%
68-70'	5,14,17,23	80%
70-72'	9,11,11,18	50%
72-74'	5,7,10,13	50%
74-76'	5,9,10,20	75%

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-16r

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION		
	Split-Spoon Sample Information		
	Interval	Blow Counts	Percent Recovery
	76-78'	2,3,4,4	80%
	78-80'	9,21,22,24	80%
	80-82'	14,16,14,15	40%
	82-84'	11,18,25,23	90%
	84-86'	25,50+,- -	50%
	86-88'	33,50,-,-	50%
	88-90'	34,50(2"),-,-	40%
	90-92'	50(2"),-,-,-	0%
	Drilled Hollow Stem Augers to 89.5' then Wash Rotary from 89.5-112'		
	NA: Not Available/Not Applicable		
	HSA: Hollow Stem Auger		

HISTORIC BORING LOGS

(Provided in previous post-closure operating permit application)

GRANGER LAND DEVELOPMENT COMPANY
GRANGER MID 082 771 700 LANDFILL
POST-CLOSURE OPERATING LICENSE

APPENDIX 7-A

SOIL BORING LOGS AND PROFILES

GEOLOGICAL SURVEY SAMPLE NO. ☐

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

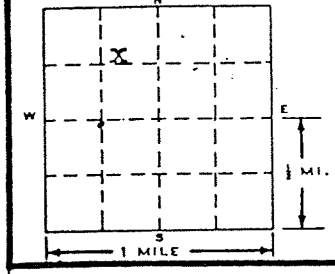
County	Township Name	Fraction	Section Number	Town Number	Range Number
Clinton	Watertown	SW ¼ NE ¼ SW¼	19	5N N/S.	3W E/W.

Distance And Direction from Road Intersections

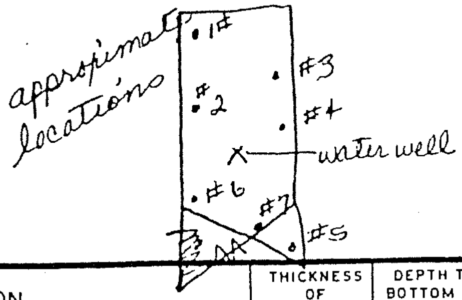
Monitoring well No. 1 - Granger Land fill.

Street address & City of Well Location

Locate with "X" in section below



Sketch Map:



3 OWNER OF WELL:

Address Granger Land Development
2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH: (completed) 55 ft. Date of Completion 9/1/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ______

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☒ Monitoring well No. 1

7 CASING: Threaded ☐ Welded ☐
Diam.
_____ in. to _____ ft. Depth
_____ in. to _____ ft. Depth

Height: Above/Below Surface _____ ft.
Weight _____ lbs./ft.
Drive Shoe? Yes ☐ No ☐

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Gravel and Clay	2	2
Brown Clay	2	4
Grey Clay	2	6
Light Grey Clay	22	28
Grey Clay stiff	2	30
Grey Clay - ~~wall~~ wet	20	50
Clay and sand	5	55
#2		
14816.2 N		
6067.2 E		

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: 242-10 Dia.: 2"
Slot/Gauze _____ Length _____
Set between _____ ft. and _____ ft.
Fittings: 4'2" pipe, 2' coupling, 2" cap

9 STATIC WATER LEVEL
_____ ft. below land surface

10 PUMPING LEVEL below land surface
_____ ft. after ___ hrs. pumping _____ g.p.m.
_____ ft. after ___ hrs. pumping _____ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) _____ Chlorides (Cl) _____
Hardness _____ Other _____

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐ _____
Depth: From _____ ft. to _____ ft.

14 Nearest Source of possible contamination
_____ feet _____ Direction _____ Type
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name _____
Model Number _____ HP ___ Volts _____
Length of Drop Pipe _____ ft. capacity _____ G.P.M.
Type: ☐ Submersible
☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

Inv. 7543
SURFACE ELEVATION 835.0

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Gilbert and Ingalls, Inc. 0408
REGISTERED BUSINESS NAME REGISTRATION NO.

Address 6461 W. Howe Road, DeWitt, Mich. 48820

Signed _____ Date 10/20/76
AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

IMPORTANT: File with deed.

WELL OWNER COPY

GEOLOGICAL SURVEY SAMPLE No. ☐

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

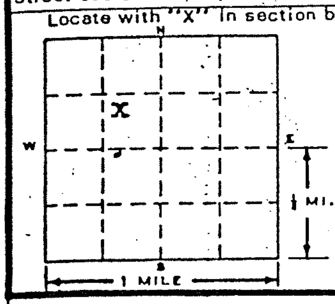
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Clinton	Watertown	NW ¼ SE ¼ NW ¼	19	5N N/S.	3W E/W.

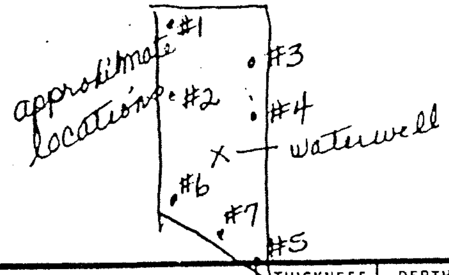
Distance And Direction from Road Intersections
Monitoring Well No. 2- Granger Land fill

Street address & City of Well Location

Locate with "X" in section below



Sketch Map:



3 OWNER OF WELL:
Granger Land Development
Address 2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH: (completed) 41 ft. Date of Completion 9/1/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ______

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☒ Monitoring well No. 2

7 CASING: Threaded ☒ Welded ☐
Diam.
____ in. to ____ ft. Depth
____ in. to ____ ft. Depth
Height: Above/Below Surface ______ ft.
Weight ______ lbs./ft.
Drive Shoe? Yes ☐ No ☐

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Top soil	2	2
Sand and gravel	19	21
Grey Clay	20	41
	XXXXXX	XXXXXX

#3
13495.3 N
6052.3 E

TOP of Casing - 851.00 or 850.84

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: 242-10 Dia.: 2"
Slot/Gauze ______ Length ______
Set between ______ ft. and ______ ft.
Fittings: 20' 2" galv. pipe
2-2" couplings, 1-2" cap

9 STATIC WATER LEVEL
______ ft. below land surface

10 PUMPING LEVEL below land surface
______ ft. after ____ hrs. pumping ______ g.p.m.
______ ft. after ____ hrs. pumping ______ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ______ Chlorides (Cl) ______
Hardness ______ Other ______

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐ ______
Depth: From ______ ft. to ______ ft.

14 Nearest Source of possible contamination
______ feet ______ Direction ______ Type
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name ______
Model Number ______ HP ____ Volts ______
Length of Drop Pipe ______ ft. capacity ______ G.P.M.
Type: ☐ Submersible
☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.
Inv. 7543
SURFACE ELEVATION 849.0

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Gilbert and Ingalls, Inc. 0408
REGISTERED BUSINESS NAME REGISTRATION NO.
Address 6461 W. Howe Road, DeWitt, Mich. 48820
Signed ______ AUTHORIZED REPRESENTATIVE Date 10/20/76

D67d 100M (Rev. 12-68)

IMPORTANT: File with deed.

WELL OWNER COPY

GEOLOGICAL SURVEY SAMPLE No. ☐

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

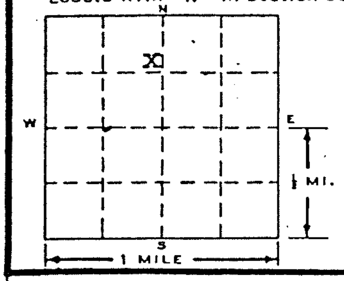
County	Township Name	Fraction	Section Number	Town Number	Range Number
Clinton	Watertown	SE ¼ NE ¼ NW ¼	19	5N N/S.	3W E/W.

Distance And Direction from Road Intersections

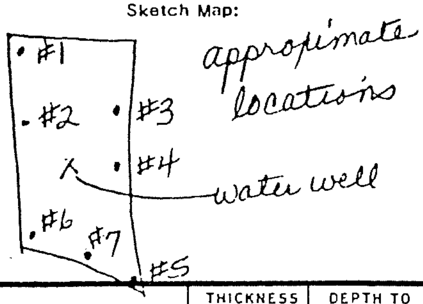
Monitoring well No. 3 - Granger Landfill

Street address & City of Well Location

Locate with "X" in section below



Sketch Map:



3 OWNER OF WELL:

Granger Land Development

Address 2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH: (completed) 50 ft. Date of Completion 9/2/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ______

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☒ Monitoring well No. 3

7 CASING: Threaded ☐ Welded ☐
Diam.
____ in. to ____ ft. Depth
____ in. to ____ ft. Depth

Height: Above/Below Surface ______ ft.
Weight ______ lbs./ft.
Drive Shoe? Yes ☐ No ☐

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand and gravel	7	7
Gravel and clay	7	14
Grey Clay	36	50
	XXXXXX	XXXXX

#4

14240.2 N

7325.1 E

TOP OF CASING: 848.66

GROUND SURFACE: 846.00 ASSUMED

RAS

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: 242-10 Dia.: ______
Slot/Gauze ______ Length ______
Set between ______ ft. and ______ ft.
Fittings: 8' 2" pipe
1-2" coupling,1-2" cap

9 STATIC WATER LEVEL
______ ft. below land surface

10 PUMPING LEVEL below land surface
______ ft. after ____ hrs. pumping ______ g.p.m.
______ ft. after ____ hrs. pumping ______ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ______ Chlorides (Cl) ______
Hardness ______ Other ______

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐ ______
Depth: From ______ ft. to ______ ft.

14 Nearest Source of possible contamination
______ feet ______ Direction ______ Type
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name ______
Model Number ______ HP ____ Volts ______
Length of Drop Pipe ______ ft. capacity ______ G.P.M.
Type: ☐ Submersible
☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

Inv. 7543

SURFACE ELEVATION 846.0

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Gilbert and Ingalls, Inc. 0408
REGISTERED BUSINESS NAME REGISTRATION NO.

Address 6461 W. Howe Road, DeWitt, Michigan 4882

Signed AUTHORIZED REPRESENTATIVE Date 10/20/76

D67d 100M (Rev. 12-68)

IMPORTANT: File with deed.

WELL OWNER COPY

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

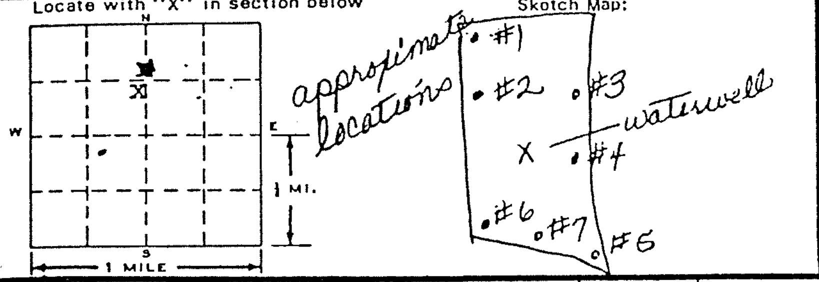
County	Township Name	Fraction	Section Number	Town Number	Range Number
Clinton	Watertown	NE ¼ SE ¼ NW ¼	19	5N N/S.	3W E/W.

Distance And Direction from Road Intersections

Monitoring well No. 4 - Granger Landfill

Street address & City of Well Location

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL:
Granger Land Development
Address 2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH: (completed) 67 ft. Date of Completion 9/2/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ______

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☒ xx Monitoring well

7 CASING: Threaded ☐ Welded ☐ Height: Above/Below
Diam. Surface ______ ft.
______ in. to ______ ft. Depth Weight ______ lbs./ft.
______ in. to ______ ft. Depth Drive Shoe? Yes ☐ No ☐

8 SCREEN:
Type: 242-7 Dia.: ______
Slot/Gauze ______ Length ______
Set between ______ ft. and ______ ft.
Fittings: 18' 2" galv. pipe
1-2" cap,

9 STATIC WATER LEVEL
______ ft. below land surface

10 PUMPING LEVEL below land surface
______ ft. after ___ hrs. pumping ______ g.p.m.
______ ft. after ___ hrs. pumping ______ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ______ Chlorides (Cl) ______
Hardness ______ Other ______

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐ ______
Depth: From ______ ft. to ______ ft.

14 Nearest Source of possible contamination
______ feet ______ Direction ______ Type
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name ______
Model Number ______ HP ____ Volts ______
Length of Drop Pipe ______ ft. capacity ______ G.P.M.
Type: ☐ Submersible
☐ Jet ☐ Reciprocating

2 FORMATION

FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Clay	6	6
Gravel	12	18
Brown Clay	7	25
Grey Clay	42	67
	XXXXXXXX	XXXXXX

#5
13809.0 N
7357.5 E

TOP OF CASING : 860.56
GROUND SURFACE : 857.5 ASSUMED
RAS

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

Inv. 7543

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Gilbert and Ingalls, Inc. 0408
REGISTERED BUSINESS NAME REGISTRATION NO.

Address 6461 W. Howe Road, DeWitt, Mich. 48820

Signed ______ Date 10/20/76
AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

IMPORTANT: File with deed.

WELL OWNER COPY

GEOLOGICAL SURVEY SAMPLE No. ☐

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

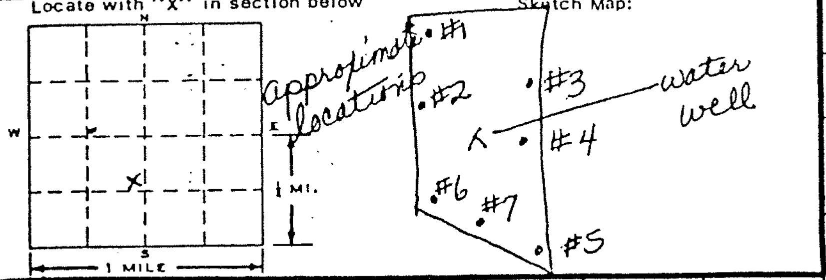
County	Township Name	Fraction	Section Number	Town Number	Range Number
Clinton	Watertown	SE ¼ NE ¼ SW ¼	19	5N N/S.	3W E/W.

Distance And Direction from Road Intersections

Monitoring well No. 5
Granger Landfill

Street address & City of Well Location

Locate with "X" in section below — Sketch Map:



3 OWNER OF WELL:

Address Granger Land Development
2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH: (completed) 65 ft. Date of Completion 9/3/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ____

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☒ Monitoring well No. 5

7 CASING: Threaded ☐ Welded ☐ Diam.
____ in. to ____ ft. Depth
____ in. to ____ ft. Depth
Height: Above/Below Surface ____ ft.
Weight ____ lbs./ft.
Drive Shoe? Yes ☐ No ☐

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Clay	6	6
Sand and Gravel	12	18
Fine sand	11	29
Grey Clay	16	45
Grey Clay tite	20	65
	XXXXX	XXXXXX

#6
11890.1 N
7319.7 E

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: 242-10 Dia.: ____
Slot/Gauze ____ Length ____
Set between ____ ft. and ____ ft.
Fittings: 27' 2" galv. pipe
1-2" coupling, 1-2" cap

9 STATIC WATER LEVEL
____ ft. below land surface

10 PUMPING LEVEL below land surface
____ ft. after ____ hrs. pumping ____ g.p.m.
____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ____ Chlorides (Cl) ____
Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐ ____
Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination
____ feet ____ Direction ____ Type
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name ____
Model Number ____ HP ____ Volts ____
Length of Drop Pipe ____ ft. capacity ____ G.P.M.
Type: ☐ Submersible
☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

Inv. 7543
SURFACE ELEVATION 860.0

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Gilbert and Ingalls, Inc. — 0408
REGISTERED BUSINESS NAME — REGISTRATION NO.

Address 6461 W.Howe Road, DeWitt, Mich.

Signed ____ AUTHORIZED REPRESENTATIVE Date 10/20/76

D67d 100M (Rev. 12-68)

IMPORTANT: File with deed.

WELL OWNER COPY

GEOLOGICAL SURVEY SAMPLE No. ☐

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

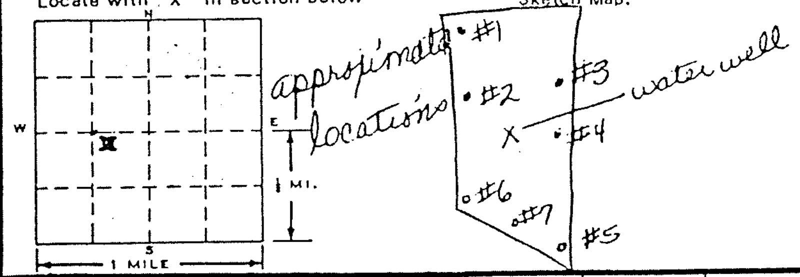
County	Township Name	Fraction	Section Number	Town Number	Range Number
Clinton	Watertown	NW ¼ NE ¼ SW ¼	19	5N N/S.	3W E/W.

Distance And Direction from Road Intersections: Monitoring well No. 6 - Granger Landfill

Street address & City of Well Location

Locate with "X" in section below

Sketch Map:



3 OWNER OF WELL: Granger Land development

Address 2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH: (completed) 65 ft. Date of Completion 9/3/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☐ ______

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☒ Monitoring well No. 6

7 CASING: Threaded ☐ Welded ☐ Diam.

____ in. to ____ ft. Depth

____ in. to ____ ft. Depth

Height: Above/Below Surface ____ ft.

Weight ____ lbs./ft.

Drive Shoe? Yes ☐ No ☐

8 SCREEN:

Type: 242-10 Dia.: ____

Slot/Gauze ____ Length ____

Set between ____ ft. and ____ ft. See Note

Fittings: [illegible] 27' 2" galv. pipe
1-2" coupling,1-2" cap

9 STATIC WATER LEVEL

____ ft. below land surface

10 PUMPING LEVEL below land surface

____ ft. after ____ hrs. pumping ____ g.p.m.

____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ____ Chlorides (Cl) ____

Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No ☐ Neat Cement ☐ Bentonite ☐ ____

Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination

____ feet ____ Direction ____ Type

Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed

Manufacturer's Name ____

Model Number ____ HP ____ Volts ____

Length of Drop Pipe ____ ft. capacity ____ G.P.M.

Type: ☐ Submersible ☐ Jet ☐ Reciprocating

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Clay	15	15
Gravel	12	27
Brown Clay	17	44
Grey Clay	21	65
	XXXXXX	XXXXXXX
#7		
12261.96 N		
6069.2 E		
9/26/85 Static H_2O Measured to		
37.3 ∴ well must be deeper than 27'		

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

Inv. 7543

SURFACE ELEVATION 869.0

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Gilbert and Ingalls, Inc. — REGISTERED BUSINESS NAME

0408 — REGISTRATION NO.

Address 6461 W. Howe Road, DeWitt, Michigan

Signed ____ AUTHORIZED REPRESENTATIVE Date 10/20/76

D67d 100M (Rev. 12-68)

IMPORTANT: File with deed.

WELL OWNER COPY

GEOLOGICAL SURVEY SAMPLE No. ☐

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT
OF
PUBLIC HEALTH

1 LOCATION OF WELL

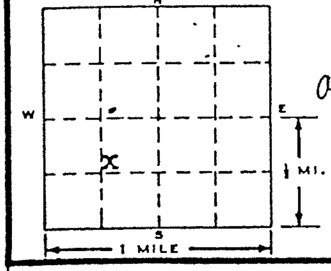
County	Township Name	Fraction	Section Number	Town Number	Range Number
Clinton	Watertown	SW ¼ NE ¼ SW ¼	19	5N N/S.	3W E/W.

Distance And Direction from Road Intersections

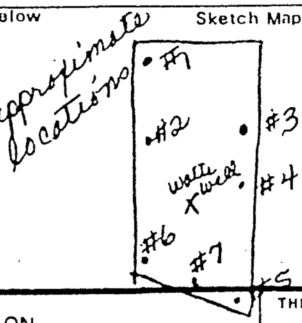
Monitoring well No.7 - Granger Landfill

Street address & City of Well Location

Locate with "X" in section below



Sketch Map:



3 OWNER OF WELL:

Address Granger Land Development
2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH: (completed) 65 ft. Date of Completion 9/7/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ______

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☐ Commercial
☐ Test Well ☐ ______

7 CASING: Threaded ☐ Welded ☐ Height: Above/Below
Diam. Surface ____ ft.
____ in. to ____ ft. Depth Weight ____ lbs./ft.
____ in. to ____ ft. Depth Drive Shoe? Yes ☐ No ☐

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown clay	15	15
Sand and gravel	13	28
Grey Clay	37	65
	XXXXXXXXXXX	
#8		
12027.5 N		
6591.4 E		
surface elevation		
866.0 Assumed		
RAJ		

USE A 2ND SHEET IF NEEDED

8 SCREEN:
Type: 242-10 Dia.: ______
Slot/Gauze ______ Length ______
Set between ____ ft. and ____ ft.
Fittings: 28' 2" galv. pipe
1-2" coupling, 1-2" cap.

9 STATIC WATER LEVEL
______ ft. below land surface

10 PUMPING LEVEL below land surface
______ ft. after ____ hrs. pumping ______ g.p.m.
______ ft. after ____ hrs. pumping ______ g.p.m.

11 WATER QUALITY in Parts Per Million:
Iron (Fe) ______ Chlorides (Cl) ______
Hardness ______ Other ______

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☐ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☐ No
☐ Neat Cement ☐ Bentonite ☐ ______
Depth: From ______ ft. to ______ ft.

14 Nearest Source of possible contamination
______ feet ______ Direction ______ Type
Well disinfected upon completion ☐ Yes ☐ No

15 PUMP: ☐ Not installed
Manufacturer's Name ______
Model Number ______ HP ____ Volts ____
Length of Drop Pipe ______ ft. capacity ____ G.P.M.
Type: ☐ Submersible
☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

Inv. 7543

17 WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Gilbert and Ingalls, Inc. 0408
REGISTERED BUSINESS NAME REGISTRATION NO.

Address 6461 W. Howe Road, DeWitt, Michigan 48

Signed ______ Date 10/20/76
AUTHORIZED REPRESENTATIVE

D67d 100M (Rev. 12-68)

IMPORTANT: File with deed.

WELL OWNER COPY

GEOLOGICAL SURVEY SAMPLE No. ☐

Granger Landfill

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

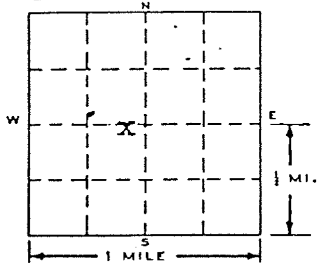
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Clinton	Watertown	NE ¼ NE ¼ SW¼	29	5N N/S.	3W E/W.

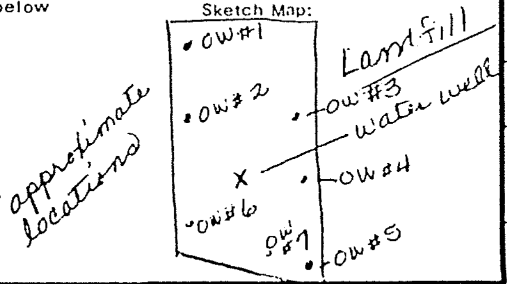
Distance And Direction from Road Intersections: W. Grand River Avenue, Granger Land fill

Street address & City of Well Location

Locate with "X" in section below



Sketch Map:



3 OWNER OF WELL:

Address Granger Land Development
2702 S. Cedar Street
Lansing, Michigan

4 WELL DEPTH: (completed) 215 ft. Date of Completion 9/10/76

5 ☐ Cable tool ☒ Rotary ☐ Driven ☐ Dug
☐ Hollow rod ☐ Jetted ☐ Bored ☐ ______

6 USE: ☐ Domestic ☐ Public Supply ☐ Industry
☐ Irrigation ☐ Air Conditioning ☒ Commercial
☐ Test Well ☐ ______

7 CASING: Threaded ☐ Welded ☐

Diam. ~~XXX~~ 4 in. to 112 ft. Depth

______ in. to ______ ft. Depth

Height: Above/Below Surface ______ ft.

Weight 11 lbs./ft.

Drive Shoe? Yes ☐ No ☐

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Clay	16	16
Gravel	17	33
Grey Clay	35	68
Grey clay and stones	22	90
Sticky grey clay	5	95
Grey Clay and gravel	2	97
Red Shale and sandy	5	102
Grey shale and sandstone	8	110
Grey Sandstone	105	215
	XXXXXX	XXXXXXX
#9		
12676.5 N		
6336.3 E		

USE A 2ND SHEET IF NEEDED

8 SCREEN:

Type: ______ Dia.: ______

Slot/Gauze ______ Length ______

Set between ______ ft. and ______ ft.

Fittings:

9 STATIC WATER LEVEL

______ ft. below land surface

10 PUMPING LEVEL below land surface

70 ft. after ___ hrs. pumping 30 g.p.m.

______ ft. after ___ hrs. pumping ______ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ______ Chlorides (Cl) ______

Hardness ______ Other ______

12 WELL HEAD COMPLETION: ☐ In Approved Pit
☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☒ Yes ☐ No
☐ Neat Cement ☒ Bentonite ☐ ______
Depth: From 0 ft. to 112 ft.

14 Nearest Source of possible contamination

______ feet ______ Direction ______ Type

Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed

Manufacturer's Name Myers

Model Number SG 102-10AA HP 1 Volts ______

Length of Drop Pipe 84 ft. capacity ______ G.P.M.

Type: ☒ Submersible
☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

Inv. 7568

SURFACE ELEVATION 870.0

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Gilbert and Ingalls, Inc. 0408
REGISTERED BUSINESS NAME REGISTRATION NO.

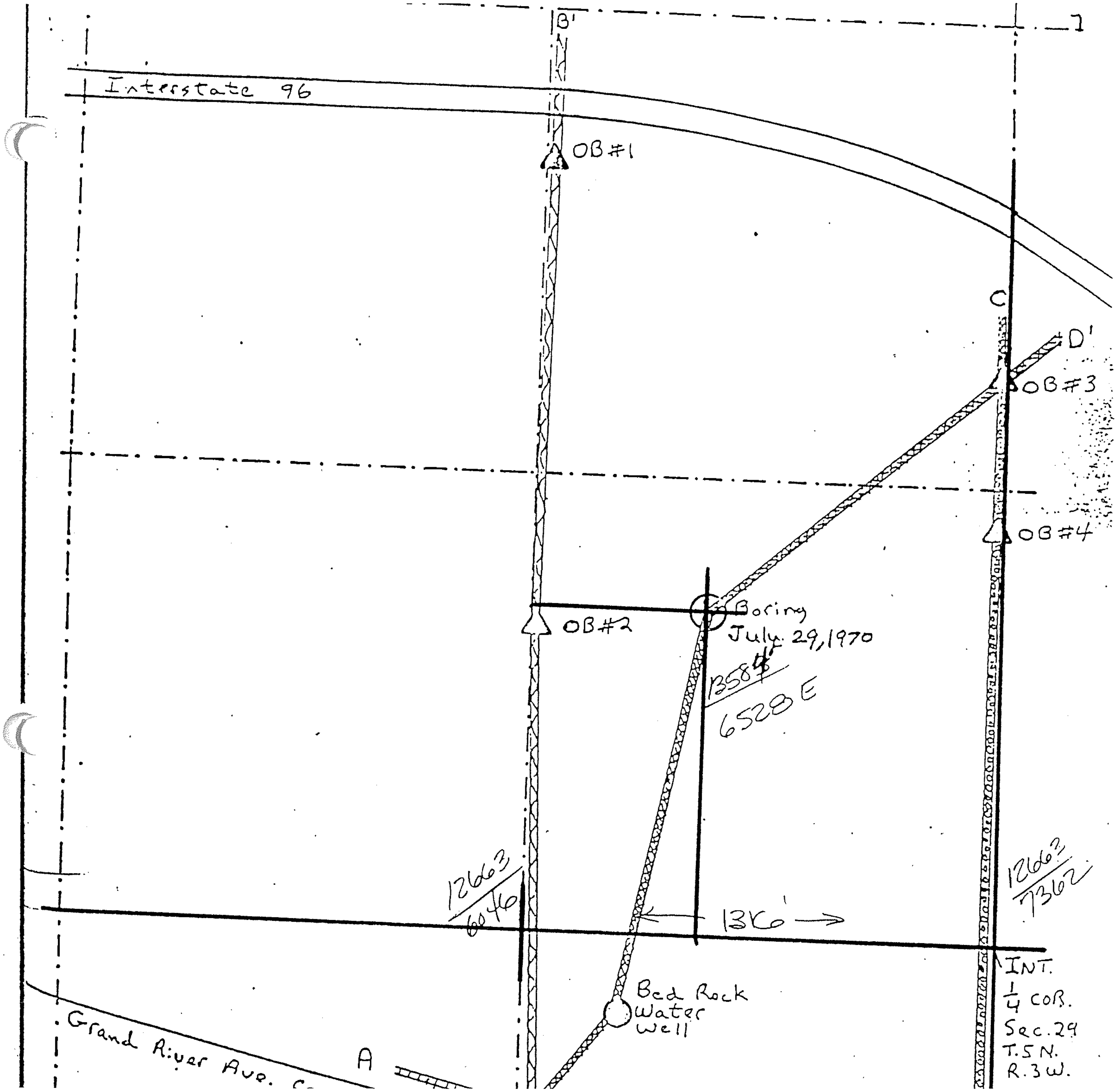
Address 6461 W. Howe Road, DeWitt, Michigan

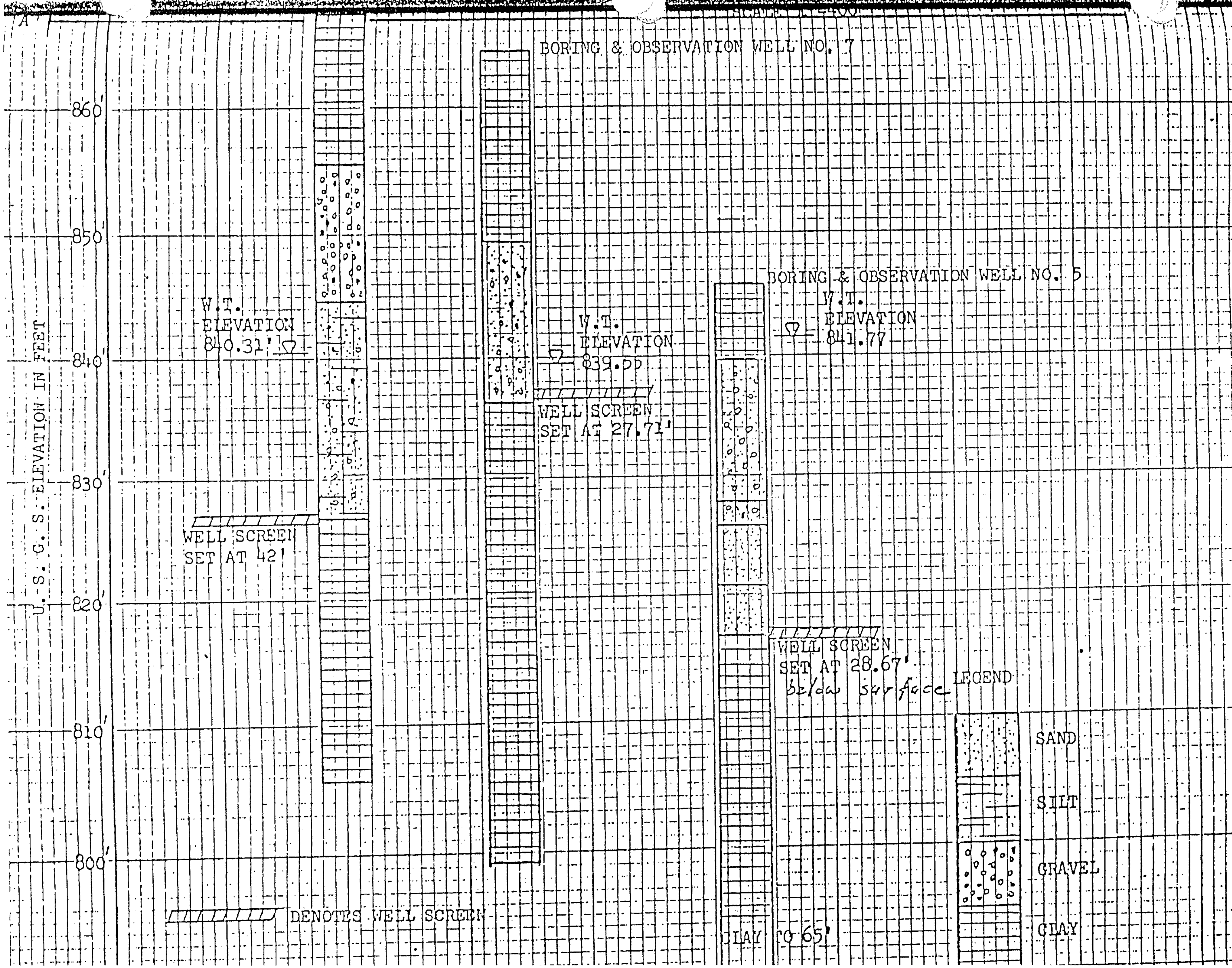
Signed ______ AUTHORIZED REPRESENTATIVE Date 10/20/76

D67d 100M (Rev. 12-68)

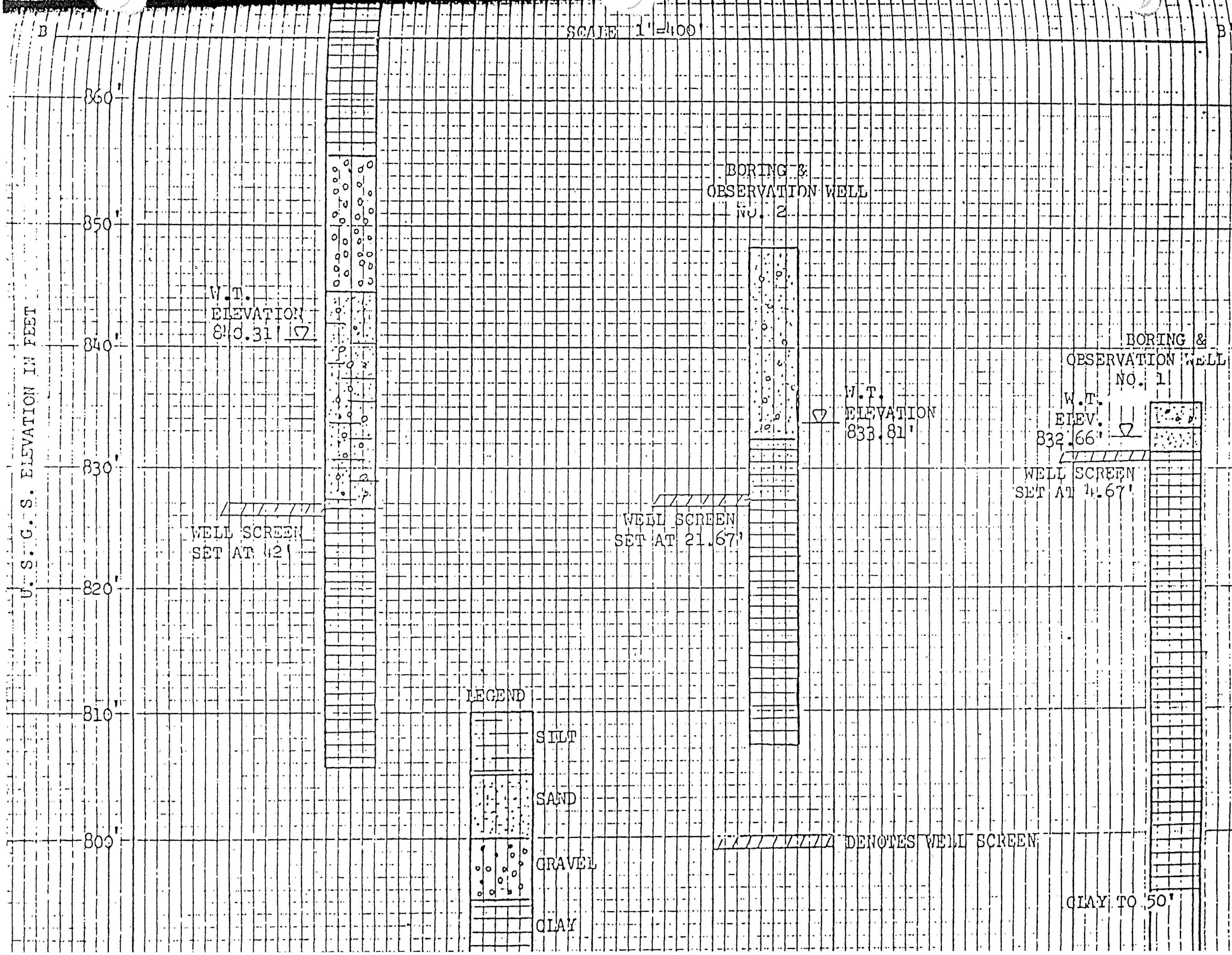
IMPORTANT: File with deed.

WELL OWNER COPY


B'
Interstate 96
OB#1
C
D'
OB#3
OB#4
OB#2
Boring
July 29,1970
13584
6528 E
12663
6046
1366'
12662
7362
INT.
1/4 COR.
Sec.29
T.5N.
R.3W.
Bed Rock
Water
Well
A
Grand River Ave.

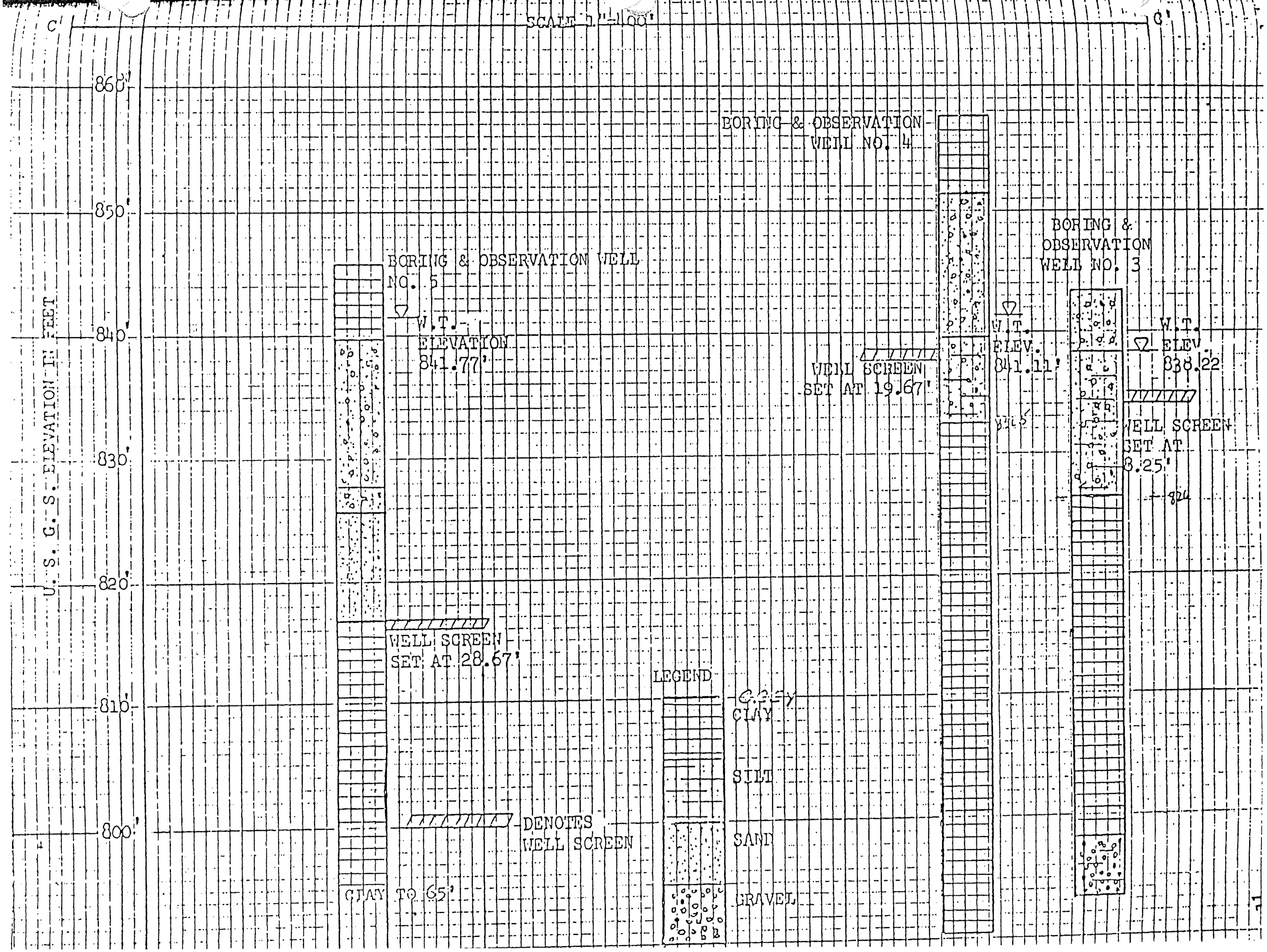


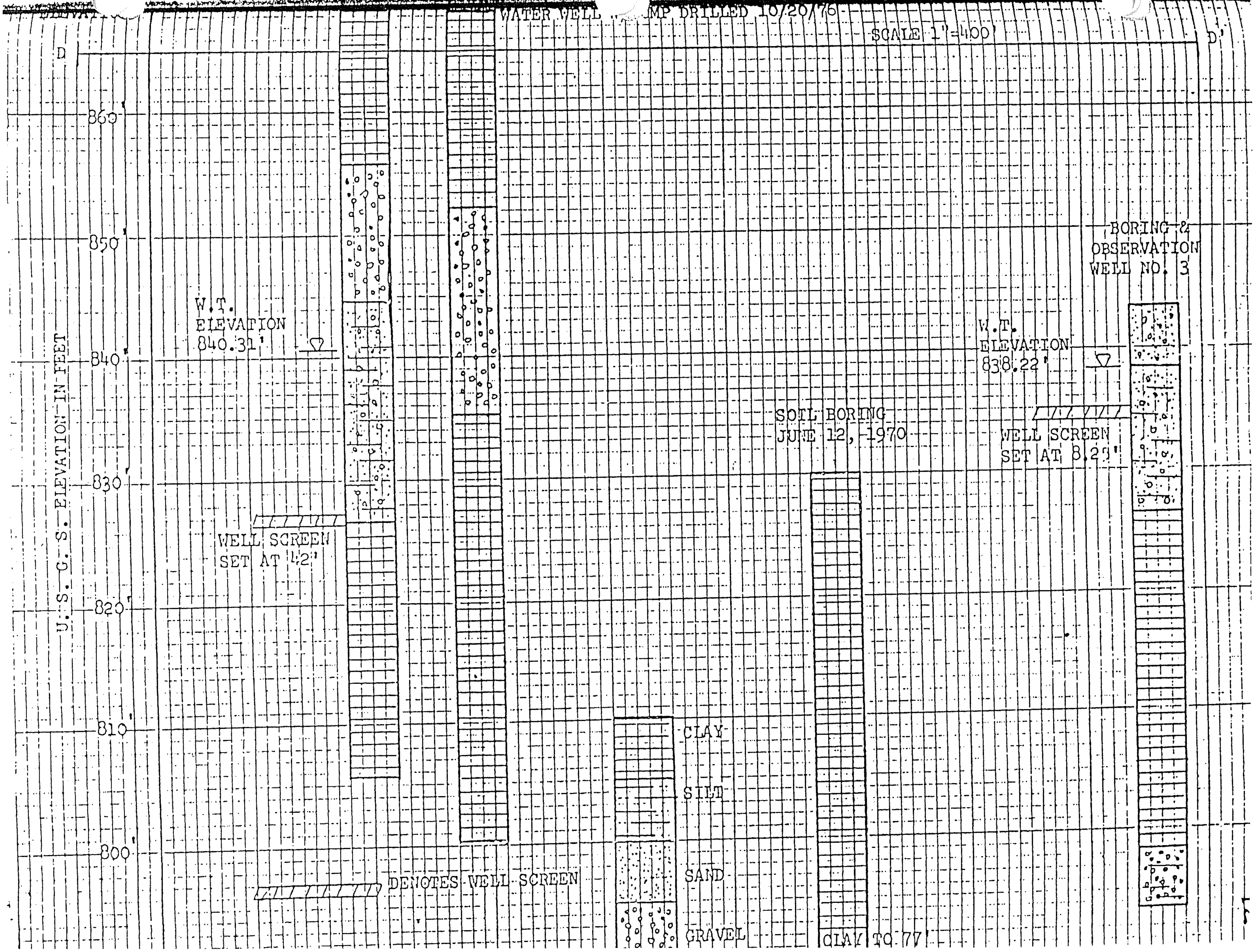
CROSS-SECTION A-A' FIGURE NO. 5



CROSS-SECTION B-B' FIGURE NO. 6

10


C
C'
SCALE 1"=100'
U. S. G. S. ELEVATION IN FEET
860'
850'
840'
830'
820'
810'
800'
BORING & OBSERVATION WELL NO. 5
W.T. ELEVATION 841.77'
WELL SCREEN SET AT 28.67'
CLAY TO 65'
DENOTES WELL SCREEN
LEGEND
GREY CLAY
SILT
SAND
GRAVEL
BORING & OBSERVATION WELL NO. 4
WELL SCREEN SET AT 19.67'
W.T. ELEV. 841.11'
834.5
BORING & OBSERVATION WELL NO. 3
W.T. ELEV. 838.22
WELL SCREEN SET AT 8.25'
824


WATER WELL MP DRILLED 10/20/76
SCALE 1"=400'
D
D'
860'
850'
840'
830'
820'
810'
800'
U. S. G. S. ELEVATION IN FEET
W.T.
ELEVATION
840.31'
WELL SCREEN
SET AT 42"
DENOTES WELL SCREEN
CLAY
SILT
SAND
GRAVEL
SOIL BORING
JUNE 12, 1970
CLAY TO 77
W.T.
ELEVATION
838.22'
WELL SCREEN
SET AT 8.22"
BORING &
OBSERVATION
WELL NO. 3

GRANGER LAND DEVELOPMENT COMPANY
GRANGER MID 082 771 700 LANDFILL
POST-CLOSURE OPERATING LICENSE

APPENDIX 7-B

SOIL BORING LOGS

0124-1151

BORING NUMBER MW-20 B-176 TOTAL DEPTH 39' S.W.L.(BGL)

Sample Number	From 0 to 39 Feet	Lithologic Description
1	0 - 4	SAND; fine-coarse, silty, lt. brown, moist
2	4 - 9	SAND; fine-coarse, occ. gravel, silt, brown, very moist
3	9 - 24.5	TILL; clay & silt, fine angular gravel, gray, moist
no sample	24.5 - 25	CLAY, SILT; (lacustrine), gray (see SSS #5 below)
4	25 - 39	SAND; fine-med., lt. gray, saturated
		one well screened 34.5 - 36.5 feet BGL
		grouted from 32 - 0 feet BGL
		Surface Elevation = 832.82 ft.

Piezometer: ☐ Screen 924/#7 Pipe 38' Total Depth (BGL)

BORING NUMBER TOTAL DEPTH S.W.L.(BGL)

Sample Number	Interval (Blow Counts 6")	Split-Spoon Samples
SSS #1	4 - 6 (14/15)	SAND; fine-med., moist, lt. brown
SSS #2	9 - 11 (16/14)	TILL; clay & silt, fine angular gravel, gray, moist
SSS #3	14 - 16 (15/8/12)	TILL; clay & silt, fine angular gravel, gray, moist
SSS #4	19 - 21 (10/11/15)	TILL; clay & silt, fine angular gravel, gray, moist
SSS #5	24 - 26 (7/10/12)	BOTTOM; lacustrine clay & silt, gray (note: med. grain
		sand in nose) TOP: till; clay & silt, fine angular
		gravel, gray
SSS #6	29 - 31 (6/7/10)	SAND; fine-med., w/lenses of clay @ approx. 1-2", gray,
		brown
SSS #7	34 - 36 (7/8/9)	SAND; fine grain, lt. gray, saturated

Piezometer: ☐ Screen Pipe Total Depth (BGL)

GRANGER LAND DEVELOPMENT COMPANY
GRANGER MID 082 771 700 LANDFILL
POST-CLOSURE OPERATING LICENSE

APPENDIX 7-C

SOIL BORING LOGS AND PROFILES

CONSULTING ENGINEERS IN SOILS & FOUNDATIONS

JOB NO. 408-25006 Mw.16

SURFACE ELEV. Top of Casing 862.66

DATE 2-16-82

PROJECT GRANGER SANITARY LANDFILL

LOCATION WATERTOWN TOWNSHIP ~~#16~~ 173 REV KJG

CLINTON COUNTY, MICHIGAN

Sample & Type		Depth	Legend	SOIL DESCRIPTION	Penetration Blows For 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	St
				8" TOPSOIL						
		2								
		4								
		6		Sandy CLAY, brown, moist, with pebble						
		8								
		10								
			11'0"							
		12								
		14		Sandy CLAY, gray, moist, with pebble						
		16	16'0"							
		18								
		20		SAND & SILT, brown, fine, wet						
		22								
		24	24'0"							
		26								
		28								
		30								
		32								
		34								
		36		Silty to sandy CLAY, gray, moist, with pebble						
		38								
		40								
		42								
		44								
		46								
		48								
		50								
				(Cont.)						

TYPE OF SAMPLE
D. - DISTURBED
U.L.-UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1' With 140# Hammer Falling 30": Count Made At 6" Intervals

GROUND WATER OBSERVATIONS

G.W. Encounteres at 16 ft 0

G.W. Volumes HEAVY

MTE CONSULTING ENGINEERS IN SOILS & FOUNDATIONS

PROJECT GRANGER SANITARY LANDFILL

JOB NO. 408-25006

LOCATION WATERTOWN TOWNSHIP

SURFACE ELEV. Top of Casing 862.66

DATE 2-16-82

CLINTON COUNTY, MICHIGAN

Sample & Type		Depth	Legend	SOIL DESCRIPTION	Penetration Blows For 6"	Moisture %	Natural Wt P.C.F.	Dry Den Wt P.C.F.	Unc. Comp. Strength PSF.	S
			51'6"	Silty to sandy CLAY, gray, moist, with pebble						
		52								
		54		SILT, gray, wet						
		56								
			57'0"							
		58		SAND & SILT, gray, fine, wet						
		60								
		62								
		64								
		66								
		68								
		70								
		72								
		74								
		76								
		78	78'0"							
		80		Sandy CLAY, gray, moist, with pebble						
		82								
		84								
		86	86'6"							
		88		SILT & CLAY, gray, moist						
		90								
		92								
		94								
		96								
		98	98'0"							
		100		LIMESTONE (Cont.)						

TYPE OF SAMPLE
D. - DISTURBED
U.L.- UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1" With 140# Hammer Falling 30"; Count Made At 6" Intervals

MICHIGAN TESTING ENGINEERS, INC.
CONSULTING ENGINEERS IN SOILS & FOUNDATIONS

PROJECT GROUND WATER MONITORING WE
GRANGER SANITARY LANDFILL

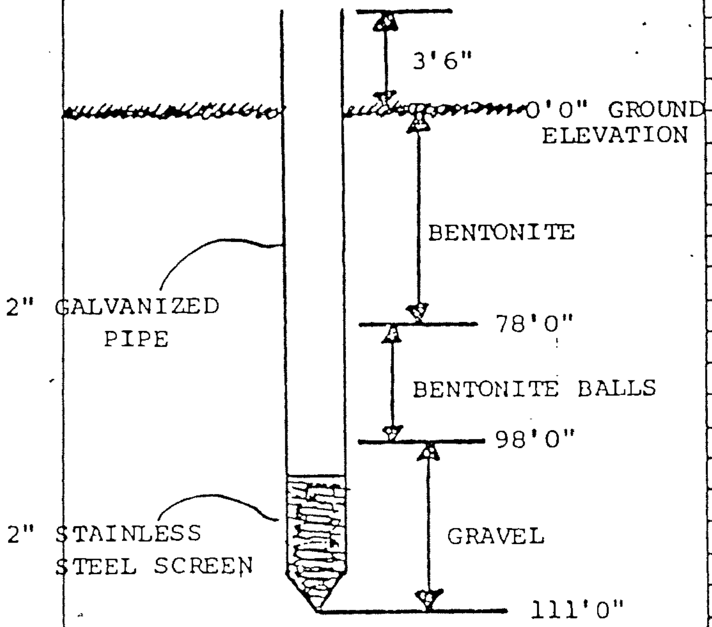
JOB NO. 408-25006

LOCATION WATERTOWN TOWNSHIP
CLINTON COUNTY, MICHIGAN

SURFACE ELEV. Top of Casing 862.66

DATE 2-16-82

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows For 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	St %
		101'0"	LIMESTONE						
	102								
	104								
	106		SANDSTONE						
	108								
	110								
		111'0"							
	112		END OF BORING @ 111'0"						
	114								
	116								
	118								
	120								
	122								
	124								
	126								
	128								
	130								
	132								
	134								
	136								
	138								
	140								
	142								
	144								
	146								
	148								
	150								



TYPE OF SAMPLE
D. - DISTURBED
U.L.- UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1' With 140# Hammer Falling 30"; Count Made At 6" Intervals

CONSULTING ENGINEERS IN SOILS & FOUNDATIONS

GROUND WATER MONITORING W
PROJECT GRANGER SANITARY LANDFILL

JOB NO. 408-25006 MW 17

LOCATION WATERTOWN TOWNSHIP

175
CLINTON COUNTY, MICHIGAN

SURFACE ELEV. Top of Casing 859.45

DATE 2-25-82

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows For 6"	Moisture %	Natural Wt P.C.F.	Dry Den Wt P.C.F.	Unc. Comp. Strength PSF.
		1'0"	TOPSOIL					
	2							
	4		Sandy CLAY, brown, moist					
		5'0"						
	6							
	8		GRAVEL					
		9'0"						
	10							
	12							
	14		SAND, brown, medium, moist					
	16							
	18							
	20	20'0"						
	22							
	24		SAND, brown, medium, wet					
	26	26'0"						
	28							
	30							
	32							
	34							
	36							
	38		Silty to sandy CLAY, gray, with pebble					
	40							
	42							
	44							
	46							
	48							
	50							
			(Cont.)					

TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1' With 140# Hammer Falling 30"; Count Made At 6" intervals

GROUND WATER OBSERVATIONS

G.W. Encountered at 20 ft 0 in

G.W. Volumes HEAVY

CONSULTING ENGINEERS IN SOILS & FOUNDATIONS

PROJECT GROUND WATER MONITORING GRANGER SANITARY LANDFIL
JOB NO. 408-25006
LOCATION WATERTOWN TOWNSHIP
SURFACE ELEV. Top of Casing 859.45
DATE 2-25-82
CLINTON COUNTY, MICHIGAN

Sample & Type		Depth	Legend	SOIL DESCRIPTION	Penetration Blows Per 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.
		52		Silty to sandy CLAY, gray, with pebble					
		54							
		56							
		58							
		60							
		62							
		64							
		66							
		68							
		70							
		72							
		74							
		76							
		78							
		80							
		82							
		84							
		86							
		88							
		90							
		92							
		94							
			95'0"						
		96		Sandy CLAY, gray, and layers of gravel					
		98							
		100							
				(Cont.)					

TYPE OF SAMPLE
D. - DISTURBED
U.L.-UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1' With 140# Hammer Falling 30"; Count Made At 6" Intervals

JOB NO. 408-25006

SURFACE ELEV. Top of Casing 859.45

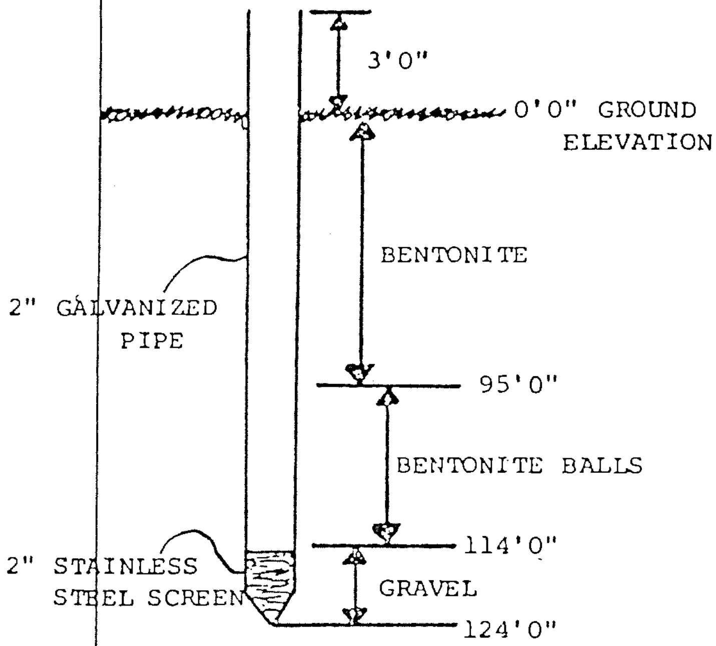
DATE 2-25-82

PROJECT GRANGER SANITARY LANDFILL

LOCATION WATERTOWN TOWNSHIP

CLINTON COUNTY, MICHIGAN

Sample & Type		Depth	Legend	SOIL DESCRIPTION	Penetration Blows Per 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.
		102		Sandy CLAY, gray, and layers of gravel					
		104							
			105'0"						
		106							
		108		Silty to sandy CLAY, gray, with pebble					
		110							
		112							
		114	114'0"						
		116							
		118		SANDSTONE					
		120							
		122							
		124	124'0"						
				END OF BORING @ 124'0"					
		126							
		128							
		130							
		132							
		134							
		136							
		138							
		140							
		142							
		144							
		146							
		148							
		150							



TYPE OF SAMPLE
D. - DISTURBED
U.L.-UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1' With 140# Hammer Falling 30"; Count Made At 6" Intervals

MICHIGAN TESTING ENGINEERS, INC.
CONSULTING ENGINEERS IN SOILS & FOUNDATIONS

GROUND WATER MONITORING W
PROJECT GRANGER SANITARY LANDFILL

JOB NO. 408-25006

Mw. 18

LOCATION WATERTOWN TOWNSHIP

~~#165~~ 174 REV KJG

SURFACE ELEV. Top of Casing 840.63

DATE 2-23-82

CLINTON COUNTY, MICHIGAN

Sample & Type		Depth	Legend	SOIL DESCRIPTION	Penetration Blows For 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.
				6" TOPSOIL					
		2							
		4		SAND, brown, medium, moist					
		6	6'0"						
		8							
		10		SAND, brown, coarse, wet					
		12	11'6"						
		14		Sandy CLAY, brown, moist					
		16	16'6"						
		18							
		20							
		22		Sandy to silty CLAY, gray					
		24							
		26							
		28	28'0"						
		30							
		32							
		34		SAND, gray, fine, wet					
		36							
		38							
		40	40'0"						
		42							
		44							
		46		SAND & SILT, gray, fine, wet					
		48							
		50							
				(Cont.)					

TYPE OF SAMPLE
D. - DISTURBED
U.L.- UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1' With 140# Hammer Falling 30"; Count Made At 6" Intervals

GROUND WATER OBSERVATIONS

G.W. Encountered at 6 ft 0 in

G.W. Volumes HEAVY

MICHIGAN TESTING ENGINEERS, INC.
CONSULTING ENGINEERS IN SOILS & FOUNDATIONS

GROUND WATER MONITORING W
PROJECT GRANGER SANITARY LANDFILL

JOB NO. 408-25006
LOCATION WATERTOWN TOWNSHIP

SURFACE ELEV. Top of Casing 840.63
DATE 2-23-82
CLINTON COUNTY, MICHIGAN

Sample & Type		Depth	Legend	SOIL DESCRIPTION	Penetration Blows Per 6"	Moisture %	Natural WL P.C.F.	Dry Den WL P.C.F.	Unc. Comp. Strength PSF.	S
		52								
		54								
		56		SAND & SILT, gray, fine, wet						
		58								
		60	60'0"							
		62								
		64								
		66		Silty CLAY, gray						
		68								
		70								
		72	72'6"							
		74								
		76								
		78								
		80								
		82								
		84								
		86		Silty to sandy CLAY, gray, occasional stone						
		88								
		90								
		92								
		94								
		96								
		98	97'6"							
		100		SANDSTONE (Cont.)						

TYPE OF SAMPLE
D. - DISTURBED
U.L.- UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1' With 140# Hammer Falling 30"; Count Made At 6" Intervals

MICHIGAN TESTING ENGINEERS, INC.
CONSULTING ENGINEERS IN SOILS & FOUNDATIONS

GROUND WATER MONITORING W

PROJECT GRANGER SANITARY LANDFILL

JOB NO. 408-25006

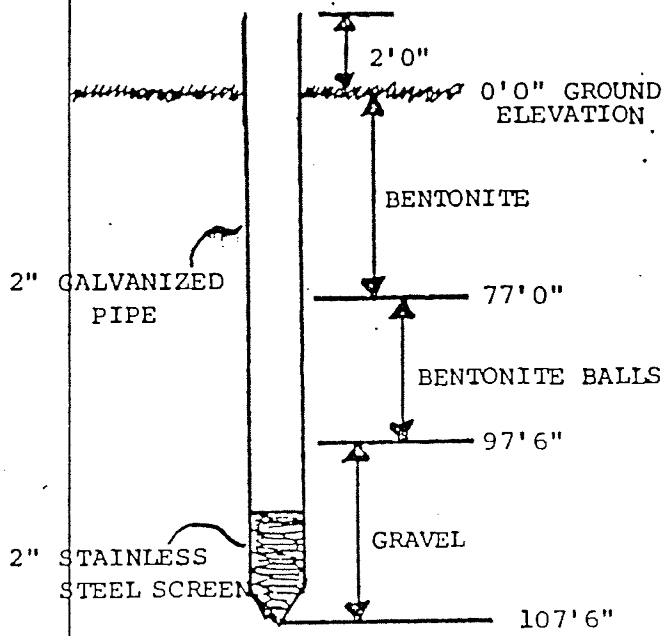
LOCATION WATERTOWN TOWNSHIP

CLINTON COUNTY, MICHIGAN

SURFACE ELEV. Top of Casing 840.63

DATE 2-23-82

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows For 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.
	102							
	104		SANDSTONE					
	106							
	108	107'6"	END OF BORING @ 107'6"					
	110							
	112							
	114							
	116							
	118							
	120							
	122							
	124							
	126							
	128							
	130							
	132							
	134							
	136							
	138							
	140							
	142							
	144							
	146							
	148							
	150							



TYPE OF SAMPLE
D. - DISTURBED
U.L.- UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1' With 140# Hammer Falling 30"; Count Made At 6" Intervals

JOB NUMBER 0124-1151 DATE July 6, 1985 PAGE

BORING NUMBER B-177 TOTAL DEPTH 24' S.W.L.(BGL)

Sample Number	From 0 to 24 Feet	Lithologic Description
1	0 - 3	SAND; fine-coarse, fine gravel, brown, moist-saturated
		@ 3'
2	3 - 4	CLAY & SILT; fine angular gravel, blue-gray, saturated
3	4 - 8.5	SAND; fine-coarse, silt, fine-med. gravel, brown,
		saturated
4	8.5 - 14.5	TILL; clay & silt, fine angular gravel, gray
5	14.5 - 24	SAND; fine-coarse, fine-med. gravel, silt, brown,
		saturated
		one well screened 19 - 21 feet BGL MW-21s
		drilled 2nd hole to 8 feet BGL MW-22d
		one well screened 5 - 7 feet BGL
		grouted from 16 - 0 feet BGL
		Surface Elevation = 823.12 ft.

Piezometer: ☐ Screen 2-924/#7 Pipe 31' Total Depth (BGL)

BORING NUMBER TOTAL DEPTH S.W.L.(BGL)

Sample Number	Interval (Blow Counts 6")	Split-Spoon Samples
SSS #1	4 - 6 (7/8)	TOP 6"; fine sand, silt minor clay, brown, saturated
		MIDDLE 6"; fine-coarse sand, fine gravel, gray,
		saturated
		BOTTOM 6"; clay & silt, fine angular gravel, gray,
		saturated
SSS #2	9 - 11 (9/16/24)	TILL; clay & silt, fine angular gravel, gray
SSS #3	14 - 16 (72/34/20)	TOP 6"; till; clay & silt, fine angular gravel, gray
		BOTTOM 12"; fine-coarse sand, fine-med. gravel, silt,
		minor clay, brown, saturated
SSS #4	19 - 21 (11/14)	Alternate layers approx. 3" of fine-coarse sand, fine-
		med. gravel, brown, saturated

Piezometer: ☐ Screen Pipe Total Depth (BGL)

#123

PROJECT GRANGER LANDFILL FACILITY

JOB NO. 408-15051

LOCATION WATERTOWN TOWNSHIP
CLINTON COUNTY, MICHIGAN

SURFACE ELEV. 866.7

DATE 11-25-81

MW-19 12749.6N - 6063.5E

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows For 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	St %
	1								
	2								
	3								
	4								
	5								
	6								
	7		CLAY, brown, moist						
	8								
	9								
	10								
	11								
	12								
	13								
	14								
	15								
	16								
	17								
	18								
	19								
	20		SAND, brown, moist, medium						
	21								
	22								
	23								
	24								
	25								
			(Cont.)						

TYPE OF SAMPLE
D. - DISTURBED
U.L.- UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS:

RECEIVED MAR 1 0 1982

Standard Penetration Test — Driving 2" OD Sampler 1' With 140# Hammer Falling 30"; Count Made At 6" Intervals

GROUND WATER OBSERVATIONS

G.W. Encountered at 36 ft 0

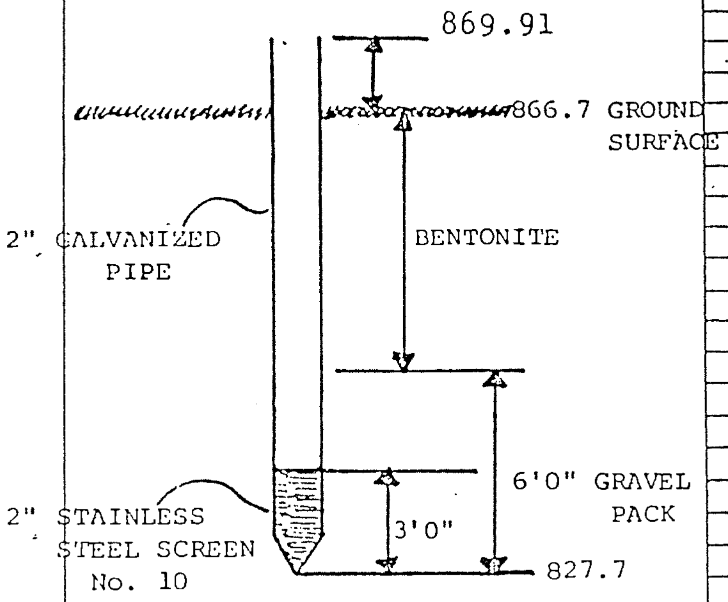
JOB NO. 408-15051

LOCATION WATERTOWN TOWNSHIP
CLINTON COUNTY, MICHIGAN

SURFACE ELEV. 866.7

DATE 11-25-81 MW-19 12749.6N - 6063.5E

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows For 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt P.C.F.	Unc. Comp. Strength PSF.
	26		SAND, brown, moist, medium					
	27							
	28							
	29							
	30		Sandy CLAY, brown, moist					
	31							
	32							
	33							
	34							
	35							
	36							
	37		SAND, brown, medium, wet, very compact					
	38							
	39		Sandy CLAY, gray, moist, stiff					
	40		END OF BORING @ 39'0"					
	41							
	42							
	43							
	44							
	45							
	46							
	47							
	48							
	49							
	50							



TYPE OF SAMPLE
D. - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
( ) - PENETROMETER

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1' With 140# Hammer Falling 30"; Count Made At 6" Intervals

PLUGGING PROCEDURE

JOB NUMBER 0124-1151

BORING NUMBER B-164 TOTAL DEPTH 25.5' S.W.L. (BGL) ________

Sample Number	From 0 to 25.5 Feet	Lithologic Description
	0 - .5	Fill, sand and crushed limestone
1	.5 - 2.5	Till, clay and silt, minor sand and gravel, gray, moist
2	2.5 - 14	Sand fine to coarse, fine gravel, saturated, brown
SSS #1	(4-5.5') 14 blows / 6"	Sand fine to coarse, silt, minor fine gravel, brown,
	1	saturated
SSS #2	(9-10.5') 5 blows / 6"	Sand fine to coarse, minor fine gravel, brown, saturated
3	14 - 22	Sand fine to coarse, fine gravel, brown, saturated
SSS #3	(14-15.5') 10 blows / 6"	Sand fine to coarse, brown, saturated
4	22 - 24	Clay and Silt, lacustrine, gray
SSS #4	(24-25.5') 14 blows / 6"	Silt grades to sand from 24 to 25 ft., (sand is fine-
		coarse) w/fine gravel, clay and silt from 25 to 25.5',
		lacustrine, gray
		Water Sample
		one bail collected 24 hours after boring was drilled
		via hollow-stem augers
		grouted from 25.5 ft. BGL to ground level
		materials used: 2 sacks cement
		1 bag bentonite
		1 bucket pellets
		Surface Elevation = 829.69 ft.

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

BORING NUMBER B-165 TOTAL DEPTH 20' S.W.L. (BGL) ____________

Sample Number	From 0 to 20 Feet	Lithologic Description
1	0 - 4	Silt, fine to coarse sand, clay, fine to medium gravel,
		brown dry
SSS #1	(4-5.5') 8 blows/6"	Till, Clay and Silt, w/gravel, grades to fine to coarse
		sand, dry
2	4 - 9	Sand fine to coarse, silt, fine-coarse gravel, brown,
		moist
SSS #2	(9-10.5') 9 blows/6"	Sand medium to coarse, fine gravel, brown, very moist
		to saturated at 10.5 ft.
3	9 - 12	Sand fine to coarse, fine gravel, moist-saturated,
		brown
4	12 - 20	Till, Silt and Clay, fine-medium gravel, fine-coarse
		sand, gray, moist
SSS #3	(14-15.5') 18 blows/6"	Till, Silt and Clay, gravel, minor sand, gray, moist
SSS #4	(19-20.5') 21 blows/6"	Till, clay, silt, fine angular gravel, gray, moist
		grouted from 20.5 ft. BGL to ground level
		materials used: 3 sacks cement
		3/4 bag bentonite
		Surface Elevation = 837.23 ft.

Piezometer: ☐ Screen ____________ Pipe ____________ Total Depth (BGL) ____________

JOB NUMBER 0124-1151 DATE May 2,

BORING NUMBER B-166 TOTAL DEPTH 54' S.W.L. (BGL) ______

Sample Number	From 0 to 54 Feet	Lithologic Description
1	0 - 4	Silt, Clay, fine gravel, fine to coarse sand, gray,
		very moist-saturated
SSS #1	(4-5.5') 6 blows/6"	Silt and Clay, fine to medium angular-subrounded gravel,
		fine to coarse sand, brown, very moist
2	4 - 11	Silt and Clay, minor gravel, fine to coarse sand, brown,
		very moist, saturated
SSS #2	(9-10.5') 8 blows/6"	Till, Clay, Silt, fine angular gravel, minor sand,
		brown
3	11 - 15	Same as SSS #2
SSS #3	(14-15')	Same as SSS #2
SSS #3 con't	(15-15.5') 3 blows/6"	Gravel fine to coarse, fine to coarse sand, minor
		silt, saturated, gray-brown
4	15 - 19	Sand fine to coarse, fine to coarse gravel, silt,
		saturated, gray-brown
SSS #4	(19-20') 3 blows/6"	Gravel fine to coarse, grades to sorted silt, brown,
		saturated
5	19 - 31	Sand and Gravel fine to coarse, silt, brown, saturated
SSS #5	(24-25.5') 11 blows/6"	Grades from fine to coarse Sand and Gravel to silt,
		saturated, brown
6	31 - 39	Silt, fine sand, brown, saturated
SSS #6	(29-30.5) 15 blows/6"	Grades from fine to coarse Sand to sorted medium sand
		to silt, brown, saturated
SSS #7	(34-35.5') 24 blows/6"	Silt w/minor clay, brown, saturated
SSS #8	(39-40.5') 20 blows/6"	Sand fine to medium, silt, minor clay, brown, saturate
7	39 - 44	Sand fine to coarse, silt, minor clay, brown, saturate
SSS #9	(44045.5')	Till, Clay, Silt, angular gravel, minor sand, gray,
		tight, moist
8	44 - 52	Tight drilling
SSS #10	(49-50.5') 22 blows/6"	Till, same as SSS #9
9	52 - 54	Semi-tight drilling
		grouted from 54 ft. BGL to ground level
		materials used: 8 bags cement, 2 bags bentonite
		Surface Elevation = 864.41 ft.

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER B-167 TOTAL DEPTH 49' S.W.L. (BGL) ______

Sample Number	From 0 to 49 Feet	Lithologic Description
1	0 - 8	Clay and Silt, very moist, orange-black-brown
2	8 - 12	Sand fine to coarse, silt, clay, fine gravel, saturated,
		brown
3	12 - 13	Sand fine to coarse, fine to coarse gravel, clay,
		black, saturated
4	13 - 27	Sand fine to coarse, fine gravel, silt, saturated,
		brown
5	27 - 29	Silt, fine gravel, brown, saturated
6	29 - 35	Silt, fine sand, brown, saturated
no sample	35 - 36	Easy drilling
no sample	36 - 37	Tight drilling
no sample	37 - 46	Easy drilling
7	46 - 47	Tight, clay-lacustrine
8	47 - 48	Easy drilling; silt, fine sand
9	48 - 49	Tight drilling; clay-lacustrine
		drilled second boring to 23.5 ft. BGL with screened
		auger
		Water Sample
	#1 20 - 22	Via SP-1 pump
		first boring grouted from 49 ft. BGL to ground level
		to ground level w/slurry
		materials used: 8.5 bags cement
		2.5 bags bentonite
		second boring grouted from 23.5 ft. BGL to ground level
		materials used: 4 sacks cement
		2 bags bentonite
		1 pail pellets
		Surface Elevation = 850.30 ft.

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

JOB NUMBER 0124-1151 DATE May 4, [illegible]

BORING NUMBER B-168 TOTAL DEPTH 24' S.W.L. (BGL) ______

Sample Number	From 0 to 24 Feet	Lithologic Description
1	0 - 4	Clay, silt, fine to coarse sand, w/fine to coarse sub-
		rounded gravel, brown, moist
SSS #1	(4-5.5') 8 blows / 6"	Sand fine to med., silt, orange-brown, moist
2	4 - 10	Sand fine to coarse, silt, w/fine subrounded gravel,
		orange-brown, moist, saturated @ approx. 8'
SSS #2	(9-10.5') 7 blows / 6"	Sand fine to coarse (top one foot), w/fine subrounded
		gravel, orange-brown, moist, grades to silt bottom 6"
3	10 - 16	Sand very fine-med. (80% fine), silt, tan-brown, sat.
SSS #3	(14-15.5') 19 blows / 6"	Sand very fine-coarse w/some gravel, grades to fine
		sand and silt lower 6"
4	16 - 24	Till, clay, silt, w/minor fine-med. subrounded gravel,
		gray, cohesive
SSS #4	(19-20.5') 19 blows / 6"	Till, clay, silt, w/minor very fine sand
SSS #5	(24-25.5') 18 blows / 6"	Till, clay, silt, minor very fine sand, grades to silt
		w/very fine sand lower 6", gray, cohesive
		Water Sample
		one collected at 10.5 - 12.5 ft. BGL via 2-inch sub-
		mersible sampling pump
		screened auger boring 15 ft. west of boring to a total
		depth of 15 ft.
		grouted from 24 ft. BGL to ground level
		materials used: 4.5 sacks cement
		1 bag bentonite
		Surface Elevation = 842.11 ft.

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

JOB NUMBER 0124-1151

BORING NUMBER B-169A (screened auger) TOTAL DEPTH 24.5' S.W.L. (BGL) ____________

Sample Number	From 0 to 24.5 Feet	Lithologic Description
	0 - .1	Crushed Limestone
1	.1 - 4	Clay, Silt, minor fine to coarse sand, minor fine
		gravel, orange-brown, moist, cohesive
2	4 - 8	Sand fine to medium, silt, minor fine gravel, orange-
		brown
3	8 - 12	Till, Clay, Silt, fine-coarse gravel, fine-medium sand,
		gray-brown, moist, cohesive
4	12 - 22	Sand fine to coarse, silt, fine to coarse gravel,
		saturation @ approx. 15 ft., orange-brown,
5	22 - 24	Gravel fine to coarse-90 percent coarse and well
		rounded, fine to coarse sand, minor silt, brown,
		saturated,
6	24 - 24.5	Till, Clay, Silt, fine angular gravel, minor fine to
		medium sand, gray, moist
		Water Sample
	#1 20 - 22'	bailed sample, air development
		grouted with slurry from 24.5 ft. BGL to ground level
		materials used: 6 bags of Type I Portland cement
		1 1/2 bags bentonite
		Surface Elevation = 848.60 ft.

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

JOB NUMBER 0124-1151

BORING NUMBER B-169B, TOTAL DEPTH 34' S.W.L. (BGL) ____

Sample Number	(split spoon) From 0 to 34 Feet	Lithologic Description
	0 - .1	Crushed Limestone
1	.1 - 2.5	Silt, brown, clay, fine to coarse gravel, minor fine to
		medium sand
2	2.5 - 5	Clay, Silt, fine to coarse gravel, minor fine to mediu
		sand, cohesive, orange-brown, moist
SSS #1	(4-5.5') 22 blows/6"	upper 12 inches Till, silt and clay, angular gravel,
		minor sand, brown; lower 6 inches medium to coarse
		sand, brown, moist
3	5 - 7	Sand fine to coarse, minor silt, fine-coarse angular
		gravel, orange-brown
4	7 - 12	Till, clay, silt, fine to coarse angular gravel, very
		cohesive, brown
SSS #2	(9-10.5') 10 blows/6"	Till, clay and silt, angular gravel
5	12 - 22	Sand fine to coarse, fine to coarse subrounded gravel,
		minor silt, orange-brown, moist
SSS #3	(14-15.5') 8 blows/6"	Sand medium to coarse, fine gravel, moist, orange-brow
SSS #4	(19-20.5') 3 blows/6"	Gravel fine to mediun, fine to coarse sand, silt,
		saturated to very moist, gray-brown
6	22 - 24	Gravel fine to coarse-90 percent coarse and well round
		minor fine to coarse sand, minor silt, brown, moist,
SSS #5	(24-25.5') 15 blows/6"	Till, clay, silt, fine angular gravel, minor sand, gra
		moist
no sample	24 - 34	Till, clay, silt, fine angular gravel, minor sand, gra
		moist
SSS #6	(29-30.5') 15 blows/6"	Till, same as above
SSS #7	(34-35.5') 18 blows/6"	Till, same as above
		grouted from 34 ft. BGL to ground level
		materials used: 6 1/2 bags of cement
		2 bags bentonite
		Surface Elevation = 848.60 ft.

Piezometer: ☐ Screen ____ Pipe ____ Total Depth (BGL) ____

JOB NUMBER

BORING NUMBER B-170 TOTAL DEPTH 21' S.W.L. (BGL) ______

Sample Number	From 0 to 21 Feet	Lithologic Description
	0 - 1	Road Fill
1	1 - 11	Clay, silt, fine to coarse gravel, fine to coarse sand,
		brown-gray, moist
2	11 - 20	Sand fine to coarse, fine gravel, brown, saturated
3	20 - 21	Clay and silt, gray
		Water Sample
		one collected at 12 - 14 ft. BGL via 2-inch temporary
		well
		grouted from 21 ft. BGL to ground level
		materials used: 2 sacks cement
		2 bags bentonite
		Surface Elevation = 829.50 ft.

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

JOB NUMBER 0124-1151

BORING NUMBER B-171 TOTAL DEPTH 12.5' S.W.L. (BGL) ____

Sample Number	From 0 to 12.5 Feet	Lithologic Description
1	0 - 1	Sand fine to coarse, silt, fine to coarse gravel, very
		moist, minor clay, dk. brown
2	1 - 3	Sand fine to coarse, minor fine gravel, very moist,
		yellow-brown
3	3 - 5	Sand fine to coarse, minor fine gravel, saturated, brow
4	5 - 12	Silt w/fine lenses of lacustrine clay, brown, saturated
5	12 - 12.5	Very tight clay, silt, lacustrine
		Screened Auger Sample
		5 - 7 feet bailed
		grouted from 12.5 ft. BGL to ground level
		materials used: 1 sack cement
		1 bag bentonite
		1 pail pellets
		Surface Elevation = 834.45 ft.

Piezometer: ☐ Screen ____ Pipe ____ Total Depth (BGL) ____

JOB NUMBER 0124-1151 DATE May 19, 19 PAGE 11

BORING NUMBER B-172 TOTAL DEPTH 15' S.W.L. (BGL)

Sample Number	From 0 to 15 Feet	Lithologic Description
1	0 - 4	Sand fine to coarse, fine to coarse gravel, silt, clay
		brown, moist
2	4 - 6	Sand fine to medium, silt, minor clay, brown, moist
3	6 - 8	Till, silt, clay, sand and fine to coarse gravel,
		brown, moist,
4	8 - 13	Till, clay, silt, fine to coarse sand and gravel, gray
		moist
	13 - 15	Garbage, very rough drilling, refusal at 15 ft., no
		water
		grouted from 15 ft. BGL to ground level
		materials used: 2 sacks cement
		1 bag bentonite
		1 bucket pellets
		Surface Elevation = 843.00 ft.

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

JOB NUMBER 0124-1151 DATE July 6,

BORING NUMBER B-176 TOTAL DEPTH 39' S.W.L.(BGL)

Sample Number	From 0 to 39 Feet	Lithologic Description
1	0 - 4	SAND; fine-coarse, silty, lt. brown, moist
2	4 - 9	SAND; fine-coarse, occ. gravel, silt, brown, very moist
3	9 - 24.5	TILL; clay & silt, fine angular gravel, gray, moist
no sample	24.5 - 25	CLAY, SILT; (lacustrine), gray (see SSS #5 below)
4	25 - 39	SAND; fine-med., lt. gray, saturated
		one well screened 34.5 - 36.5 feet BGL
		grouted from 32 - 0 feet BGL
		Surface Elevation = 832.82 ft.

Piezometer: ☐ Screen 924/#7 Pipe 38' Total Depth (BGL)

BORING NUMBER TOTAL DEPTH S.W.L.(BGL)

Sample Number	Interval (Blow Counts 6")	Split-Spoon Samples
SSS #1	4 - 6 (14/15)	SAND; fine-med., moist, lt. brown
SSS #2	9 - 11 (16/14)	TILL; clay & silt, fine angular gravel, gray, moist
SSS #3	14 - 16 (15/8/12)	TILL; clay & silt, fine angular gravel, gray, moist
SSS #4	19 - 21 (10/11/15)	TILL; clay & silt, fine angular gravel, gray, moist
SSS #5	24 - 26 (7/10/12)	BOTTOM; lacustrine clay & silt, gray (note: med. grain
		sand in nose) TOP: till; clay & silt, fine angular
		gravel, gray
SSS #6	29 - 31 (6/7/10)	SAND; fine-med., w/lenses of clay @ approx. 1-2", gray,
		brown
SSS #7	34 - 36 (7/8/9)	SAND; fine grain, lt. gray, saturated

Piezometer: ☐ Screen Pipe Total Depth (BGL)

JOB NUMBER 0124-1151 DATE July 6, 1983 PAGE --

BORING NUMBER B-177 TOTAL DEPTH 24' S.W.L.(BGL) ____

Sample Number	From 0 to 24 Feet	Lithologic Description
1	0 - 3	SAND; fine-coarse, fine gravel, brown, moist-saturated
		@ 3'
2	3 - 4	CLAY & SILT; fine angular gravel, blue-gray, saturated
3	4 - 8.5	SAND; fine-coarse, silt, fine-med. gravel, brown,
		saturated
4	8.5 - 14.5	TILL; clay & silt, fine angular gravel, gray
5	14.5 - 24	SAND; fine-coarse, fine-med. gravel, silt, brown,
		saturated
		one well screened 19 - 21 feet BGL
		drilled 2nd hole to 8 feet BGL
		one well screened 5 - 7 feet BGL
		grouted from 16 - 0 feet BGL
		Surface Elevation = 823.12 ft.

Piezometer: ☐ Screen 2-924/#7 Pipe 31' Total Depth (BGL) ____

BORING NUMBER ____ TOTAL DEPTH ____ S.W.L.(BGL) ____

Sample Number	Interval (Blow Counts 6")	Split-Spoon Samples
SSS #1	4 - 6 (7/8)	TOP 6"; fine sand, silt minor clay, brown, saturated
		MIDDLE 6"; fine-coarse sand, fine gravel, gray,
		saturated
		BOTTOM 6"; clay & silt, fine angular gravel, gray,
		saturated
SSS #2	9 - 11 (9/16/24)	TILL; clay & silt, fine angular gravel, gray
SSS #3	14 - 16 (72/34/20)	TOP 6"; till; clay & silt, fine angular gravel, gray
		BOTTOM 12"; fine-coarse sand, fine-med. gravel, silt,
		minor clay, brown, saturated
SSS #4	19 - 21 (11/14)	Alternate layers approx. 3" of fine-coarse sand, fine-
		med. gravel, brown, saturated

Piezometer: ☐ Screen ____ Pipe ____ Total Depth (BGL) ____

JOB NUMBER 0124-1151 DATE July 7, 1985 PAGE

BORING NUMBER B-178 TOTAL DEPTH 34' S.W.L.(BGL)

Sample Number	From 0 to 34 Feet	Lithologic Description
1	0 - 6	SILT, CLAY; fine sand, dry-moist, brown
2	6 - 11.5	CLAY & SILT; very moist, brown
3	11.5 - 13	SILT, CLAY; fine angular gravel, dk. brown, very moist
4	13 - 19	TILL; clay & silt, fine angular gravel, gray, tight,
		moist
5	19 - 34	SAND; fine-coarse, grayish-brown, saturated
		one well screened 27 - 29 feet BGL
		grouted from 25 - 0 feet BGL
		Surface Elevation = 831.42 ft.

Piezometer: ☐ Screen 924/#7 Pipe 30' Total Depth (BGL)

BORING NUMBER TOTAL DEPTH S.W.L.(BGL)

Sample Number	Interval (Blow Counts 6")	Split-Spoon Samples
SSS #1	4 - 6 (6/8/10)	SILT, CLAY, SAND; fine, organics, black-gray, moist
SSS #2	9 - 11 (7/6/5)	SILT, CLAY; fine sand, gray-brown, very moist
SSS #3	14 - 16 (8/11/14)	TILL; clay & silt, fine angular gravel, gray, moist
SSS #4	19 - 21 (5/4/7)	TOP 4"; fine-coarse sand, fine gravel, silt, brown,
		saturated
		BOTTOM; clay & silt, gravel, brown, very moist
SSS #5	24 - 26 (4/3/3)	TOP 13"; fine-coarse sand, brown, saturated
		BOTTOM; clay & silt, lacustrine, gray, saturated
SSS #6	29 - 31 (3/3/3)	SAND; fine-coarse, grayish-brown, saturated

Piezometer: ☐ Screen Pipe Total Depth (BGL)

JOB NUMBER ________

BORING NUMBER B-179 TOTAL DEPTH 46' S.W.L.(BGL) ________

Sample Number	From 0 to 46 Feet	Lithologic Description
1	0 - 5	SILT, CLAY, SAND; fine-med., very moist, gray
2	5 - 8	TILL; clay & silt, fine angular gravel, sand, dk.
		brown, moist
3	8 - 10	SILT, SAND; fine-med., clay, gray-black, very moist-
		saturated
4	10 - 17	SAND; fine-coarse, minor silt, brown, very moist
5	17 - 23	TILL; silt, clay, fine angular gravel, soft, very
		moist
6	23 - 28	TILL; clay & silt, fine angular gravel, soft, very
		moist
7	28 - 35	SILT; very fine sand, minor clay, lt. gray, saturated
8	35 - 46	TILL; clay & silt, fine angular gravel, gray moist
		Surface Elevation = 849.10 ft.
		grouted from 46 - 0 feet BGL

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

BORING NUMBER ________ TOTAL DEPTH ________ S.W.L.(BGL) ________

Sample Number	Interval (Blow Counts 6")	Split-Spoon Samples
SSS #1	4 - 6 (6/5/6)	TOP 6"; silt, clay, fine-med.. sand
		BOTTOM 12"; till; clay & silt, fine angular gravel, sand
		brown
SSS #2	9 - 11 (4/6/6)	TOP 12"; silt, sand, clay, gray-black
		BOTTOM 6"; fine-med. sand, brown, very moist
SSS #3	14 - 16 (7/7/10)	SAND; fine-coarse, occ. silt layer, brown, saturated
SSS #4	19 - 21 (7/7/7)	TILL; silt, clay, fine angular gravel, sand, lt. brown,
		soft, saturated
SSS #5	24 - 26 (7/7/10)	TILL; clay & silt, fine angular gravel, gray, saturated
SSS #6	29 - 31 (21/25/30)	SILT; very fine sand, minor clay, lt. gray, saturated
SSS #7	34 - 38 (7/10/14)	SILT; gray, grades to med. brown, sand, grades to till;
		silt, clay, fine angular gravel, gray
SSS #8	39 - 41 (12/13/16)	TILL; clay & silt, fine angular gravel, gray
SSS #9	44 - 46 (8/1/3)	TOP 3"; fine-coarse sand, grades to silt, grads to lacustrine clay in bottom 3"

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

JOB NUMBER 0124-1151 DATE July 12, 1983 PAGE 16

BORING NUMBER B-180 TOTAL DEPTH 44' S.W.L.(BGL)______

Sample Number	From 0 to 44 Feet	Lithologic Description
1	0 - 5	CLAY & SILT; sand, fine-coarse gravel, brown, moist
2	5 - 7.5	CLAY & SILT; minor sand & gravel, gray, moist
3	7.5 - 9	SAND; fine-coarse, silt, fine-med. gravel, minor clay,
		saturated, brown
4	9 - 20	SAND; fine-coarse, silt, gravel, minor clay, brown,
		saturated
5	20 - 25.5	SAND; fine-coarse, silt, minor clay & fine gravel,
		brown
6	25.5 - 27	TILL; clay & silt, fine-med. angular gravel
7	27 - 44	SAND; fine-coarse, silt, minor clay, lt. gray
		Surface Elevation = 830.22 ft.
		grouted from 44 - 0 feet BGL

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL)______

BORING NUMBER______ TOTAL DEPTH______ S.W.L.(BGL)______

Sample Number	Interval (Blow Counts 6")	Split-Spoon Samples
SSS #1	4 - 6 (7/7/9)	CLAY & SILT, sand & gravel, grades from brown to gray
SSS #2	9 - 11 (3/11)	SAND; fine-coarse, grayish-brown, saturated, grades
		to gray silt
SSS #3	14 - 16 (9/9/11)	Alternate layers of gray silt w/clay & brown sand w/
		silt & clay
SSS #4	19 - 21 (6/7/11)	Alternate layers of silt w/clay & fine-coarse sand,
		grayish-brown
SSS #5	24 - 26 (11/9/11)	TOP 14"; alternate layers of silt & clay, fine-coarse
		sand, fine gravel
		BOTTOM; till; clay & silt, fine angular gravel, gray
SSS #6	29 - 31 (9/12/12)	TOP 15"; fine-coarse sand, brown, saturated
		BOTTOM 3"; silt, clay, gray
SSS #7	34 - 36 (6/8/11)	Alternate zones of silt & clay, gray, fine-coarse sand,
		fine-med. gravel, brown, saturated
SSS #8	39 - 41 (6/6/8)	SAND; fine-coarse, saturated

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

JOB NUMBER 0124-1151 DATE July 7, 1983 PAGE 17

BORING NUMBER B-181 TOTAL DEPTH 41' S.W.L.(BGL)

Sample Number	From 0 to 41 Feet	Lithologic Description
1	0 - 3	CLAY & SILT; gray, soft, moist
2	3 - 4	CLAY & SILT; fine sand, brown, moist
3	4 - 8.5	SAND; fine-coarse, fine gravel, brown, saturated
4	8.5 - 13.5	TILL; clay & silt, fine angular gravel, gray, tight,
		moist
	13.5 - 14	no sample; intermittent tight - easy drill
5	14 - 25	SAND; fine-coarse, brown, saturated
6	25 - 30	CLAY & SILT, gray, moist
7	30 - 41	SAND; fine-med., minor silt, brown, saturated
		Surface Elevation = 829.45 ft.
		grouted from 41 - 0 feet BGL

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER ______ TOTAL DEPTH ______ S.W.L.(BGL) ______

Sample Number	Interval (Blow Counts 6")	Split-Spoon Samples
SSS #1	4 - 6 (7/11)	SAND; fine-coarse, fine gravel, brown, saturated
SSS #2	9 - 11 (17/19/22)	TILL; clay, silt, fine angular gravel, gray
SSS #3	14 - 16 (16/15)	TOP 6"; clay & silt, lacustrine, gray
		BOTTOM 6"; fine-coarse sand, fine-med. gravel, brown,
		saturated
SSS #4	19 - 21 (14/13/17)	SAND; fine-med., brown, saturated
SSS #5	24 - 26 (14/16/17)	SAND; fine grading to silt, grading to clay, gray,
		lacustrine
SSS #6	29 - 31 (17/23)	TOP 6"; silt, clay, fine sand, gray
		BOTTOM 6"; fine sand, brown
SSS #7	34 - 36 (13/20/27)	SAND; fine-med., brown, saturated
SSS #8	39 - 41 (10/12)	SAND; fine-med., brown, saturated

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

JOB NUMBER 0124-1151 DATE July 13, 1983 PAGE 18

BORING NUMBER B-182 TOTAL DEPTH 51' S.W.L.(BGL)

Sample Number	From 0 to 51 Feet	Lithologic Description
1	0 - 7	SAND; fine-med., silt, minor clay, dk. brown, moist
2	7 - 21	SAND; fine-coarse, clay, occ. fine-med. gravel, dk. brown, moist, odor
3	21 - 41	SAND; fine-coarse gravel, minor silt, brown, saturated
4	41 - 51	SILT, CLAY; gray, tight drill
		grouted from 51 - 0 feet BGL
		Surface Elevation = 838.24 ft.

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER ______ TOTAL DEPTH ______ S.W.L.(BGL) ______

Sample Number	Interval (Blow Counts 6")	Split-Spoon Samples
SSS #1	4 - 6 (18/21/25)	SAND; fine-coarse, occ. fine gravel, minor clay, dk. brown
SSS #2	9 - 11 (12/14/15)	SAND; fine-coarse, fine-coarse gravel, brown-black
SSS #3	14 - 16 (12/14/15)	SAND & GRAVEL; fine-coarse silt, minor clay, brown, saturated, odor
SSS #4	19 - 21 (18/19/23)	SAND & GRAVEL; fine-coarse grades to silt, sand, gravel, brown
SSS #5	24 - 26 (7/11/10)	SAND & GRAVEL; fine-coarse, brown, saturated
SSS #6	29 - 31 (7/7/8)	SAND & GRAVEL; fine-coarse, brown, saturated
SSS #7	34 - 36 (6/8/12)	GRAVEL & SAND; fine-coarse, brown, saturated
SSS #8	39 - 41 (13/15/13)	GRAVEL; fine-med., coarse sand, brown, saturated
SSS #9	44 - 46 (7/7)	SILT, CLAY; lt. gray, lacustrine
SSS #10	49 - 51 (7/10/25)	TOP 12"; till; clay & silt, fine angular gravel, gray
		BOTTOM 6"; till, gravel, clay & silt, sand, pink

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER B-183 TOTAL DEPTH 31' S.W.L.(BGL)

Sample Number	From 0 to 31 Feet	Lithologic Description
1	0 - 5	CLAY, SILT, gravel, sand, brown, moist
2	5 - 7.5	SILT, CLAY; sand, fine-coarse gravel, brown, moist
3	7.5 - 9	CLAY, SILT; fine gravel, sand, dk. brown, very moist
4	9 - 20	TILL; clay, silt, fine angular gravel, minor sand,
		brown-gray, moist
5	20 - 21.5	SAND; fine-coarse, fine gravel, brown, saturated
6	21.5 - 31	TILL; silt & clay, tight, fine angular gravel, gray
		grouted from 31 - 0 feet BGL
		Surface Elevation = 833.40

Piezometer: ☐ Screen ____ Pipe ____ Total Depth (BGL) ____

BORING NUMBER ____ TOTAL DEPTH ____ S.W.L.(BGL) ____

Sample Number	Interval (Blow Counts 6")	Split-Spoon Samples
SSS #1	4 - 6 (6/6/8)	SAND; fine, silt, brown, grades to clay & silt w/
		gravel, brown
SSS #2	9 - 11 (7/9/9)	TILL; clay & silt, fine angular gravel, sand, grayish-
		brown
SSS #3	14 - 16 (1/1/3)	TILL; silt, clay & sand, fine gravel, gray, saturated
SSS #4	19 - 21 (12/15/29)	TOP 12"; till; silt, clay, sand, fine gravel, gray
		BOTTOM 6"; fine-coarse sand, fine gravel, brown,
		saturated
SSS #5	24 - 26 (9/12/13)	TILL; clay & silt, minor fine gravel, gray, moist
SSS #6	29 - 31 (12/16/18)	TOP 12"; till; clay & silt, fine gravel, gray
		BOTTOM 6"; fine-coarse gravel, fine-coarse sand, brown,
		saturated

Piezometer: ☐ Screen ____ Pipe ____ Total Depth (BGL) ____

JOB NUMBER 0124-1151 DATE August 12, 1983 PAGE

BORING NUMBER B-184 TOTAL DEPTH 48' S.W.L.(BGL)

Sample Number	From 0 to 48 Feet	Lithologic Description
1	0 - 1.5	HUMUS; med. brown
2	1.5 - 4	CLAY; somewhat silty, orange-brown, moist
3	4 - 8	SAND; fine-med., some silt, orange-brown, moist
4	8 - 13	SAND; very fine-coarse w/silt, orange-brown, sat.,
		somewhat cohesive
5	13 - 16	SILT; w/much clay & some fine-med. sand changing to
		clay w/silt, lt. gray, sat., very cohesive
6	16 - 21	CLAY; somewhat silty, med. blue-gray, moist, very
		cohesive (trace of fine angular gravel)
7	21 - 23	SAME AS SAMPLE #6; except very moist
8	23 - 43	GRAVEL; fine-med., w/some coarse sand, 8" of mtl.
		entered auger, drilled very easy, subangular - sub-
		rounded gravel interbedded w/fine-med. sand
9	43 - 48	VERY TIGHT DRILLING; clay; somewhat silty w/fine-
		med. angular gravel, very cohesive, slightly moist

Piezometer: ☐ Screen d-924/#10 s-924/#10 Pipe d-30' s-15' Total Depth (BGL) d-30' s-15'

BORING NUMBER TOTAL DEPTH S.W.L.(BGL)

Sample Number	From __ to __ Feet	Split-Spoon Samples
	4 - 6	Blow Counts: 6-5-4
	9 - 11	Blow Counts: 7-7-12
	14 - 16	Blow Counts: 12-14-18
	19 - 21	Blow Counts: 10-13-17
	24 - 26	
	29 - 31	
		deep boring grouted 24 ft. BGL to surface (cement)
		shallow boring sealed from SWL to surface w/dry
		bentonite
		Surface Elevation = 830.34 ft.

Piezometer: ☐ Screen Pipe Total Depth (BGL)

GRANGER LAND DEVELOPMENT COMPANY
GRANGER MID 082 771 700 LANDFILL
POST-CLOSURE OPERATING LICENSE

APPENDIX 7-D

SOIL BORING LOGS

BORING NUMBER ~~P-29~~ P-28 TOTAL DEPTH 36' S.W.L. (BGL) 186

Sample Number	From 0 to 36 Feet	Lithologic Description
	0 - 1	TOPSOIL; brown, silty, dry, clay till
	1 - 4	SAND; med.-fine, reddish-brown, dry, silty
	4 - 8	CLAY TILL; reddish-brown, dry, silty w/some minor
		coarse gravel & random cobbles
	8 - 9	SAND & GRAVEL; med.-coarse sand, gray, dry, poorly
		sorted
	9 - 17	SAND; med.-fine, dk. brown w/fine gravel, dry, silty,
		poorly sorted
	17 - 21	SAND: med.-fine, lt. brown, moist, well sorted
	21 - 29	SAND & GRAVEL; gray, med.-fine sand, moist, poorly
		sorted, med.-fine gravel at approx. 25 ft. BGL
	29 - 30	CLAY; lt. brown, silty, moist
	30 - 35	SAND; med.-fine, lt. brown, saturated, well sorted,
		silty
	35 - 36	CLAY; lt, brown, silty, moist, elastic, dense
		drilling T.D. = 35 feet BGL
		sampling T.D. = 36 feet BGL
		well T.D. = 33 feet BGL
		bentonite slurry grout from 5 - 30 feet BGL
		gravel packed from 29 - 33 feet BGL
		screened interval = 31 - 33 feet BGL
		developed by air jetting, clear, high recharge rate
		materials: (1) 2-inch #924 SSS #7 slot SSS
		35.5 feet of 2-inch galvanized casing
		866.05
		TOC ~~869.90~~ 10/85
		Surface ~ 863.

Piezometer: ☐ Screen 2' Pipe 35.5' Total Depth (BGL)

JOB NUMBER

BORING NUMBER ~~P-29~~ P-28 TOTAL DEPTH ______ S.W.L. (BGL) ______

		Split-Spoon Sampling	
		Sample Interval	Blow Counts
		#1; 4 - 6 feet	11, 11, 12 (NR)
		#2; 9 - 11 feet	15, 15, 15 (NR)
		#3; 14 - 16 feet	12, 12, 14 (NR)
		#4; 19 - 21 feet	6, 6, 9 (NR)
		#5; 24 - 26 feet	13, 15, 15
		#6; 29 - 31 feet	10, 20, 20
		#7; 34 - 36 feet	15, 11, 17

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER ~~P-28~~ P-29 TOTAL DEPTH 54' S.W.L. (BGL) 187

Sample Number	From 0 to 56 Feet	Lithologic Description
	0 - 3	FILL; dk. brown, clay till
	3 - 6	FILL; gray clay, dense
	6 - 10	FILL; till, reddish-brown w/strong odor
	10 - 19	FILL; clay, lt. brown, moist
	19 - 24	SAND; med.-fine, dk. brown, dry w/cobbles & med.-fine
		gravel
	24 - 41	CLAY TILL; dk. brown, silty w/interbed of med.-fine
		sand lenses, dry
	41 - 42	CLAY; lt. brown, silty, moist, tight drilling
	42 - 54	SAND; med.-fine, lt. brown, saturated, well sorted
	54	CLAY TILL; gray, elastic, moist, dense
		drilling T.D. = 54 feet BGL
		sampling T.D. = 56 feet BGL
		well T.D. = 45 feet BGL
		screened interval = 43 - 45 feet BGL
		grouted from 5 - 42 feet BGL and backfill w/natural
		material and installed casing guard
		gravel packed from 41 - 45 feet BGL
		development required bail development due to slow
		recharge rate, moderately clean, some silts present
		materials: (1) 2-inch #924 SSS #7 slot
		(4) 2-inch x 10-foot galvanized casing
		(1) 2-inch x 4.7-foot galvanized casing
		869.90
		TOC ~~866.05~~ 10/85

Piezometer: ☐ Screen 2' Pipe 44.7' Total Depth (BGL) ______

BORING NUMBER ~~P-28~~ P-29 TOTAL DEPTH ______ S.W.L. (BGL) ______

		Split-Spoon Sampling	
		Sample Interval	Blow Counts
		#1; 54 - 56 feet	20, 20, 21

Piezometer: ☐ Screen ______ Pipe ______ Total Depth (BGL) ______

BORING NUMBER P-30 TOTAL DEPTH 41' S.W.L. (BGL) 30'

Sample Number	From 0 to 41 Feet	Lithologic Description
	0 - 14	CLAY; dk. brown, moist & dense, drilling was tight
	14 - 17	SAND; med.-fine, lt. brown, moist, sorted w/cobbles &
		pebbles
	17 - 18	SAND; med.-fine, dk. brown, moist
	18 - 21	SAND: med.-fine, lt. brown, moist w/minor gravel &
		cobbles
	21 - 22	SAND & GRAVEL; med.-fine sand, fine gravel, gray w/
		cobbles
	22 - 30	SAND; lt. brown-buff, med.-fine, moist, well sorted
	30 - 32	SAND; brown, fine, saturated, well sorted & silty
	32 - 41	SAND; med.-fine, brown, saturated & well sorted
	41	CLAY; brown, moderately silty, moist, elastic &
		relatively impermeable
		screened interval: 39 - 41 ft. BGL #924, 7-slot
		grouted w/bentonite slurry from 5 - 30 ft. BGL and
		backfilled w/natural materials; cement pad and casing
		guard were installed
		Split-Spoon Sample Intervals
		#1; 5 - 7 ft. BGL
		#2; 10 - 12 ft. BGL
		#3; 15 - 17 ft. BGL
		#4; 20 - 22 ft. BGL
		#5; 25 - 27 ft. BGL
		#6; 30 - 32 ft. BGL
		#7; 35 - 37 ft. BGL
		#8; 41 - 43 ft. BGL
		TOC 869.62 10/85

Piezometer: ☐ Screen 924 #7 Pipe 40' x 2" galv. Total Depth (BGL) 41'

JOB NUMBER [illegible]

BORING NUMBER P-33 TOTAL DEPTH 49' S.W.L. (BGL) 189

Sample Number	From 0 to 49 Feet	Lithologic Description
	0 - 3	FILL; clay, brown, cap material
	3 - 25	FILL; waste material
	25 - 30	SAND: med.-fine, dk. brown, dry, well sorted
	30 - 49	SAND; med.-fine, lt. brown, silty, moist w/some fine
		gravel at approx. 35 ft. BGL, became saturated at
		approx. 42 ft. BGL
	49	CLAY; tight, became soupy
		drilling T.D. = 49 feet BGL
		sampling T.D. = no samples were acquired of confining
		clay due to obstructed lead auger .
		well T.D. = 49 feet BGL
		backfilled w/natural materials and w/2 buckets of
		bentonite pellets at top of water table
		gravel packed from 45 - 49 feet BGL
		development required bail development due to slow
		recharge rate, moderately clean, but may have some
		minor silts
		materials: (1) 2-inch #924 SS #7 slot
		(5) 2-inch x 10-foot galvanized casing
		TOC 874.97 10/85

Piezometer: ☐ Screen 2' Pipe 50' Total Depth (BGL) ______

JOB NUMBER 0124-151

BORING NUMBER MW-35 TOTAL DEPTH 39' S.W.L. (BGL) 19'

Sample Number	From 0 to 39 Feet	Lithologic Description
	0 - 1	TOPSOIL; dk. brown, moist, silty
	1 - 12	CLAY TILL; reddish-brown, dry, elastic w/minor fine
		gravel
	12 - 20	CLAY TILL; dk. brown, moist, sandy, med.-coarse w/
		fine gravel, silty, some minor cobbles
	20 - 25	SAND: fine, lt. brown, moist, well sorted w/some silt
	25 - 29	GRAVEL; coarse, poorly sorted w/med.-fine sand, wet
	29 - 30	CLAY: lt. brown, dense, moist, elastic
	30 - 36	SAND: med.-fine, lt. brown, saturated, well sorted
	36 - 37	CLAY; brown, moist, elastic, silty
		drilling T.D. = 37 feet BGL
		sampling T.D. = 39 feet BGL
		well T.D. = 36 feet BGL
		screened interval = 34 - 36 feet BGL
		grouted from 5 - 30 feet BGL and backfilled w/natural
		materials (clay); casing guard installed
		development by air jetting, clear w/good recovery rate
		materials: (1) 2-inch #924 #7 slot
		(1) 2-inch x 6-foot galvanized casing
		(3) 2-inch x 10-foot galvanized casing
		TOC 864.58 10/85
		Surface ~ 862

Piezometer: ☐ Screen 2' Pipe 36' Total Depth (BGL) ____

JOB NUMBER 0124-131

BORING NUMBER MW-35 TOTAL DEPTH ________ S.W.L. (BGL) ________

		Split-Spoon Sampling	
		Sample Interval	Blow Counts
		#1; 4 - 6 feet	10, 12, 13
		#2; 9 - 11 feet	8, 12, 15
		#3; 14 - 16 feet	3, 4, 5 (NR)
		#4 19 - 21 feet	11, 11, 11
		#5; 24 - 26 feet	9, 8, 11
		#6; 29 - 31 feet	6, 10, 10
		#7; 34 - 36 feet	19, 16, 17
		#8; 37 - 39 feet	18, 21, 23 (NR)

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

BORING NUMBER MW#25 TOTAL DEPTH 63' S.W.L.(BGL) ____

Sample Number	From ___ to ___ Feet	Lithologic Description
	0-20	SAND; fine-coarse with silt fraction-dry
		brown-small amount, fine gravel-increasing
		with depth
	20-25	TILL; with gravel-dry, gray
	25-28	SAND; fine-coarse with gravel, moist, brown,
		dry clay inter beds
	28-35	SAND; very fine, well sorted, brown-saturated
		with small amount silt
	35-38	SAND; medium, saturated-brown
	38-59	CLAY TILL; gray, plastic
	59-63	SAND; coarse, saturated, "salt and pepper"

Piezometer: ☐ Screen 924 x 7 Pipe 2" galv. Total Depth (BGL) 63'

BORING NUMBER ____ TOTAL DEPTH ____ S.W.L.(BGL) ____

Sample Number	From ___ to ___ Feet	Lithologic Description
		screen set: 61 feet - 63 feet
		casing: 64
		grout (bentonite, slurry): 56 feet - surface
		casing guard: 1
		lock: 1
		cement pad: 1

Piezometer: ☐ Screen ____ Pipe ____ Total Depth (BGL) ____

BORING NUMBER MW#25 TOTAL DEPTH ________ S.W.L.(BGL) ________

Sample Number	From ___ to ___ Feet	Lithologic Description
Blow Count		Split Spoon Samples
35	8-10	SAND; fine-coarse, with gravel, brown-moist
to 100 (18")	13-15	SAND; with clay seam-possible cobble
32	18-20	SAND; no clay
40(33)	23-25	SAND?; sample taken twice-not representative
51	28-30	SAND; very fine-well sorted-saturated, brown,
		some silt
25	33-35	SAND; last 2 inches sand, medium, unsorted,
		saturated, brown
15	38-40	CLAY TILL; gray, with gravel, plastic moist
40	43-45	Same as above
51	48-50	Same as above
41	53-55	Same as above
75	58-60	SAND; to 59 feet, 59-60 feet coarse sand,

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) ________

BORING NUMBER MW#25 (continued) TOTAL DEPTH ________ S.W.L.(BGL) ________

Sample Number	From ___ to ___ Feet	Lithologic Description
75	58-60	unsorted-saturated, some gravel, "salt and
		pepper"

Piezometer: ☐ Screen ______ Pipe ________ Total Depth (BGL) ________

JOB NUMBER #0124-1151 Granger

BORING NUMBER SS-193/P-3 ~~MW-36~~ TOTAL DEPTH 36' S.W.L. (BGL) approx. 27'

Sample Number	From 0 to 36 Feet	Lithologic Description
	0 - 1	TOPSOIL; dk. brown, moist, silty
	1 - 4.5	CLAY TILL; reddish-brown, dry w/minor fine gravel,
		silty, elastic
	4.5 - 12	CLAY TILL; lt. brown, dry, tight drilling w/med.-fine
		sand and minor coarse gravel
	12 - 15.5	SAND & GRAVEL; med.-fine sand and gravel w/minor silts,
		predominantly dry w/perched zone occurring at 12.5-13
		feet, thin clay stringer at 13 feet, brown, poor
		cutting returns, increase in gravel at approx. 14 feet
	15.5 - 30	SAND; fine, lt. brown, dry, well sorted, silty w/
		minor coarse sand, sturated at 27 feet
	30 - 31	SILT/CLAY; no cuttings, increase in drilling pressure
	31 - ~~36~~ 35	SAND; fine, lt. brown, saturated, silty
	~~36~~ 35	CLAY; brown, silty, moist, elastic, dense
		drilling T.D. = 36 feet BGL
		well T.D. = 36 feet BGL
		screened interval = 34 - 36 feet BGL
		2-inch x 2-foot #924 #7 slot well screen
		sand packed from 31 - 36 feet BGL
		2-inch x 36-feet galvanized casing
		bentonite slurry grouted from 27 feet to surface and
		backfilled w/natural materials; cement pad installed
		w/protector at surface
		developed w/air lift method for approx. 2 hours; initia
		water quality silt brown w/slow recharge; final quality
		was clear w/improved recharge response (approx.1/2gpm)
		Split Spoon Samples
		#1; 31 - 32.5 feet BGL
		#2; 32.5 - 34 feet BGL
		#3; 34 - 35.5 feet BGL

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) 36'

JOB NUMBER #0124-1151 Granger

BORING NUMBER SB-174 / PW-37 PW-1 TOTAL DEPTH 35' S.W.L. (BGL) approx. 27'

Sample Number	From 0 to 35 Feet	Lithologic Description
	0 - 1	TOPSOIL; dk. brown, moist, silty
	1 - 4	CLAY TILL; reddish-brown, dry w/minor med.-fine sand
		and fine gravel
	4 - 12.5	CLAY TILL; lt. brown, dry, tight drilling w/med.-fine
		sand, minor coarse gravel
	12.5 - 16	SAND & GRAVEL; brown, med.-fine sand and gravel w/
		silts, clay lense occurred at approx. 13 feet creating
		perched conditions
	16 - 30	SAND; dry, well sorted, fine, lt. brown, silty w/minor
		coarse sand, saturated at approx. 27.5'
	30 - 31	CLAY/SILT; increase in drilling pressure, no cuttings
	31 - 35	SAND; fine, light brown, saturated, silty
		drilling T.D. = 35 feet BGL
		well T.D. = 35 feet BGL w/2 feet bottom blank
		screened interval = 27.5 - 33 feet BGL
		4-inch x 5.5-foot #15 slot well screen
		sand packed from 26 - 33 feet BGL
		bentonite slurry grouted from 26 feet to surface
		(collapse confirmation conducted)
		backfilled w/natural cuttings
		developed w/air jetting for 1 hour, insufficient
		volumes of water for lift purging; flushed w/100
		gallons of water and expelled by air; will require
		pump development to acquire clear water quality

Piezometer: ☐ Screen ________ Pipe ________ Total Depth (BGL) 35'

BORING/WELL LOG DATA
KECK CONSULTING SERVICES, INC.

From 11/4/87 Keck Report

PROJECT: 124-1151 Granger #2 Hydro

WELL/BORING No.: PW-38

LOCATION: 8550 W. Grand River Grand Ledge, Michigan

DATE DRILLED: September 14 & 15, 1987

DRILLING METHOD: Cable Tool

CASING TYPE/DIA.: 6 Ft of 8-Inch Black Steel
30 Ft of 8-Inch Black Steel

TOTAL DEPTH DRILLED: 39.60 Feet

TOTAL CASING: 36 Feet

GROUND ELEVATION:

T.O.C. ELEVATION:

GROUT TYPE/QUANTITY: 12 Bags Bentonite Holeplug Clay Brown Backfill

SCREEN TYPE/LENGTH: Johnson 8" x 6' - .15 Slot 1st 4', then 2' T.W.

GROUT INTERVAL(S): 21 to 26 Feet and 6 to 9 Feet

SCREENED INTERVAL: 33.60 to 39.60 Feet BGL

DEPTH TO WATER: 31.5 Feet From Ground Level

GRAVEL PACK TYPE: Silica Sand, Fine Ottawa Ind. Sand Corp.

WATER LEVEL ELEVATION:

GRAVEL PACK INTERVAL: 26 Feet Below Grade to 39.60 Feet Below Grade

STATIC WATER LEVEL: DATE:

REMARKS:

LOGGED BY: Steven J. Daily

SIGNATURE:

DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
-1		TOP SOIL
-12.5		CLAY: brown, gritty and some gravel
2.5-17		SAND: fine to coarse and some medium to very coarse
7		with clay, gray strips.
7-24		SAND: fine to medium and gravel fine to coarse
4-32		SAND: fine to coarse and some gravel fine, silty, light brown.
-32.5		CLAY: light brown, silty
5-38		SAND: light brown, fine to medium, some coarse
8-39		CLAY: brown, gravelly, "soft"
39-40		CLAY: gray, gravelly, "soft"
		NOTE: From 35 to 37 feet, apparently water-bearing sand.

BORING/WELL LOG DATA

KECK CONSULTING SERVICES, INC.

From 11/4/87 Keck Report

JECT: 124-1151 Granger #2 Hydro

WELL/BORING No.: PW-39

LOCATION: 8550 W. Grand River Avenue Grand Ledge, Michigan

DATE DRILLED: September 24-25, 1987

DRILLING METHOD: Cable Tool

CASING TYPE/DIA.: 8-Inch Black Steel/6 Feet
4-Inch Black Steel/28.99 Feet

TOTAL DEPTH DRILLED: 39.5 Feet BGL

TOTAL CASING: 34.99 Feet

GROUND ELEVATION: 864.48 Feet

T.O.C. ELEVATION: 867.11 Feet

GROUT TYPE/QUANTITY: 19-20 Feet/12 Bags Hole Plug
11-19 Feet/Natural (clay)

SCREEN TYPE/LENGTH: Johnson 8-Inch/6 Feet **

GROUT INTERVAL(S): *

SCREENED INTERVAL: 33-39 Feet BGL

DEPTH TO WATER: Approximately 27.85 Feet BGL

GRAVEL PACK TYPE: Silica Sand, Fine Ottawa Indust. Sand Corp.

WATER LEVEL ELEVATION:

GRAVEL PACK INTERVAL: 24-39 Feet Below Grade

STATIC WATER LEVEL: 832.36 Feet DATE: 10/16/87

REMARKS: 14 inch borehole. Natural gas detected 11-19 feet below ground level. Therefore, additional grout 6-11 feet below ground level.

LOGGED BY: Steven J. Daily

SIGNATURE:

PTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
1		TOP SOIL
1-9		CLAY: brown, gritty and some gravel.
9-13		SAND: medium to coarse and gravel medium to coarse, dry.
13-13,5		CLAY: brown
13.5-20		SAND: medium to coarse with gravel medium to coarse.
20-21		CLAY: brown
21-27		SAND: fine and silty with gravel medium.
27-28		CLAY: brown
28-37		SAND: fine to meidum with gravel fine to medium.
37-38.5		CLAY: brown, gritty with some gravel.
38.5-39.5		CLAY: gray, gritty and gravely.

* 6-11 Feet/5 Bags Hole Plug, 6 Bags Bentonite
0-6 Feet/Natural Materials (Brown Clay)

** 15 Slot Top 4 Feet then 2 Feet Tight Wound.

BORING/WELL LOG DATA

KECK CONSULTING SERVICES, INC.

PROJECT: Granger/West Landfill	WELL/BORING No.: P-31
LOCATION: Grand Ledge, Michigan	DATE DRILLED: October 11, 1988
DRILLING METHOD: 4 1/4-Inch Hollow-Stem Auger	CASING TYPE/DIA.: Galvanized/2-Inch T&C R&D
TOTAL DEPTH DRILLED: 61.31 Feet BGL	TOTAL CASING: 62.3 Feet
GROUND ELEVATION: ~ 886	T.O.C. ELEVATION: 887.58
GROUT TYPE/QUANTITY: Hole Plug-12 Bags	SCREEN TYPE/LENGTH: 2-Inch Stainless Steel/3 Feet
GROUT INTERVAL(S): 56 Feet BGL to Surface	SCREENED INTERVAL: 58.31-61.3 Feet BGL
DEPTH TO WATER:	GRAVEL PACK TYPE: Keck #50 - Silica
WATER LEVEL ELEVATION:	GRAVEL PACK INTERVAL: 56-61.3 Feet BGL
	STATIC WATER LEVEL: 823.58 DATE: 10/18/88

REMARKS:

LOGGED BY: Steve Daily

SIGNATURE:

DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
0-2		CLAY: gritty, brown.
2-7		CLAY: sandy, brown.
7-20		CLAY: gravelly till, gray
20-26		SAND: brown.
26-61.3		CLAY: gravelly till, stiff, gray.

170

GRANGER L.F. WEST

0-4' Clay fill w/Med Gravel
4-6 Sand w/some silt F-Medium
Brown
6-11.0 Sand w/some silt F-Medium
Grey
11.0-24.0 Sand F-Med/silty w/some Gra
Brown
24.0-26 Sand-Fine/silty w/some Grav
Saturated @ 24' DRK GREY/Cohesiv
26-44- Clay-Garbage
44-48 Sand fine drk Grey Saturate
Soupy w/some Gravel
48-52.5 Clay/silty Cohesive Grey/Bl
Moist

Sand Pack 46'-53' 3 Bags
31'-46' = 30 Gal Slurry Grout
25'-31' clay seal 5 Bag (2) @ Surf
0-25' Backfill Native

11284
6446
15764
0.0.
764

96
35

8-24-88
P-31

Original P31
Drilled New P31
and filled this
11/88
Used Bentonite Pellets

Was @
12912 N
7100 E
Per KJG
11/8/88

STEARNS DRILLING COMPANY
Industrial Park Drive
Dutton, Michigan 49316
616/698-7770

No. 89-2295-9

LOG OF TEST BORING NO. 200
MW 41

Sheet 1 of 3

Project Granger Landfill

Location Grand Ledge, MI

Date Completed

Crew Chief Mike Hefferan
Drill Rig CME 75
Boring Method 4½" HSA I.D.

Hole Plugged With

GROUNDWATER: FROM GRADE
Encountered @ ft.
After completion ft.
After 0.5 hrs. 51.5 ft.
Seepage ft.
Boring Caved at ft.

MONITOR WELL DATA:
Pipe/Type Galvanized
Length 61.0'
Above Ground 5.0'
Cap Flip Top Locking

Screen/Type Johnson
Size 2" x 36"
Slot 7
Set @ 56.0' - 59.0'
Backfilled Silica Sand

Bentonite Seal
Grout/Type Neat Cement
Depth 49.0' - 0.0
Protective Casing No
Materials Cleaned Steamed

Development Rod Pump

REMARKS:

LEGEND:
BlowCount/Blows per 6"
w/140# hammer x 30" drop
SS – 2" Split Spoon Sampler
LS – Brass Liner Sample
ST – Shelby Tube Sample

Sample Type	REC	Blow Count	In Feet	SOIL DESCRIPTION
				Brown Silty Clay, Some Fine Sand, Occasional Coarse Sand, Cobble, Fill
			5	
SS	24	4 7 9 9	10	
				Brown Medium to Fine Sand, Occasiona Fine Gravel
SS	18	4 5 6 7	15	
SS	20	4 4 5 5		
SS	24	2 2 3 3		
				Brown Very Fine Sand
SS	24	2 2 3 3	20	Brown Coarse to Fine Sand, Occasiona Fine Gravel
SS	24	2 3 4 6		Brown Medium to Fine Sand, Wet
				Brown Silt, Wet
SS	24	4 5 2 2	25	Gray Silty Clay, Little Fine Sand, Occasional Fine Gravel
SS	24	4 4 5 5		
SS	24	1 2 3 4		
			30	

STEARNS DRILLING COMPANY
Industrial Park Drive
Dutton, Michigan 49316
616/698-7770

Job No. 89-2183-5

LOG OF TEST BORING NO. SB #199 / MW #40

Sheet 1 of 2

Project Granger

Location Watertown Township

Date Completed 89 5-4-98

Crew Chief Jim Gryska
Drill Rig CME 550
Boring Method HSA & Wash Bore
Hole Plugged With Benseal & Soil

GROUNDWATER:
Encountered @ 26.0 ft.
After completion ____ ft.
After ____ hrs. ____ ft.
Seepage ____ ft.
Boring Caved at ____ ft.

MONITOR WELL DATA:
Pipe/Type 2" Galvanized
Length 36.0'
Above Ground 2.0'
Cap Locking Flip Cap

Screen/Type Stainless
Size 3.0'
Slot 7
Set @ 34.0' - 37.0'
Backfilled Nat. Sands to 15.0'

Bentonite Seal 15.0' - 1.0' *
Grout/Type Redi-Mix
Depth at Surface
Protective Casing ____
Materials Cleaned Steamed

Development Rod Pumped 7 GPM for 45 minutes

REMARKS: Water still a little cloudy
* Holeplug 40.0'-37.0'
Sand Pack 37.0'-35.0'

LEGEND:
BlowCount/Blows per 6" w/140# hammer x 30" drop
SS – 2" Split Spoon Sampler
LS – Brass Liner Sample
ST – Shelby Tube Sample
SNR – Sample not recovered

Type	REC	Count	In Feet	SOIL DESCRIPTION
				Topsoil - Brown Sandy Clay
				Brown & Gray Mottled Sandy Clay, Dry
SS	15	4 7 9	5	
				Brown Sandy Clay, Occasional Fine Gravel, Dry
SS	18	5 11 16	10	
				Brown Fine Sand, Dry
SS	18	5 9 10	15	
SS	18	4 7 9	20	
SS	18	4 6 8	25	
SS	18	2 4 6	30	Wet

STEARNS DRILLING COMPANY
Industrial Park Drive
Dutton, Michigan 49316
616/698-7770

ob No. 89-2183-5

LOG OF TEST BORING NO. SB #199 / MW #40

Sheet 2 of 2

Project Granger

Location Watertown Township

Date Completed 5-4-~~98~~89

Crew Chief Jim Gryska
Drill Rig CME 550
Boring Method HSA & Wash Bore
Hole Plugged With Benseal and Soil

GROUNDWATER:
Encountered @ 26.0 ft.
After completion ft.
After hrs. ft.
Seepage ft.
oring Caved at ft.

MONITOR WELL DATA:
Pipe/Type 2" Galvanized
Length 36.0'
Above Ground 2.0'
Cap Locking Flip Cap
Screen/Type Stainless
Size 3.0'
Slot 7
Set @ 34.0' - 37.0'
Backfilled Nat. Sands to 15.0'

Bentonite Seal 15.0' - 1.0' *
Grout/Type Redi-Mix
Depth at Surface
Protective Casing
Materials Cleaned Steamed
Development Rod Pumped 7 GPM for 45 minutes

REMARKS: Water still a little cloudy
* Holeplug 40.0'-37.0'
Sand Pack 37.0'-35.0'

EGEND:
BlowCount/Blows per 6" w/140# hammer x 30" drop
SS – 2" Split Spoon Sampler
LS – Brass Liner Sample
ST – Shelby Tube Sample
SNR – Sample not recovered

Type	REC	Count	In Feet	SOIL DESCRIPTION
SS WB	18	2 4 5	35	
				Brown Silty Clay, Moist, with Seams of Brown Very Fine Silty Sand
SS WB	18		40	
				End of Boring at 40.0'
			45	
			50	
			55	
			60	

STEARNS DRILLING COMPANY
Industrial Park Drive
Dutton, Michigan 49316
616/698-7770

No. 89-2295-9

LOG OF TEST BORING NO. 200
MW 41

Sheet 2 of 3

Project Granger Landfill

Location Grand Ledge

Date Completed

Crew Chief Mike Hefferan
Drill Rig CME 75
Boring Method $4\frac{1}{4}$" HSA I.D.

Hole Plugged With

GROUNDWATER:
Encountered @ ft.
After completion ft.
fter 0.5 hrs. 51.5 ft.
eepage ft.
Boring Caved at ft.

MONITOR WELL DATA:
Pipe/Type Galvanized
Length 61.0'
Above Ground 5.0'
Cap Flip Top Locking

Screen/Type Johnson
Size 2" x 36"
Slot 7
Set @ 56.0' - 59.0'
Backfilled Silica Sand

Bentonite Seal
Grout/Type Neat Cement
Depth 49.0' - 0.0
Protective Casing No
Materials Cleaned Steamed

Development Rod Pump

REMARKS:

LEGEND:
BlowCount/Blows per 6"
w/140# hammer x 30" drop
SS – 2" Split Spoon Sampler
LS – Brass Liner Sample
ST – Shelby Tube Sample

Sample Type	REC	Blow Count	In Feet	SOIL DESCRIPTION
SS	12	1 2 2 4		
SS	24	1 2 3 4	35	
SS	24	2 3 5 7	40	
				Gray Silty Clay, Some Fine Sand, Occasional Coarse Sand, Fine Gravel, Till
SS	24	4 5 8 11	45	
SS	24	2 4 9 16	50	Gray Very Fine Silty Sand, Wet
SS	24	0 0 2 4	55	Gray Medium to Fine Sand, Wet
SS	24	1 9 13 16	60	Gray Silty Clay, Little Fine Sand, Occasional Fine Gravel

STEARNS DRILLING COMPANY
Industrial Park Drive
Dutton, Michigan 49316
616/698-7770

Job No. 89-2295-9

LOG OF TEST BORING NO. 200
MW 41

Sheet 3 of 3

Project Granger Landfill

Location Grand Ledge, MI

Date Completed

Crew Chief Mike Hefferan
Drill Rig CME 75
Boring Method 4¼" HSA I.D.

Hole Plugged With

GROUNDWATER:
Encountered @ ft.
After completion ft.
After 0.5 hrs. 51.5 ft.
Seepage ft.
Boring Caved at ft.

MONITOR WELL DATA:
Pipe/Type Galvanized
Length 61.0'
Above Ground 5.0'
Cap Flip Top Locking

Screen/Type Johnson
Size 2" x 36"
Slot 7
Set @ 56.0' - 59.0'
Backfilled Silica Sand

Bentonite Seal
Grout/Type Neat Cement
Depth 49.0' - 0.0
Protective Casing No
Materials Cleaned Steamed

Development Rod Pump

REMARKS:

LEGEND:
BlowCount/Blows per 6"
w/140# hammer x 30" drop
SS - 2" Split Spoon Sampler
LS - Brass Liner Sample
ST - Shelby Tube Sample
SNR - Sample not recovered

Type	REC	Count	in Feet	SOIL DESCRIPTION
		3		
		8		
SS	18	13		
		17		
				End of Boring at 62.0'
			65	
			70	
			75	
			80	
			85	
			90	

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-43s
LOGGED BY:	Michael McDermott	DATE:	2/1/96
DRILLING METHOD:	4 1/4" ID Hollow Stem Auger	TOTAL DEPTH DRILLED:	21.5'
SCREEN TYPE:	2" ID stainless steel #7 slot	CASING TYPE:	2" ID galvanized
GRAVEL PACK TYPE:	#5 sand	GROUT TYPE:	Holeplug(HP); Bent. Cement Slurry (BC)
CASING GUARD TYPE:	4" square	WELL DEVELOPMENT TYPE:	Bailer
SCREENED INTERVAL:	15-20'	GRAVEL PACK INTERVAL:	13.5-20'
GROUT INTERVAL:	0-11.5' (BC); 11.5-13.5' (HP)	DEPTH TO WATER:	17'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	855.59

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-3'	Clay Till: brown, silty clay with trace sand and small gravel
3-20.5'	Sand: brown, fine, well sorted, contains occasional thin (<1') lenses of more coarse and less well sorted sand
20.5-21.5'+	Clay: brown, soft, silty
21.5'	End of Borehole

Split Spoon Sample Information

Sample Interval	Blow Counts	Recovery
0-2'	16,20,14,16	24"
2-4'	3,4,4,5	12"
4-6'	2,2,2,2	12"
6-8'	4,5,5,4	12"
8-10'	4,4,4,4	12"
10-12'	4,6,6,4	12"
12-14'	3,4,4,6	12"
14-16'	2,4,4,5	18"
16-18'	2,5,4,5	18"
18-20'	2,4,4,5	18"
20-22'	2,4,6,8	18"

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-43d
LOGGED BY:	Michael McDermott	DATE:	2/5/96 and 2/6/96
DRILLING METHOD:	4 1/4" ID Hollow Stem Auger	TOTAL DEPTH DRILLED:	64'
SCREEN TYPE:	2" ID stainless steel #7 slot	CASING TYPE:	2" ID galvanized
GRAVEL PACK TYPE:	#5 sand	GROUT TYPE:	Bentonite Cement Slurry
CASING GUARD TYPE:	4" square	WELL DEVELOPMENT TYPE:	Pump
SCREENED INTERVAL:	57-62'	GRAVEL PACK INTERVAL:	54-62'
GROUT INTERVAL:	0-54'	DEPTH TO WATER:	44'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	855.69

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-3'	Clay Till: brown, silty clay with trace sand and small gravel
3-20.5'	Sand: brown, fine, well sorted contains occasional thin (<1") lenses of more coarse
	and less well sorted sand, saturated @ 17'
20.5-35'	Clay: brown, soft, silty, changes to gray @ 25', becomes siltier and more stiff @ 32'
35-38'	Silt: gray, moist with trace very fine sand
38-44'	Clay: gray, silty, stiff with trace sand and small gravel
44-62.5'	Sand: gray, fine, saturated
62.5-64' +	Clay Till: gray, silty, stiff
64'	End of Borehole
	Split Spoon Sample Information

Sample Interval	Blow Counts	Recovery
18-20'	3,1,2,1	22"
20-22'	1,2,1,1	24"
22-24'	3,1,2,2	24"
24-26'	2,2,3,6	24"
26-28'	2,3,6,7	24"
28-30'	1,3,4,6	24"
30-32'	2,3,4,4	18"
32-34'	4,6,9,1	18"
34-36'	2,8,9,9	18"
36-38'	5,8,9,8	24"

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-43d

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION	
38-40'	3,3,4,3	24"
40-42'	5,6,8,6	18"
42-44'	6,5,9,10	24"
44-46'	5,7,10,12	24"
46-48'	0,2,6,8	24"
48-50'	0,2,8,9	24"
50-52'	2,4,9,9	24"
52-54'	3,6,7,4	18"
54-56'	2,3,6,7	18"
56-58'	0,6,8,8	12"
58-60'	1,3,4,5	18"
60-62'	3,4,7,9	18"
62-64'	5,10,11,15	24"

SOIL BORING/WELL LOG

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-44d
LOGGED BY:	Michael McDermott	DATE:	2/5/96
DRILLING METHOD:	4 1/4" ID Hollow Stem Auger	TOTAL DEPTH DRILLED:	51.5'
SCREEN TYPE:	2" ID stainless steel #7 slot	CASING TYPE:	2" ID galvanized
GRAVEL PACK TYPE:	Natural	GROUT TYPE:	Bentonite Cement Slurry
CASING GUARD TYPE:	4" square	WELL DEVELOPMENT TYPE:	Pump
SCREENED INTERVAL:	40-43'	GRAVEL PACK INTERVAL:	40-43'
GROUT INTERVAL:	0-40'	DEPTH TO WATER:	40'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	866.08

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION	
0-1'	Fill: sand, clay and wood debris	
1-14'	Clay: brown, sandy clay with trace silt and small gravel	
14-38'	Sand: brown, very fine-fine, saturated @ 28'	
38-40'	Clay: brown, silty clay, moist	
40-43'	Sand: brown, medium-coarse, angular	
43-46'	Clay: brown, soft silty changes to gray @ 44'	
46-51.5'+	Clay Till: gray, silty, stiff	
51.5'	End of Borehole	
	Split Spoon Sample Information	
0-2'	20,30,12,7	24"
2-4'	2,3,4,6	24"
4-6'	2,2,5,7	21"
6-8'	4,6,10,12	21"
8-10'	1,5,9,12	21"
10-12'	3,5,9,12	21"
12-14'	3,5,8,10	21"
14-16'	1,6,7,9	21"
16-18'	3,5,8,9	21"
18-20'	3,8,8,8	21"
20-22'	3,6,7,7	21"
22-24'	1,5,9,9	21"

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-44d

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION	
24-26'	8,12,14,16	21"
26-28'	1,4,6,4	21"
28-30'	5,5,8,8	21"
30-32'	3,7,9,8	21"
32-34'	2,4,7,7	21"
34-36'	0,0,2,2	21"
36-38'	4,5,9,11	21"
38-40'	3,4,7,7	12"
40-42'	3,4,9,11	12"
42-44'	4,4,5,7	24"
44-46'	4,5,6,6	12"
46-48'	3,6,8,8	21"
48-50'	2,4,7,8	24"
50-52'	3,10,21,33	24"

Note: The soil boring for this hole was drilled and sampled 2/5/96. MDEQ requested a screen interval at this location of 40-43' bgl. This soil boring was therefore cement bentonite grouted. A second soil boring was completed in this vicinity on 2/6/96. This boring was drilled to 43" bgl and the well was completed as described above.

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-45
LOGGED BY:	Michael McDermott	DATE:	2/7/96
DRILLING METHOD:	4 1/4" ID Hollow Stem Auger	TOTAL DEPTH DRILLED:	46'
SCREEN TYPE:	2" ID stainless steel #7 slot	CASING TYPE:	2" ID galvanized
GRAVEL PACK TYPE:	Natural	GROUT TYPE:	Bentonite Cement Slurry
CASING GUARD TYPE:	4" square	WELL DEVELOPMENT TYPE:	Pump
SCREENED INTERVAL:	39-44'	GRAVEL PACK INTERVAL:	30-44'
GROUT INTERVAL:	0-30'	DEPTH TO WATER:	26'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	843.17

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-.5'	Topsoil
.5-6'	Clay Till: red brown, silty, with mottled gray cracks and trace sand and small gravel
6-8.5'	Sand: brown, medium-coarse angular, saturated
8.5-26'	Clay Till: silty with trace sand and small gravel, stiff, moist
26-46' +	Sand: gray, very fine-fine, saturated, contains occasional thin (<1") lenses of medium sand
	and/or lenses in which the sand is clayey.
46'	End of Borehole

	Split Spoon Sample Information	
Sample Interval	Blow Counts	Recovery
0-2'	11,15,16,18	24"
2-4'	2,35,4	12"
4-6'	1,2,2,3	12"
6-8'	0,3,5,5	6"
8-10'	0,1,0,1	12"
10-12'	1,3,3,3	24"
12-14'	1,4,5,5	24"
14-16'	2,2,5,7	24"
16-18'	2,5,8,8	24"
18-20'	2,4,7,8	24"

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-45

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION	
20-22'	1,4,7,8	24"
22-24'	4,4,5,6	24"
24-26'	1,3,4,10	24"
26-28'	4,15,20,20	24"
28-30'	2,2,4,5	24"
30-32'	1,1,1,1	12"
32-34'	1,1,1,1	8"
34-36'	1,1,3,4	12"
36-38'	1,3,5,6	21"
38-40'	0,3,6,9	24"
40-42'	0,4,7,8	24"
42-44'	0,2,4,6	21"
44-46'	0,2,4,9	21"

5B.214

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-6R
LOGGED BY:	Michael C. Serafini	DATE:	5/30/00
DRILLING METHOD:	Hollow-Stem Auger	TOTAL DEPTH DRILLED:	42'
SCREEN TYPE:	2"x5', # 7 Slot Stainless Steel	CASING TYPE:	2" Galvanized
GRAVEL PACK TYPE:	#6 Sand	GROUT TYPE:	Holeplug (HP) bentonite Slurry (BS)
CASING GUARD TYPE:	4" Above Grade	WELL DEVELOPMENT TYPE:	Surge/Pump & Bail
SCREENED INTERVAL:	34-39'	GRAVEL PACK INTERVAL:	31.9-39'
GROUT INTERVAL:	BS: 3-29.2' HP: 2-3/29.2-31.9'	DEPTH TO WATER:	~35"
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA 871.99

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION	
	Grass Surface Cover	
0-12'	**Clay Till:**	grayish brown to brownish gray in color with depth, motteled rust and gray in some areas, silty clay matrix with some sand and pebbles 1-5mm in diameter, soft and moist at first grading to firm with depth, coal fragments from 8-10 feet
12-16'	**Clay Till:**	medium gray, silty clay matrix, some sand and pebbles 1-50 mm in diameter, firm, between 13 and 14 feet there is a small gravel lense just before 16 feet the color becomes brown
16-22'	**Sand & Gravel:**	tan to whitish, sand is fine to medium to coarse to vey coarse with predominantly very fine to fine gravel with some medium to coarse, 20 to 21 feet the formation is very gravely, moist
22-26'	**Sand:**	tan, very fine to fine to mostly medium grained in upper interval, becoming coarse to very coarse in cvontent from 24 to 24.6 feet, then grading to very fine grained sand with silt
26-30'	**Silt:**	tan, cohesive, very moist to wet, from 28.4 feetto 29.9 feet the silt formation is interbedded with sand and or silty sand
30-36.1'	**Sand:**	whitish tan, grading to tan, sand is mostlt medium grained with some ver fine to fine to coarse material, some very fine to fine gravel, by 32 feet the sand is very fine to fine with some silt, and by 36 feet it is very gravely, saturated at ~35 feet

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-6R

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
36.1-39.2'	**Interbedded Sand & Silt:** Tan grading to gray at depth, sand is anywhere from very fine to fine to medium to coarse grained, saturated
39.2-40'	**Clay:** gray, silty at first then lacustrine like, firm, moist
40-42'	**Clay Till:** gray, very silt and sandy clay matrix, some pebbles 1-20 mm in diameter, soft, very moist
42'	**End of Borehole**

Split-Soon Sample Information

Sample Interval	Blow Counts	% Recovery
0-2'	1,1,3,4	75
2-4'	4,4,6,7	100
4-6'	3,8,13,14	100
6-8'	5,8,13,17	100
8-10'	5,8,14,16	100
10-12'	3,6,9,12	100
12-14'	3,6,9,13	100
14-16'	2,7,8,13	100
16-18'	6,13,15,17	70
18-20'	8,13,15,16	70
20-22'	11,12,13,15	70
22-24'	7,8,13,11	70
24-26'	6,9,13,18	75
26-28'	6,10,11,17	100
28-30'	6,9,9,6	100
30-32'	5,8,7,8	90
32-34'	7,10,11,13	100
34-36'	10,12,12,12	100
36-38'	4,10,7,13	90
38-40'	12,13,7,9	70
40-42'	3,2,4,2	100

SB-215

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG 14615-7410

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	230-1051
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-14Rs
LOGGED BY:	Michael C. Serafini, CPG	DATE:	9/12/00
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	28'
SCREEN TYPE:	2"x5', # 7 Slot Stainless Steel	CASING TYPE:	2" Coupled Galvanized
GRAVEL PACK TYPE:	#6 Sand	GROUT TYPE:	Holeplug (HP) Bent. Slurry (BS)
CASING GUARD TYPE:	4" Above Grade	WELL DEVELOPMENT TYPE:	Surge/Pump & Bail
SCREENED INTERVAL:	21-26'	GRAVEL PACK INTERVAL:	19.4-26'
GROUT INTERVAL:	BS: 2-17' HP: 17-19.4'	DEPTH TO WATER:	~23'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA 865.11

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-2'	**Fill:** clay brought in for drilling pad
2-16'	**Clay :** brown, very dry, brittle, silty and loamy in upper interval, by 8' slight moisture and less brittle, clay matrix is silty, sandy with very fine through coarse gravel, between 8 and 10' there is brown and tan mottling with variable oxidation, the clay from 13-16' had an increase in gravel content and drilled "rocky"
16-16.5	**Sand:** dark brown, very fine to fine grained, silty, trace very fine gravel, moist
16.5-16.7	**Silt:** tan to light brown, moist
16.7-20.5	**Sand & Gravel:** whitish tan, very fine through coarse grained sand, predominantly medium to coarse, very fine through coarse gravel, predominantly fine to medium, low moisture
20.5-20.7'	**Silt:** light brown, moist, somewhat cohesive
20.7-25	**Sand:** tan, very fine to fine grained wih some silt, interval also has medium to coarse grained sand between 22-24.5', **saturated by 23' down to~ 25',**
25-25.5'	**Silty Clay:** yellowish tan, soft to firm, moist
25.5-27.3'	**Silt:** tan, moist, somewhat cohesive, from 27.1-27.3' the silt is gray in color
27.3-27.5'	**Silty Clay:** yellowish tan, moist
27.5-28'	**Silty/Sandy Clay:** pinkish gray, silty/sandy clay matrix, some very fine to fine gravel, very soft, very moist
28'	**End of Borehole**

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	230-1051
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-14Rs

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION

SPLIT-SPOON SAMPLE INFORMATION

Sample Interval	Blow Counts	% Recovery
20-22'	5,4,3,3	75
22-24'	1,2,3,5	85
24-26'	2,4,5,8	75
26-28'	5,6,7,4	100

NA:Not Available

SB. 216

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG 14614-7413

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	230-1051
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-14Rd
LOGGED BY:	Michael C. Serafini, CPG	DATE:	9/11/00
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	59'
SCREEN TYPE:	2"x5', # 7 Slot Stainless Steel	CASING TYPE:	2" Coupled Galvanized
GRAVEL PACK TYPE:	#6 Sand	GROUT TYPE:	Holeplug (HP) Bent. Slurry (BS)
CASING GUARD TYPE:	4" Above Grade	WELL DEVELOPMENT TYPE:	Surge/Pump
SCREENED INTERVAL:	53-58'	GRAVEL PACK INTERVAL:	51-58'
GROUT INTERVAL:	BS: 5-48.7" HP: 48.7-51'	DEPTH TO WATER:	~52'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA 865.89

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-2'	**Fill:** clay brought in for drilling pad
2-16'	**Clay :** brown, very dry, brittle, silty and loamy in upper interval, by 8' slight moisture and less brittle, clay matrix is silty, sandy with very fine through coarse gravel, between 8 and 10' there is brown and tan mottling with variable oxidation, the clay from 13-16' had an increase in gravel content and drilled "rocky"
16-16.5	**Sand:** dark brown, very fine to fine grained, silty, trace very fine gravel, moist
16.5-16.7	**Silt:** tan to light brown, moist
16.7-20.5	**Sand & Gravel:** whitish tan, very fine through coarse grained sand, predominantly medium to coarse, very fine through coarse gravel, predominantly fine to medium, low moisture
20.5-20.8'	**Silt:** light brown, very moist
20.8-27	**Sand:** tan, very fine to fine grained wih some silt, upper interval is moist, then wet by 22.6', and **saturated by 23' down to 27'**, silt or silty clay lenses from 25.4-25.5' and 25.8-26', the formation is much siltier from 26-27'
27-27.4'	**Silty Clay:** yellowish tan, soft to firm, moist
27.4-30.9'	**Silty/Sandy Clay:** pinkish gray grading to brownish gray from 28-28.6' then back to pinkish, gray, silty/sandy (very fine to fine grained) clay matrix, trace very fine to fine grave,l very soft, very moist, gray very fine to fine grained sand lens from 28.6-28.7'
30.9-51.9'	**Clay Till:** brownish gray grading to gray by 34', silty/sandy clay matrix, very fine to fine sized gravel, trace medium to coarse, moist, soft in upper portion of interval, then grading from firm to stiff with depth.

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	230-1051
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-14Rd

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
51.9-57.9'	**Sand:** grayish, very fine to fine grained, somewhat silty in upper foot of interval, 0.1' gray clay lens between 52 and 53', **saturated**
57.9-59'	**Clay Till:** gray, silty/sandy clay matrix, very fine to fine sized gravel, trace medium to coarse, moist, firm to stiff
59'	**End of Borehole**

SPLIT-SPOON SAMPLE INFORMATION

Sample Interval	Blow Counts	% Recovery
2-4'	NA	50
4-6'	5,7,7,9	95
6-8'	8,11,9,8	100
8-10'	3,5,7,8	100
10-12'	5,8,9,11	100
12-14'	5,7,8,6	50
14-16'	4,4,4,3	50
16-18'	3,3,6,6	100
18-20'	3,6,8,8	70
20-22'	3,3,2,3	100
22-24'	2,3,3,6	70
24-26'	3,3,4,6	100
26-28'	5,6,5,2	100
28-30'	2,2,3,5	100
30-32'	2,3,3,4	100
32-34'	2,2,2,3	100
34-36'	2,3,4,5	100
36-38'	3,4,7,7	100
38-40'	3,4,6,8	100
40-42'	3,5,6,9	90
42-44'	4,5,7,10	100
44-46'	3,6,7,10	100
46-48'	4,5,8,10	100
48-50'	3,4,6,9	100
50-52'	6,8,23,27	0
52-54'	2,3,6,10	50
54-56'	NA	100
56-58'	3,4,5,9	100
58-60'	6,8,10,11	100

NA:Not Available

HORIZON ENVIRONMENTAL

SB-219

SB-217

Page: 1 of 1
Boring No.: MW-20-R
Completed Well No.: MW-20-R
Client: Granger - Grand River Ave. Facility
Project No.: GRN-0106
Date: Started: 4/30/01 Finished: 4/30/01
Time: Started: 7:45 am Finished: 1:00 pm

Well/Boring Log Sheet

State	**County**	**Township**	**Fraction**	**Section**	**T**	**R**
MI	Clinton	Watertown	NW ¼	29	5N	3W

Contractor: Stearns Drilling
Address:
Dutton, MI
Equipment: CME 850 Truck
Crew Chief: Dwayne
Horizon Supervisor: Dan Greene

Drilling Method(s)	**Depth**
4.25" Hollow Stem Auger	38.0'

Ground Surface Elevation (ft.):
TOC Elevation (ft.)
Datum (ft.):
Static Water Level: 19.5'
Reference: TOC

Grout/Seal **Depth/to**	**Material/Method**
1.0	Concrete
29.0	Bentonite grout

Location: Grand River Ave. landfill adjacent to I96 ROW fence 6' west of former MW20.

Construction: ☒ Abandonment: ☐ Additional Field Notes: Log Books: ☐ Computer File: ☐

Thickness (feet)	Depth to Base (feet)	USCS*	Lithologic Description	Sample Depth	Blow Counts				Headspace	Background
					6"	12"	18"	24"		
1.5	1.5	CL	Clay and silt, stiff, brown, dry	0.0-2.0	2	4	4	7		
4.5	6.0	SP	Sand, fine, brown, dry	2.0-4.0	3	4	4	3		
5.0	11.0	CL	Clay, some silt, trace sand, trace gravel, gray, soft, moist	4.0-6.0	3	5	8	7		
15.0	26.0	CL	Clay, some silt, trace sand, trace gravel, gray, stiff, dry	6.0-8.0	2	3	3	3		
2.0	28.0	CL	Clay, some silt, trace sand, trace gravel, gray, stiff, moist	8.0-10.0	1	3	4	9		
10.0	38.0	SP	Sand, fine, gray, wet	10.0-12.0	3	7	10	10		
				12.0-14.0	3	5	5	7		
				14.0-16.0	3	4	7	7		
			Well screened 33' to 38'	16.0-18.0	2	4	6	8		
				18.0-20.0	2	5	8	9		
				20.0-22.0	3	5	6	8		
				22.0-24.0	3	3	5	6		
				24.0-26.0	5	8	7	7		
				26.0-28.0	3	4	4	8		
				28.0-30.0	0	2	2	3		
				30.0-32.0	0	2	3	4		
				32.0-34.0	2	3	5	7		
				34.0-36.0	3	3	4	7		
				36.0-38.0	7	2	3	7		

* = The USCS symbol assigned is based on visual and manual observations and not on tests performed in the laboratory.

HORIZON ENVIRONMENTAL

Project Name: Granger

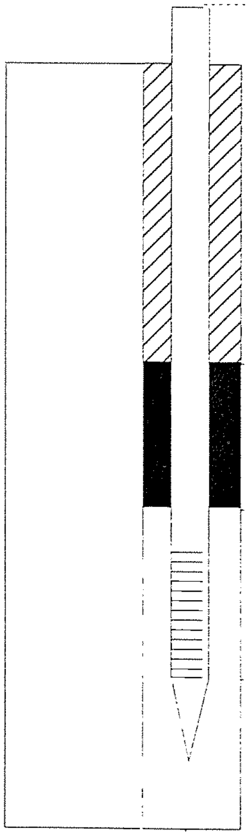
Project Number: GRN-0106

Log of Well Abandonment

Well Number: MW 20R

Top of Casing Elevation (feet):

Generalized Subsurface Profile



Length of Casing Above Ground Surface: 3.45'

Concrete Cap

Depth to Top of Grout or Backfill: 1.0'

Material (Backfill): Bentonite Slurry

Tremmie Grouted

Depth to Top of Bentonite Pellets: 29.0'

Depth to Top of Filter Pack: 31.0'

Type: Gibralter #6

Depth to Bottom of Well Screen: 38.0'

Borehole Backfill Material: Sand Pack

Total Depth of Borehole: 38.0'

Water Level Data

Date	Time	Water Level	Elevation

Development: Pumped with rig moyno, surged and repeat until clear.

Survey Reference:

Well Casing

Diameter: 2"

Total Length: 36.45'

Material: Galvanized

Cap Type: Pipe Cap

Well Screen

Diameter: 2"

Length: 5'

Slot/Type: 7 Slot

Material: Stainless Steel

Protective Well Casing

Material: N/A Sq. N/A

Height Above Ground: N/A

Lock Type: Granger #2001

General Notes:

STEARNS DRILLING COMPANY

6974 Hammond SE
Dutton, Michigan 49316-9116
616/698-7770
X 616/698-9886

Job No. 01-8976-4

LOG OF TEST BORING NO. MW-20R

Sheet: 1 of 2

Project: Granger Grand River

Location: Lansing, Michigan

Date Completed: April 30, 2001

Crew Chief: Daverman, Duane
Drill Rig: CME 850
Boring Method: 4 1/4" H.S.A.

Hole Plugged With: Bentonite grout

GROUNDWATER:

Encountered @		28.50 ft.
After completion		ft.
After	hrs.	ft.
Seepage:		ft.
ring Caved at:		ft.

MONITOR WELL DATA:
Pipe/Type: Galvanized
Length: 2" x 36'
Above Ground: 3.0'
Cap: 2" J-plug

Screen/Type: Stainless m.s.
Size: 2" x 60"
Slot: .070"
Set @ 33.0' - 38.0'
Backfilled: Sandpack to 30.0'

Bentonite Seal: Holeplug to 28.1'
Grout/Type: Bentonite
Depth: 28.0' - 2.0'
Protective Casing: No
Materials Cleaned: Steamed
Development:

REMARKS: Surged and pumped - 65 gal.

LEGEND:
BlowCount/Blows per 6"
w/140# hammer x 30" drop
SS-2" Split Spoon Sampler
Brass Liner Sample
ST-Shelby Tube Sample
SNR-Sample not recovered
LB-Large Bore

Sample Type	REC	Blow Count	Depth Feet	SOIL DESCRIPTION	T W
SS	16"	2 4 4 7	1.0	Top soil Brown fine to medium sand	
SS	16"	2 4 4 3			
SS	20"		5		
SS	20"	2 3 3 3	7.0	Brown-gray silty clay	
SS	20"		10		
SS	20"	3 7 10 10		Gray sandy clay	
SS	22"	3 5 5 7			
SS	22"	3 4 7 7	15		
SS	22"	2 4 6 8			
SS	22"	2 5 8 9	19.0 20	Gray sandy clay with gravel, cobbles	
SS	10"	3 5 6 8			
SS	12"	2 3 5 6			
SS	12"	5 6 7 7	25		
SS	20"	3 4 4 8	28.5	Gray fine sand, silty - wet	
SS	12"	0 2 3 3	30		

STEARNS DRILLING COMPANY

6974 Hammond SE
Dutton, Michigan 49316-9116
616/698-7770
X 616/698-9886

Job No. 01-8976-4

LOG OF TEST BORING NO. MW-20R

Sheet: 2 of 2

Project: Granger Grand River

Location: Lansing, Michigan

Date Completed: April 30, 2001

Crew Chief: Daverman, Duane
Drill Rig: CME 850
Boring Method: 4 1/4" H.S.A.

Hole Plugged With: Bentonite grout

GROUNDWATER:

Encountered @	28.50	ft.
After completion		ft.
After hrs.		ft.
Seepage:		ft.
ring caved at:		ft.

MONITOR WELL DATA:
Pipe/Type: Galvanized
Length: 2" x 36'
Above Ground: 3.0'
Cap: 2" J-plug

Screen/Type: Stainless m.s.
Size: 2" x 60"
Slot: .070"
Set @ 33.0' - 38.0'
Backfilled: Sandpack to 30.0'

Bentonite Seal: Holeplug to 28.1'
Grout/Type: Bentonite
Depth: 28.0' - 2.0'
Protective Casing: No
Materials Cleaned: Steamed
Development:

REMARKS:

LEGEND:
BlowCount/Blows per 6"
w/140# hammer x 30" drop
SS-2" Split Spoon Sampler
Brass Liner Sample
ST-Shelby Tube Sample
SNR-Sample not recovered
LB-Large Bore

Sample Type	REC	Blow Count	Depth Feet		SOIL DESCRIPTION	T W
SS	16"	1 3 4 6		▨	Gray fine sand, silty - wet	
SS	16"	2 3 5 7		▤		
SS	16"	3 3 4 7	35	▨		
SS	16"	3 5 5 7	38.0	▤		
			40 45 50 55 60		**E.O.B. @ 38.0'**	

HORIZON ENVIRONMENTAL

Page: 1 of 1
Boring No.: SB-21
Completed Well No.: N/A
Client: Granger - Grand River Ave. Facility
Project No.: GRN-0106
Date: Started: 5/2/01 Finished: 5/2/01
Time: Started: 1030 Finished: 1200

Well/Boring Log Sheet

State	County	Township	Fraction	Section	T	R
MI	Clinton	Watertown	NW ¼	29	5N	3W

Contractor: Stearns Drilling
Address:
Dutton, MI
Equipment: CME 850
Crew Chief: Burt
Horizon Supervisor: Ed Culver

Drilling Method(s)	Depth
8" HSA 4 ¼ ID	18'

Ground Surface Elevation (ft.):
TOC Elevation (ft.)
Datum (ft.):
Static Water Level: 6.5 ±
Reference: gd.

Grout/Seal Depth/to	Material/Method
20'	Bentonite grout

Location: Grand River Landfill site, adjacent to I-96 ROW 6' south of former MW 21S.

Construction: ☐ Abandonment: ☒ Additional Field Notes: Log Books: ☐ Computer File: ☐

Thickness (feet)	Depth to Base (feet)	USCS*	Lithologic Description	Sample Depth	Blow Counts 6"	12"	18"	24"	Headspace	Background
0.5	0.5	N/A	Topsoil	6.0-8.0	1	2	6	6		
1.5	2.0	SC	Sand, fine, clayey, brown	8.0-10.0	6	9	7	8		
2.0	4.0	SP	Sand, fine, brown	10.0-12.0	3	5	6	7		
1.0	5.0	SC	Sand, fine, silty, clayey, brown, moist	12.0-14.0	4	6	9	13		
1.5	6.5	CL	Clay, dark gray, sandy, moist	14.0-16.0	2	5	6	5		
1.9	8.4	SW	Sand, coarse, gray, wet	16.0-18.0	4	5	6	8		
5.6	14.0	CL	Clay, gray, very sandy, moist	18.0-20.0	3	4	5	7		
1.0	15.0	SW	Sand, fine, brown, wet							
4.0	19.0	SW	Sand, coarse, brown, wet, some cobble stones							
1.0	20.0	SW	Sand, fine, brown, wet							

* = The USCS symbol assigned is based on visual and manual observations and not on tests performed in the laboratory.

STEARNS DRILLING COMPANY

6974 Hammond SE
Dutton, Michigan 49316-9116
616/698-7770
X 616/698-9886

Job No. 01-8976-4

LOG OF TEST BORING NO. MW22D-R

Sheet: 1 of 1

Project: Granger - Grand River

Location: Lansing, Michigan

Date Completed: May 2, 2001

Crew Chief: Daverman, Duane
Drill Rig: CME 850
Boring Method: 4 1/4" H.S.A.

Hole Plugged With: Bentonite grout

GROUNDWATER:
Encountered @ 8.50 ft.
After completion ft.
After hrs. ft.
Seepage: ft.
ring Caved at: ft.

MONITOR WELL DATA:
Pipe/Type: 2" galvanized
Length: 28.0'
Above Ground: 3.0'
Cap: 2" J-plug

Screen/Type: 2" stainless steel
Size: 2" x 5'
Slot: .070"
Set @ 30.0' - 25.0'
Backfilled: 20.0' - 23.0'

Bentonite Seal: 23.0' - 20.5'
Grout/Type: Quik-grout
Depth: 20.0' - 1.0'
Protective Casing: None
Materials Cleaned:
Development: Yes - 55 gals.

REMARKS:

LEGEND:
BlowCount/Blows per 6"
w/140# hammer x 30" drop
SS-2" Split Spoon Sampler
rass Liner Sample
ST-Shelby Tube Sample
SNR-Sample not recovered
LB-Large Bore

Sample Type	REC	Blow Count	Depth Feet		SOIL DESCRIPTION	T W
		0			Brown clayey fine sand	
SS	12"	1				
		2				
		3				
		2				
SS	12"	2				
		2				
		2				
		2	4.5			
SS	12"	3	5		Gray-black clayey sand, organics	
		3				
		4				
		2				
SS	15"	4				
		4				
		6				
		5	8.5			
SS	16"	7			Brown fine to coarse sand - wet	
		10				
		9	10			
		4				
SS	18"	11				
		18				
		15				
		3	12.5			
SS	20"	6			Gray clay	
		8				
		11				
		2				
SS	20"	4	15			
		8				
		10	16.0			
		3			Gray brown clay	
SS	24"	5				
		7				
		9				
		2				
SS	24"	3				
		7				
		9	20			
		5				
SS	24"	5				
		8				
		9				
		3				
SS	24"	5				
		5				
		11	24.0			
		1			Brown silty fine sand	
SS	18"	1	25			
		1			Brown medium sand - wet	
		-				
		3	26.5			
SS	24"	8			Brown silty sand - wet	
		10	27.5			
		12			Brown medium sand - wet	
		5				
SS	24"	4	29.0			
		8			Brown silty clay	
		4	30			
					E.O.B. @ 30.0'	

STEARNS DRILLING COMPANY

6974 Hammond SE
Dutton, Michigan 49316-9116
'/698-7770
X 616/698-9886

Job No. 01-8976-4

LOG OF TEST BORING NO. MW-23SR

Sheet: 1 of 1

Project: Granger Grand River

Location: Lansing, Michigan

Date Completed: May 1, 2001

Crew Chief: Daverman, Duane
Drill Rig: CME 850
Boring Method: 4 1/4" H.S.A.

Hole Plugged With: Bentonite grout

GROUNDWATER:

Encountered @	ft.
After completion	ft.
After hrs.	ft.
Seepage:	ft.
ing Caved at:	ft.

MONITOR WELL DATA:
Pipe/Type: Galvanized
Length: 2" x 11'
Above Ground: 3.0'
Cap: 2" J-plug

Screen/Type: Stainless m.s.
Size: 2" x 60"
Slot: .070"
Set @ 8.0' - 13.0'
Backfilled: Sand to 6.0'

Bentonite Seal: Holeplug to 4.0'
Grout/Type: Bentonite
Depth: 4.0' - 1.0'
Protective Casing: No
Materials Cleaned: Steamed
Development:

REMARKS:

LEGEND:
BlowCount/Blows per 6"
w/140# hammer x 30" drop
" Split Spoon Sampler
Brass Liner Sample
ST-Shelby Tube Sample
SNR-Sample not recovered
LB-Large Bore

Sample Type	REC	Blow Count	Depth Feet		SOIL DESCRIPTION	T W
					Brown sandy clay	
			2.5		Brown fine to medium sand, clayey	
			5			
SS				▤		
			8.0	▤	Brown fine to medium sand, clayey - wet	
SS				▨		
			10	▨		
SS				▤		
			12.0	▤	Brown sandy clay	
SS			13.0	▨	Gray sandy clay	
			15		**E.O.B. @ 14.0'**	
			20			
			25			
			30			

HORIZON ENVIRONMENTAL

SB.221

Page: 1 of 1
Boring No.: MW-24 DR
Completed Well No.: MW-24 DR
Client: Granger - Grand River Ave. Facility
Project No.: GRN-0106
Date: Started: 4/30/01 Finished: 5/1/01
Time: Started: 4:00 Finished: 1000

Well/Boring Log Sheet

State	County	Township	Fraction	Section	T	R
MI	Clinton	Watertown	NW ¼	29	5N	3W

Contractor: Steams Drilling
Address:
Dutton, MI
Equipment: CME 850 Truck
Crew Chief: Dwayne
Horizon Supervisor: Dan Greene

Drilling Method(s)	Depth
4.25" Hollow Stem Auger	33.0'

Ground Surface Elevation (ft.):
TOC Elevation (ft.)
Datum (ft.):
Static Water Level: 14.37
Reference: TOC

Grout/Seal

Depth/to	Material/Method
1.5	Concrete
22.6	Bentonite grout

Location: Grand River Ave. landfill adjacent to I96 ROW fence 7' west of former MW24D.

Construction: ☒ Abandonment: ☐ Additional Field Notes: Log Books: ☐ Computer File: ☐

Thick ness (feet)	Depth to Base (feet)	USCS*	Lithologic Description	Sample Depth	Blow Counts				Headspace	Background
					6"	12"	18"	24"		
3.0	3.0	SC	Sand, some silt, trace clay, brown, dry	0.0-2.0	2	2	1	2		
4.0	7.0	SC	Sand, some silt, trace clay, brown, moist	2.0-4.0	5	4	2	2		
3.0	10.0	SC	Sand, some silt, trace clay, brown, wet	4.0-6.0	2	2	2	2		
2.0	12.0	CL	Clay, some silt, trace sand, trace gravel, brown, moist	6.0-8.0	10	6	6	7		
6.0	18.0	CL	Clay, some silt, trace sand, trace gravel, stiff, gray, dry	8.0-10.0	29	22	6	7		
6.3	24.3	CL	Clay, gray, very sandy, pebbles, trace gravel, moist	10.0-12.0	22	18	17	18		
5.7	30.0	GW	Gravel, fine, coarse sand, brown, wet	12.0-14.0	6	6	9	13		
2.0	32.0	SW	Sand, medium, brown, wet	14.0-16.0	11	14	17	12		
				16.0-18.0	3	6	9	10		
				18.0-20.0	14	5	10	11		
			Well screened 28' to 33'	20.0-22.0	4	5	6	12		
				22.0-24.0	2	5	7	8		
				24.0-26.0	1	6	6	7		
				26.0-28.0	2	8	11	9		
				28.0-30.0	2	4	5	7		
				30.0-32.0	1	4	4	7		

* = The USCS symbol assigned is based on visual and manual observations and not on tests performed in the laboratory.

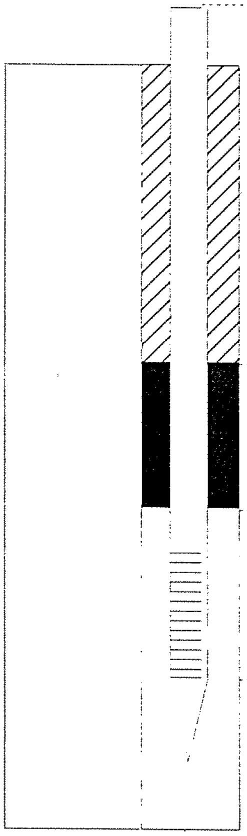
HORIZON ENVIRONMENTAL

Project Name: Granger
Project Number: GRN-0106

Log of Well Abandonment

Well Number: MW 24DR

Generalized Subsurface Profile



Length of Casing Above Ground Surface: 4.0'

Concrete Cap

Depth to Top of Grout or Backfill: 1.0'

Material (Backfill): Bentonite Grout

Depth to Top of Bentonite Pellets: 22.6'

Depth to Top of Filter Pack: 25.0'

Type: #6 Silica Sand

Depth to Bottom of Well Screen: 33.0'

Borehole Backfill Material: N/A

Total Depth of Borehole: 33.0'

Top of Casing Elevation (feet):

Water Level Data

Date	Time	Water Level	Elevation
5/1/01	PM	14.37/TOC	
		10.5/GD	

Development: Moyno pump at 15 gpm with surging. Total gallons pumped 225 gallons.

Survey Reference:

Well Casing
Diameter: 2"
Total Length: 32'
Material: Galvanized
Cap Type: Pipe Cap

Well Screen
Diameter: 2"
Length: 5'
Slot/Type: 7 Slot
Material: Stainless Steel

Protective Well Casing
Material: N/A Sq. N/A
Height Above Ground: N/A
Lock Type: Granger #2001

General Notes: Had to add water to augers to bail out sand and gravel blowing into augers prior to setting well casings.

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	P-29r
LOGGED BY:	Michael C. Serafini, CPG	DATE:	6/28/2004
DRILLING METHOD:	4 1/4" ID Hollow Stem Auger	TOTAL DEPTH DRILLED:	63'
SCREEN TYPE:	2" ID x 5' PVC #10 slot	CASING TYPE:	2" ID PVC
GRAVEL PACK TYPE:	#6 sand	GROUT TYPE:	Holeplug (hp)/Bent. Slurry(bs)
CASING GUARD TYPE:	6" Above Grade	WELL DEVELOPMENT TYPE:	NA
SCREENED INTERVAL:	55.5-60.5'	GRAVEL PACK INTERVAL:	54.5-63'
GROUT INTERVAL:	hp 50.2-54.5'/3-11' bs 11-50.2'	DEPTH TO WATER:	
GROUND ELEVATION:		TOP OF CASING ELEVATION:	

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-3'	**Clay:** dark brown, silty/sandy matrix, soft, moist
3-7'	**Clay:** grayish brown grading to brownish gray, silty/sandy clay matrix, firm, low moisture
7-9'	**Garbage:** black, refuse, soil and rock
9-26'	**Clay Till:** brown, silty/sandy clay matrix, some very fine to fine gravel pebbles, firm, moist
26-30'	**Sand & Gravel:** brown, very fine through coarse sand and gravel, some silt, moist
30-47'	**Sand:** tan to light brown, very fine to fine sand with some silt, trace medium sand and very fine to fine gravel lenses, cobbles/drilling at 47'
47-59'	**Silty Sand:** grayish tan, very fine to fine sand and silt, increased silt content with depth, trace gravel in cutting return, saturated
59-63'	**Silty Clay:** gray, very silty, plastic, very soft, moist
63'	**Clay Till:** presence of the underlying clay till formation at the site is inferred by a significant in the down hole drill pressure at 63'
63'	**End of Borehole**

SB.229

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	PW-46
LOGGED BY:	Michael C. Serafini, CPG	DATE:	3/1/2004
DRILLING METHOD:	36" Diameter Bucket Auger	TOTAL DEPTH DRILLED:	60.5'
SCREEN TYPE:	12"x 5' grvl. grd. 50 slot w/ geo fab	CASING TYPE:	12" ID Steel
GRAVEL PACK TYPE:	#2NS Sand/Pea Stone (PS)	GROUT TYPE:	Holeplug (hp)/Neat Cement(nc)
CASING GUARD TYPE:	NA	WELL DEVELOPMENT TYPE:	Pump/Surge
SCREENED INTERVAL:	29-34'	GRAVEL PACK INTERVAL:	27-34' (2NS)/14-27' (PS)
GROUT INTERVAL:	hp 11.5-14'/ nc 0-11.5'	DEPTH TO WATER:	~28'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-6'	**Clay:** brown, silty/sandy, firm, moist
6-16'	**Sand & Gravel:** brown, very fine through coarse grained sand and very fine through coarse gravel
16-17'	**Silt:** brown silt with slight cohesion
17-29'	**Sand:** brown, very fine to fine grained with some silt, moist to wet by end of interval
29-35'	**Clayey Silt:** brown, cohesive silt, wet to saturated
35-36'	**Clay Till:** brownish gray, silty/sandy clay matrix with trace sand and small gravel, stiff low moisture content
60.5'	**End of Borehole**

58-230

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-47
LOGGED BY:	Michael C. Serafini, CPG	DATE:	10/26/2004
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	70'
SCREEN TYPE:	2"x5', # 10 slot, PVC	CASING TYPE:	2" PVC
GRAVEL PACK TYPE:	#6 Sand	GROUT TYPE:	Holeplug (HP) Bent. Slurry (BS)
CASING GUARD TYPE:	Above Grade	WELL DEVELOPMENT TYPE:	Surge/Pump
SCREENED INTERVAL:	60-65'	GRAVEL PACK INTERVAL:	58-68'
GROUT INTERVAL:	BS: 5-50' HP: 56-58'	DEPTH TO WATER:	~58'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-5'	**Clay :** brown, very dry, brittle, silty and loamy in upper interval, silty clay matrix, trace very fine through very coarse gravel
5-14'	**Clay:** grayish brown, silty/sandy clay matrix, trace pebbles, low moisture, crumbles easily in upper portion of interval, with depth clay grades to rust, brown and gray mottling, moist and firm
14-21'	**Clay Till:** medium brown, silty/sandy clay matrix, low moisture, trace pebbles that range from very fine through coarse gravel in size, stiff
21-34'	**Sand:** tan to brown within the interval, predominantly very fine to fine grained with occasional mixture of medium to coarse sand, trace gravel, from 26-28' there are thin silt and gravel lenses, formation has low moisture content until 32 feet where it becomes "wet"
34-38'	**Interbedded Clay Till/Silt/Sand and Gravel:** brown, multiple thin interbeds of these materials, predominantly clay till, formation is "very wet"
38-43'	**Clay Till:** medium brown, silty/sandy clay matrix, trace pebbles that range from very fine through coarse sized gravel, ranges from soft to firm, "wet" in the upper portion of interval then becoming moist
43-47.5'	**Clay Till:** gray, silty/sandy clay matrix, trace pebbles, soft, very moist
47.5-51'	**Silty Sand:** gray, very fine sand and silt, dry in upper interval with increasing moisture content w/ depth
51-55.5	**Silt:** gray, somewhat cohesive, "wet"
55.5-60'	**Silty Sand:** gray, very fine sand and silt, "wet" in upper interval, saturated by 58 feet
60-68'	**Sand:** gray, very fine to fine with some silt, increase in silt content by 65.5 feet, saturated

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-47

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
68-70'	**Clay Till:** gray, silty/sandy clay matrix, trace pebbles very fine to coarse sized gravel, low moisture, firm to stif
70'	**End of Borehole**

SPLIT-SPOON SAMPLE INFORMATION

Sample Interval	Blow Counts	% Recovery
4-6'	11,12,11,11	100
9-11'	4,5,4,4,	0
12-14'	0,1,0,0	20
14-16'	1,1,4,9	100
16-18'	5,10,11,20	100
18-20'	6,12,12,19	100
20-22'	7,11,11,14	100
22-24'	5,10,10,13	80
24-26'	4,8,10,11	75
26-28'	5,9,9,10	90
28-30'	5,6,10,12	90
30-32'	7,14,15,10	100
32-34'	3,8,9,13	75
34-36'	5,5,4,3	100
36-38'	3,3,7,6	100
38-40'	5,5,6,6	100
40-42'	1,4,5,9	100
42-44'	3,3,4,7	100
44-46'	5,8,8,9	100
46-48'	2,4,22,30	100
48-50'	23,34,36,23	100
50-52'	12,19,19,14	90
52-54'	3,2,5,8	100
54-56'	14,19,26,32	100
56-58'	11,21,25,31	75
58-60'	3,6,9,10	100
60-62'	1,1,2,8	100
62-64'	3,3,8,14	100
64-66'	2,4,7,8	100
66-68'	4,4,8,11	100
68-70'	2,10,11,14	100

NA: Not Available

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-9r
LOGGED BY:	Michael C. Serafini, CPG	DATE:	3/17/2005
DRILLING METHOD:	4 1/4" ID Hollow Stem Auger	TOTAL DEPTH DRILLED:	24'
SCREEN TYPE:	2" ID x 5' PVC #10 slot	CASING TYPE:	2" ID PVC
GRAVEL PACK TYPE:	#5 sand	GROUT TYPE:	holeplug (hp)bentonite slurry(bs)
CASING GUARD TYPE:	6" AGL (Granger Guard)	WELL DEVELOPMENT TYPE:	surge
SCREENED INTERVAL:	16.5-21.5'	GRAVEL PACK INTERVAL:	14-21.5'
GROUT INTERVAL:	hp 12.2-14' bs 1-12.2'	DEPTH TO WATER:	~14'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-1'	**Clay:** Dark brown, silty/sandy clay matrix, moist, ~1' frost
1-2'	**Clay:** light brown, silty/sandy clay matrix, moist
2-4'	**Clay:** medium brown, silty/sandy clay matrix, trace pebbles: very fine gravel sized, soft to firm
4-5.3'	**Clayey Sand & Gravel:** reddish brown, low cohesion, very fine to very coarse grained sand and
	very fine to medium sized gravel, some silt, moist
5.3-7'	**Sand & Gravel:** brown, very fine to very coarse grained sand with very fine to fine sized gravel
7-8.5'	**Sand:** brown, very fine to medium grained
8.5-10'	**Sand & Gravel:** light brown, very fine to coarse sand and gravel
10-12'	**Sand:** light brown, fine to medium w/ some very fine and coarse grained sand with trace very fine
	to coarse sized gravel
12-15.8'	**Gravel & Sand:** grayish, very fine to medium sized gravel with very fine to coarse sand, saturated
	at 14'
15.8-16'	**Sand:** tan, very fine to medium grained, saturated
16-18.2'	**Sand & Gravel:** light brown, very fine to coarse sand and gravel, saturated
18.2-21.6'	**Gravel:** very fine to coarse sized gravel with trace fine to coarse grained sand, saturated
21.6-22'	**Silt:** light brown, moist
22-23'	**Silt:** gray, moist

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-9r

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
23-24'	**Clay Till:** brownish gray, silty/sandy clay matrix, pebbles: very fine to medium sized gravel, moist, soft
24'	**End of Borehole**

Split-Spoon Sample Information

Interval	**Blow Counts**	**Percent Recovery**
2-4'	2,3,3,4	100%
4-6'	2,3,1,2	60%
6-8'	2,2,3,5	60%
8-10'	5,5,5,5	90%
10-12'	4,5,7,9	60%
12-14'	5,6,7,7	80%
14-16'	4,7,7,7	90%
16-18'	2,4,6,9	100%
18-20'	2,9,11,14	100%
20-22'	5,7,6,8	100%
22-24'	6,4,4,6	100%

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-11sr
LOGGED BY:	Michael C. Serafini, CPG	DATE:	3/16/2005
DRILLING METHOD:	4 1/4" ID Hollow Stem Auger	TOTAL DEPTH DRILLED:	26'
SCREEN TYPE:	2" ID x 5' PVC #10 slot	CASING TYPE:	2" ID PVC
GRAVEL PACK TYPE:	#5 sand	GROUT TYPE:	holeplug (hp)bentonite slurry(bs)
CASING GUARD TYPE:	6" AGL (Granger Guard)	WELL DEVELOPMENT TYPE:	surge
SCREENED INTERVAL:	17-22'	GRAVEL PACK INTERVAL:	15-22'
GROUT INTERVAL:	hp 13.2-15' bs 2-13.2'	DEPTH TO WATER:	~18'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-1'	**Sand:** tan, very fine to fine, silty, very moist
1-3'	**Clay:** med brown, silty, very soft, very moist
3-5.5'	**Clay Till:** mottled brown, gray and rust, silty clay matrix, trace pebbles: very fine to medium sized gravel, moist, soft becoming firm with depth
5.5-11'	**Clay Till:** brown w/ some gray mottling, silty/sandy clay matrix, some pebbles: very fine to fine sized gravel, lower moisture content, firm
11-13'	**Clay Till:** grayish brown, silty/sandy clay matrix, pebbles: very fine to coarse sized gravel, very stiff lower moisture content, small 3/4" diameter sand lense at 11.5', coal chunk at 13'
13-15.5	**Silt:** brown, initially low moisture then wet at base of interval
15.5-18.5'	**Silty Sand:** brown, very fine sand and silt, some fine grained sand by 18' saturated at 18'
18.5-21.6'	**Sand:** brown, very fine to fine grained with trace silt, saturated, bottom inch very fine to coarse
21.6-22'	**Silt:** brown, somewhat cohesive, wet
22-24.5'	**Silt:** gray, somewhat cohesive, wet
24.5-26'	**Clay Till:** brownish gray, silty/sandy clay matrix, pebbles: very fine to medium sized gravel, very moist, very soft
26'	**End of Borehole**

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-11sr

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION

Split-Spoon Sample Information

Interval	Blow Counts	Percent Recovery
2-4'	2,1,2,2	90%
4-6'	1,3,3,3	60%
6-8'	4,6,9,11	100%
8-10'	4,6,10,14	100%
10-12'	3,7,12,15	100%
12-14'	4,8,13,16	100%
14-16'	5,11,12,14	100%
16-18'	5,9,12,14	100%
18-20'	4,11,9,11	100%
20-22'	1,4,5,7	100%
22-24'	8,8,10,11	75%
24-26'	0,1,2,3	100%

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-13r
LOGGED BY:	Michael C. Serafini, CPG	DATE:	3/21/2005
DRILLING METHOD:	4 1/4" ID Hollow Stem Auger	TOTAL DEPTH DRILLED:	52'
SCREEN TYPE:	2" ID x 5' PVC #10 slot	CASING TYPE:	2" ID PVC
GRAVEL PACK TYPE:	#5 sand	GROUT TYPE:	holeplug (hp)bentonite slurry(bs)
CASING GUARD TYPE:	6" AGL (Granger Guard)	WELL DEVELOPMENT TYPE:	surge
SCREENED INTERVAL:	45.5-50.5'	GRAVEL PACK INTERVAL:	41.1-50.5
GROUT INTERVAL:	hp 40-41.1' 2-7'bs 7-40'	DEPTH TO WATER:	~44'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-2'	**Clay:** brown, silty/sandy clay matrix, occassional cobbles, moist
2-4.5'	**Sand:** brown, very fine to coarse grained, some silt and clay sized material, trace very fine gravel
4.5-6'	**Clay:** dark brown, very sandy/silty clay matrix, trace pebbles: very fine gravel sized, crumbles easily
6-10.5'	**Clay:** brown grading to grayish brown, silty/sandy clay matrix, pebbles: very fine to fine sized
	gravel, soft to firm, moist
10.5-11.7'	**Silt:** brown, moist
11.7-13	**Sand:** brown to grayish brown, very fine to coarse grained, some silt, wet, trace very fine gravel
13-14'	**Sand:** brown, very fine to coarse, some silt and clay sized material, trace very fine gravel, wet
14-15.6'	**Interbedded Sand and Clay:** brown, very fine - fine sand and brown silty clay, moist to wet
15.6-17'	**Clay Till:** gray, becoming darker gray with depth, silty/sandy clay matrix, trace pebbles as very fine
	gravel, low moisture, firm
17-26'	**Clay Till:** brown w/ some gray motteling, silty/sandy clay matrix, trace pebbles: very fine to fine
	sized gravel, stiff
26-33.1'	**Clay Till:** gray, silty/sandy clay matrix, trace pebbles: very fine sized gravel, moist, firm
33.1-37.5'	**Sand & Gravel:** brown, very fine to very coarse grained sand with very fine to medium sized
	gravel, trace silt, bottom 0.5 feet predominantly fine to coarse grained sand
37.5-38'	**Silt:** brown

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-13r

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
38-39.6'	**Sand:** tan, fine to medium coarse grained
39.6-41'	**Silt:** yellowish brown, moist
41-49.5'	**Sand:** alternating intermittently between between tan, gray and lt brown with some oxidation in lower part of interval, ranging from very fine to fine grained with differing amounts of silt, moist to wet saturated by 44 feet
49.5-50.5'	**Sand & Gravel:** light gray, very fine to very coarse grained sand with very fine to medium sized gravel, trace silt, saturated
50.5-52'	**Clay Till:** brownish gray, silty/sandy clay matrix, pebbles: very fine to medium sized gravel, soft to firm, moist
52'	**End of Borehole**

Split-Spoon Sample Information

Interval	Blow Counts	Percent Recovery
4-6'	5,4,5,6	100%
6-8'	0,2,3,3	100%
8-10'	2,4,9,8	10%
10-12'	3,7,7,9	100%
12-14'	4,6,7,6	100%
14-16'	5,7,11,13	100%
16-18'	6,8,7,13	100%
18-20'	6,10,15,19	100%
20-22'	6,11,15,17	100%
22-24'	9,11,17,24	100%
24-26'	5,12,18,20	100%
26-28'	3,4,8,11	100%
28-30'	2,4,7,10	100%
30-32'	3,5,7,8	100%
32-34'	7,19,27,26	100%
34-36'	11,21,24,24	100%
36-38'	11,17,21,26	100%
38-40'	7,13,17,20	100%
40-42'	7,15,25,53	100%
42-44'	21,29,34,30	100%
44-46'	4,10,12,16	100%
46-48'	7,12,17,23	100%
48-50'	3,10,15,11	100%
50-52'	3,6,5,6	100%

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger - Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township, Michigan	BORING/WELL NUMBER:	PW-48
LOGGED BY:	Michael C. Serafini, CPG	DATE:	3/31/2005
DRILLING METHOD:	36" Bucket Auger	TOTAL DEPTH DRILLED:	39'
SCREEN TYPE:	5', #50 slot gravel guard w/ geo fabric	CASING TYPE:	16" Steel 2' balnk beneath screen
GRAVEL PACK TYPE:	2NS Sand	GROUT TYPE:	holeplug (hp) cement (cm)
CASING GUARD TYPE:	NA	WELL DEVELOPMENT TYPE:	NA
SCREENED INTERVAL:	32-37'	GRAVEL PACK INTERVAL:	21-39'
GROUT INTERVAL:	(hp) 19-21' (cm) 0-19'	DEPTH TO WATER:	~33'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-0.5'	**Clay:** medium brown, silty/sandy matrix, moist soft
0.5-2'	**Clay:** dark brown, silty/sandy matrix, moist
2-12.5'	**Clay Till:** medium brown, silty/sandy clay matrix, trace pebbles, moist and soft in upper part of
	interval, w/ depth decreasing moisture content and firm
12.5-18'	**Sand:** brown, very fine to fine grained w/ some medium and silt, moist
18-20'	**Sand & Gravel:** light brown, very fine to coarse grained sand w/ very fine to fine sized gravel,
	some very coarse, silty, wet
20-20.4'	**Silt:** medium brown, somewhat cohesive, moist
20.4-21.3'	**Sand:** tan, very fine to coarse grained w/ trace very fine sized gravel
21.3-22.8'	**Sand:** tan, very fine grained and silty
22-8'-23.2'	**Silt:** medium brown, slight cohesion, moist
23.2-24'	**Sand:** tan, very fine grained w/ silt
24-25.8'	**Sand:** tan, fine to coarse grained
25.8-27.3'	**Silty Sand:** tan, silt w/ very fine grained sand, moist
27.3-30.75'	**Sand:** tan, very fine grained
30.75-31.2'	**Sand:** tan, very fine to medium grained, moist to wet

PROJECT NAME:	Granger - Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township, Michigan	BORING/WELL NUMBER:	PW-48

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
31.2-33'	**Silt:** medium brown, moist
33-36'	**Sand:** tan: very fine to fine grained, saturated
36-36.5'	**Sand & Gravel:** brown, fine to coarse grained sand w/ very fine to coarse sized gravel, saturated
36.5-38'	**Silt:** tan, slightly cohesive, wet
38-39'	**Clay Till:** gray, silty clay matrix, trace pebbles, moist, soft
39'	End of Borehole
	NA: Not Applicable

SOIL BORING/WELL LOG

PROJECT NAME:	Granger - Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township, Michigan	BORING/WELL NUMBER:	SB-48
LOGGED BY:	Michael C. Serafini, CPG	DATE:	3/18/2005
DRILLING METHOD:	4 1/4" ID Hollow Stem Auger	TOTAL DEPTH DRILLED:	39'
SCREEN TYPE:	NA	CASING TYPE:	NA
GRAVEL PACK TYPE:	NA	GROUT TYPE:	holeplug (hp)bentonite slurry(bs)
CASING GUARD TYPE:	NA	WELL DEVELOPMENT TYPE:	NA
SCREENED INTERVAL:	NA	GRAVEL PACK INTERVAL:	NA
GROUT INTERVAL:	(hp) 0-8' (bs) 8-39'	DEPTH TO WATER:	~33'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-0.5'	**Clay:** medium brown, silty/sandy matrix, moist soft
0.5-2'	**Clay:** dark brown, silty/sandy matrix, moist
2-12.5'	**Clay Till:** medium brown, silty/sandy clay matrix, trace pebbles, moist and soft in upper part of
	interval, w/ depth decreasing moisture content and firm
12.5-18'	**Sand:** brown, very fine to fine grained w/ some medium and silt, moist
18-20'	**Sand & Gravel:** light brown, very fine to coarse grained sand w/ very fine to fine sized gravel,
	some very coarse, silty, wet
20-20.4'	**Silt:** medium brown, somewhat cohesive, moist
20.4-21.3'	**Sand:** tan, very fine to coarse grained w/ trace very fine sized gravel
21.3-22.8'	**Sand:** tan, very fine grained and silty
22-8'-23.2'	**Silt:** medium brown, slight cohesion, moist
23.2-24'	**Sand:** tan, very fine grained w/ silt
24-25.8'	**Sand:** tan, fine to coarse grained
25.8-27.3'	**Silty Sand:** tan, silt w/ very fine grained sand, moist
27.3-30.75'	**Sand:** tan, very fine grained
30.75-31.2'	**Sand:** tan, very fine to medium grained, moist to wet

PROJECT NAME:	Granger - Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township, Michigan	BORING/WELL NUMBER:	SB-48

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
31.2-33'	**Silt:** medium brown, moist
33-36'	**Sand:** tan: very fine to fine grained, saturated
36-36.5'	**Sand & Gravel:** brown, fine to coarse grained sand w/ very fine to coarse sized gravel, saturated
36.5-38'	**Silt:** tan, slightly cohesive, wet
38-39'	**Clay Till:** gray, silty clay matrix, trace pebbles, moist, soft
39'	**End of Borehole**

Split-Spoon Sample Information

Interval	Blow Counts	Percent Recovery
19-21'	4,5,5,6	100%
21-23'	8,8,8,5	100%
23-25'	5,7,10,11	75%
25-27'	5,10,12,16	75%
27-29'	6,12,14,14	100%
29-31'	6,10,12,12	100%
31-33'	8,13,11,6	100%
33-35'	2,7,8,10	100%
35-37'	6,10,8,5	100%
37-39'	5,5,6,7	100%

NA: Not Applicable

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	230-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-25R
LOGGED BY:	Michael C. Serafini, CPG	DATE:	3/1/2006
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	63.75'
SCREEN TYPE:	2"x5', # 10 slot PVC	CASING TYPE:	2" PVC
GRAVEL PACK TYPE:	#6 Sand	GROUT TYPE:	Holeplug (HP) Bent. Slurry (BS)
CASING GUARD TYPE:	Granger Guard	WELL DEVELOPMENT TYPE:	Surge
SCREENED INTERVAL:	58-63'	GRAVEL PACK INTERVAL:	52-63'
GROUT INTERVAL:	BS: 4-51' HP: 51-52'	DEPTH TO WATER:	~55.5'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-7'	**Clay:** dark brown, silty/sandy clay matrix, moist, by 2' brown in color and by 7' grayish brown
7-15'	**Sand:** brown, very fine to fine grained and silty, trace medium to coarse grained material, trace very fine to coarse gravel, "dirty" moist
15-19'	**Sandy Clay:** brownish gray, very sandy/silty clay matrix, moist
19-28'	**Clay:** brown, silty/sandy clay matrix with pebbles as very fine to coarse sized gravel
~28-43'	**Clay Grading to Perched Sand:** darker brown, silty/sandy clay matrix, wet, very poor cutting return while drilling from 34 to 42' and when cuttings began to return, they were brown and "soupy" and more "sandy" suggesting a perched water condition not observed during drilling
43-55.5'	**Clay Till:** gray, silty/sandy clay matrix, trace pebbles as very fine to fine gravel, firm to stiff, moist
55.5-59.6'	**Sand:** gray, very fine to fine grained, saturated
59.63.5'	**Interbeded Sand & Gravel:** grayish, zones of very fine to very coarse grained sand and very fine to coarse sized gravel interbeded with zones of very fine to fine grained sand, saturated
63.5-63.75'	**Clay Till:** gray, silty/sandy clay matrix, trace pebbles as very fine to fine gravel, very stiff, low moisture
63.75'	End of Borehole

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-25R

DEPTH/INTERVAL

SPLIT-SPOON SAMPLE INFORMATION

Sample Interval	Blow Counts	% Recovery
43-45'	15,15,14,12	50%
50-52'	5,8,20,21	20%
52-54'	9,14,22,16	50%
54-56'	3,5,13,13	100%
56-58'	5,8,10,12	100%
58-60'	3,5,13,12	100%
60-62'	5,7,13,17	100%
62-64'	12,17,38,50(3")	75%

The borehole was logged from 0-43/45-50 feet based on drill cutting return and changes in drill pressure. The intervals depicted are only estimates based on interpretation of field observations.

NA: Not Available/Applicable

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	230-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	MW-41R
LOGGED BY:	Michael C. Serafini, CPG	DATE:	2/28/2006
DRILLING METHOD:	4 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	64'
SCREEN TYPE:	2"x5', # 10 slot PVC	CASING TYPE:	2" PVC
GRAVEL PACK TYPE:	#6 Sand	GROUT TYPE:	Holeplug (HP) Bent. Slurry (BS)
CASING GUARD TYPE:	Granger Guard	WELL DEVELOPMENT TYPE:	Surge
SCREENED INTERVAL:	59-64'	GRAVEL PACK INTERVAL:	54-64'
GROUT INTERVAL:	BS: 4-53' HP: 53-54'	DEPTH TO WATER:	~55'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-2'	**Clay:** grayish brown, silty/sandy clay matrix, moist
2-12'	**Sand:** brown, silty with some very to coarse grained material, "dirty", moist, by 5' very fine to very coarse grained with some silt and very fine gravel
12-19'	**Clay Till:** brown, silty/sandy clay matrix with trace pebbles as very fine to coarse gravel, moist, change in drill pressure at 19 feet
19-21'	**Sand:** brown, silty with some very to coarse grained material, "dirty", moist
21~32'	**Sand:** light brown, very fine to medium grained, some silt and trace very fine gravel, moist, based on cutting return the formation is saturated at the lower portion of the interval, cutting return was poor while advancing the augers from 33 feet down, when cuttings did return, they were "soupy" from down-hole mixing
~32-55'	**Clay Till:** gray, silty/sandy clay matrix, trace pebbles as very fine to fine gravel, soft in upper interval and becoming firm in lower portion of interval, moist, estimated depth to top of formation based on change in color of "soupy" cutting return
55-58'	**Silt:** grayish color, silt, somewhat cohesive, saturated
58-60'	**Interbeded Sand & Silt:** grayish tan, very fine grained sand interbeded with thin lenses of gray silt, saturated
60-64'	**Sand:** tan, very fine to fine grained, trace medium, saturated
64'	**End of Borehole**

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	MW-41R

DEPTH/INTERVAL

SPLIT-SPOON SAMPLE INFORMATION

Sample Interval	Blow Counts	% Recovery
50-52'	3,6,12,12	100%
52-54'	4,7,13,14	100%
54-56'	7,7,12,10	100%
56-58'	-,-,-,5	100%
58-60'	2,4,7,8	100%
60-62'	3,2,3,3	100%
62-64'	3,3,9,10	100%

The borehole was logged from 0-50 feet based on drill cutting return and changes in drill pressure. The intervals depicted are only estimates based on interpretation of field observations.

NA: Not Available/Applicable

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	PW-49
LOGGED BY:	Michael C. Serafini, CPG	DATE:	7/17/2006
DRILLING METHOD:	12 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	23.5'
SCREEN TYPE:	10" x 3' SS, #20 slot w/ 2' Sub	CASING TYPE:	6" black steel
GRAVEL PACK TYPE:	Global #6 Silica	GROUT TYPE:	Holeplug (HP)
CASING GUARD TYPE:	NA	WELL DEVELOPMENT TYPE:	Air & Surge w/ J-Tube
SCREENED INTERVAL:	18.2-21.2'	GRAVEL PACK INTERVAL:	12-23.2'
GROUT INTERVAL:	HP: 5-12'	DEPTH TO WATER:	~14'
GROUND ELEVATION:	NA	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-1'	**Clay:** Dark brown, silty/sandy clay matrix, moist, ~1' frost
1-2'	**Clay:** light brown, silty/sandy clay matrix, moist
2-4'	**Clay:** medium brown, silty/sandy clay matrix, trace pebbles: very fine gravel sized, soft to firm
4-5.3'	**Clayey Sand & Gravel:** reddish brown, low cohesion, very fine to very coarse grained sand and
	very fine to medium sized gravel, some silt, moist
5.3-7'	**Sand & Gravel:** brown, very fine to very coarse grained sand with very fine to fine sized gravel
7-8.5'	**Sand:** brown, very fine to medium grained
8.5-10'	**Sand & Gravel:** light brown, very fine to coarse sand and gravel
10-12'	**Sand:** light brown, fine to medium w/ some very fine and coarse grained sand with trace very fine
	to coarse sized gravel
12-15.8'	**Gravel & Sand:** grayish, very fine to medium sized gravel with very fine to coarse sand, saturated
	at 14'
15.8-16'	**Sand:** tan, very fine to medium grained, saturated
16-18.2'	**Sand & Gravel:** light brown, very fine to coarse sand and gravel, saturated
18.2-21'	**Gravel:** very fine to coarse sized gravel with trace fine to coarse grained sand, saturated
21-22'	**Silt:** light brown, then gray near end of interval, moist

PROJECT NAME:	Granger - Watertown Twp.	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Twp., Michigan	BORING/WELL NUMBER:	PW-49

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
22-23.5	**Clay Till:** brownish gray, silty/sandy clay matrix, pebbles: very fine to medium sized gravel, moist, soft
23.5	**End of Borehole**

Split-Spoon Sample Information

Interval	**Blow Counts**	**Percent Recovery**
18-20'	2,7,12,14	90%
20-22'	1,2,2,2	75%

Log predominantly based on adjacent MW-9r with noted differences during drilling

NA: Not Applicable

STRATA ENVIRONMENTAL SERVICES, INC.

SOIL BORING/WELL LOG

PROJECT NAME:	Granger Watertown Township	PROJECT NUMBER:	257-0739
PROJECT LOCATION:	Watertown Township	BORING/WELL NUMBER:	PW-50
LOGGED BY:	Michael C. Serafini, CPG	DATE:	7/6/2006
DRILLING METHOD:	8 1/4" Hollow-Stem Auger	TOTAL DEPTH DRILLED:	40'
SCREEN TYPE:	6" x 8' stainless steel, #20 slot	CASING TYPE:	6" black steel
GRAVEL PACK TYPE:	Global #6 Silica	GROUT TYPE:	Holeplug (HP) Bentonite Slurry (BS)
CASING GUARD TYPE:	NA	WELL DEVELOPMENT TYPE:	Air & Surge w/ J-Tube
SCREENED INTERVAL:	32-40'	GRAVEL PACK INTERVAL:	28.8-40'
GROUT INTERVAL:	HP: 26.8-28.8' BS: 3-26.8'	DEPTH TO WATER:	~29'
GROUND ELEVATION:	~839'	TOP OF CASING ELEVATION:	NA

DEPTH/INTERVAL	LITHOLOGIC DESCRIPTION
0-2'	**Sand:** fill material brought in for drilling pad
2-5'	**Clay:** brown, silty/sandy clay matrix, moist
5-8'	**Fly Ash/Sand/Silt/Clay Mixture:** blackish gray, moist
8-13'	**Clay:** grayish brown grading to gray w/ depth, silty/sandy clay matrix, moist
13-20'	**Clay Till:** brown with some light brown mottling, silty/sandy clay matrix, some pebbles as very fine to very coarse sized gravel, firm to stiff, low moisture content
20-27.5'	**Clay Till:** grayish brown grading to gray, silty/sandy clay matrix, trace pebbles throughout as very fine to coarse sized gravel except from 27-27.5 where the till is very gravely
27.5-29'	**Clay Till:** brown, silty/sandy clay matrix, very moist, very gravely
28-36'	**Interbeded Gravel & Sand:** grayish brown, zones of very fine to very coarse grained sand and very fine to coarse sized gravel, grater percentage of gravel, saturated
36-39'	**Sand:** brown, very fine to fine grained with some medium, saturated
39-40'	**Sand:** grayish brown, very fine to coarse grained sand with some very fine to coarse sized gravel, all in varying percentages throughout the interval, end of interval becoming silty, saturated
40'	End of Borehole
	NA: Not Available/Applicable
	Log predominantly based on drill log for adjacent boring EB-1

ATTACHMENT E

Revised Application Review Checklist

PART 111 STATUTE	ONTENT PART 111 RUL	ECHNICAL PART 111 RUL	CONTENT RCRA RULE	TECHNICAL RCRA RULE	CATEGORY	CONTENT REQUIREMENT	TECHNICAL REQUIREMENT	LOCATION
324.11123(2)	508(1)(a)				FORM	Application form.		**Application**
324.11123(2)	504(1)(c)	511(1)	270.14(b)(22)		PRE-APPLICATION PUBLIC PARTICIPATION	Summary of pre-application public meeting.		**NA - post-closure operation**
324.11123(2), 324.11118(4)					DISCLOSURE	Disclosure statement revisions for first operating license after construction permit.		**NA - post-closure operation**
324.11123(2)	508(1)(h)				FEE	Operating license application fee of $500.00.		**Application**
Re	508(3)		270.11(d)		CERTIFICATION	Certification wording.		**Application**
324.11123(2)	508(3)		270.11(d)		CERTIFICATION	Certification signed by owner.		**Application**
324.11123(2)	508(3)		270.11(d)		CERTIFICATION	Certification signed by operator.		**Application**
324.11123(2)	508(3)		270.11(d)		CERTIFICATION	Certification signed by titleholder of land.		**Application**
324.11123(3)	508(1)(d)				CERTIFICATION OF CAPABILITY	PE certification that the facility was constructed according to approved plans in the construction permit, or that an existing facility is capable of managing hazardous waste in compliance with Part 111 of Act 451.		**NA - post-closure operation**
324.11123(2)	504(1)(d), 508(1)(b)	506			HYDROGEO	HYDROGEOLOGICAL REPORT		**Section 3**
324.11123(2)	504(1)(d), 506(1)(a), 508(1)(b)				HYDROGEO	Summary of GW monitoring data.		**Section 3.1 and 2021 Annual Groundwater Report**
324.11123(2)	504(1)(d), 506(1)(b), 508(1)(b)				HYDROGEO	Identification of uppermost aquifer and aquifers hydraulically interconnected, flow direction and rate, and basis.		**Annual Groundwater Reports**
324.11123(2)	504(1)(d), 506(1)(c), 508(1)(b)				HYDROGEO	Identification of aquifer used by public or private wells within 2,000 feet of site.		**Figure 1 and Past Hydrogeological Investigations**
324.11123(2)	504(1)(d), 506(1)(d), 508(1)(b)				HYDROGEO	Identification of all other aquifers evidenced by available well or boring logs.		**Section 3 and Appendix H**
324.11123(2)	504(1)(d), 506(1)(e)(i), 508(1)(b)		270.14(b)(19)		HYDROGEO	Delineation of waste management areas on Part B topographic map.		**Figure 1**
324.11123(2)	504(1)(d), 506(1)(e)(ii), 508(1)(b)				HYDROGEO	Delineation of property boundary on Part B topographic map.		**Figure 1**
324.11123(2)	504(1)(d), 506(1)(e)(iii), 508(1)(b)				HYDROGEO	Delineation of point of compliance on Part B topographic map.		**Figure 1**
324.11123(2)	504(1)(d), 506(1)(e)(iv), 508(1)(b)				HYDROGEO	Delineation of groundwater monitoring wells on Part B topographic map.		**Figure 3**
324.11123(2)	504(1)(d), 506(1)(e)(v), 508(1)(b)				HYDROGEO	Delineation of aquifers on Part B topographic map.		**Figure 1**
324.11123(2)	504(1)(d), 506(1)(f), 508(1)(b)				HYDROGEO	Identify all domestic, municipal, industrial, oil, and gas wells and soil borings within 1 mile of site on Part A topographic map.		**Figure 1**
324.11123(2)	504(1)(d), 506(1)(g)(i), 508(1)(b)				HYDROGEO	Delineation of any contaminant plume from unit on site on Part B topographic map.		**2021 Annual Groundwater Report, Attachment C**
324.11123(2)	504(1)(d), 506(1)(g)(ii), 508(1)(b)				HYDROGEO	For land-based units, identification of the concentration of Appendix VIII constituents in contaminant plume.		**2021 Annual Groundwater Report, Table 1 (arsenic, cadmium, chromium, & lead)**
324.11123(2)	504(1)(d), 506(2), 508(1)(b)				HYDROGEO	GWM program or justification for waiver.		**Appendix F, Section 1.0**
324.11123(2)	504(1)(d), 506(2)(a)(i), 508(1)(b)				GWM ENG REPORT	At least 5 soil borings per first 5 acres and at least 3 per each additional 5 acres.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(ii), 508(1)(b)				GWM ENG REPORT	Soil samples from each soil layer or change in lithology for each soil boring.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(ii), 508(1)(b)				GWM ENG REPORT	2 of initial 5 (and 1 of each additional 3) borings evaluated and logged using continuous sampling methods.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(ii), 508(1)(b)				GWM ENG REPORT	Soil test for particle size by both sieve and hydrometer.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(ii),508(1)(b)				GWM ENG REPORT	Soil test for Atterburg limits.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(ii), 508(1)(b)				GWM ENG REPORT	Soil test for classification , USCS.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(iii)(A), 508(1)(b)				GWM ENG REPORT	Evaluate each soil layer for moisture content.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(iii)(B), 508(1)(b)				GWM ENG REPORT	Evaluate each soil layer for permeability.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(A), 508(1)(b)				GWM ENG REPORT	Soil boring logs include soil and rock descriptions.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(B), 508(1)(b)				GWM ENG REPORT	Soil boring logs include method of sampling.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(C), 508(1)(b)				GWM ENG REPORT	Soil boring logs include sample depth.		**Appendix H & Appendix I**

PART 111 STATUTE	ONTENT PART 111 RUL	TECHNICAL PART 111 RUL	CONTENT RCRA RULE	TECHNICAL RCRA RULE	CATEGORY	CONTENT REQUIREMENT	TECHNICAL REQUIREMENT	LOCATION
324.11123(2)	504(1)(d), 506(2)(a)(iv)(D), 508(1)(b)				GWM ENG REPORT	Soil boring logs include date of boring.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(E), 508(1)(b)				GWM ENG REPORT	Soil boring logs include water level measurements.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(F), 508(1)(b)				GWM ENG REPORT	Soil boring logs include soil test data.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(G), 508(1)(b)				GWM ENG REPORT	Soil boring logs include boring location.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(iv)(H), 508(1)(b)				GWM ENG REPORT	Soil boring logs include standard penetration number.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(v), 508(1)(b)				GWM ENG REPORT	Borings not converted to observation wells are properly abandoned and recorded.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(a)(vi), 508(1)(b)				GWM ENG REPORT	Elevations corrected to USGS datum.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(2)(b), 508(1)(b)				GWM ENG REPORT	Static water level measurements from at least 3 observation wells and 1 cluster (land-based units with at least 3 clusters and at least 1 cluster well for each 20 acres)		**Appnedix F-1 and 2021 Annual Groundwater Report, Figures 1 - 11**
324.11123(2)	504(1)(d), 506(2)(c), 508(1)(b)				GWM ENG REPORT	Include water level contour map, interval not more than 1 foot.		**Appendix F-1 and 2021 Annual Groundwater Report, Figures 1 - 11**
324.11123(2)	504(1)(d), 506(2)(d), 508(1)(b)				GWM ENG REPORT	GW flow and net diagrams for more than 2 well clusters.		**Appnedix F-1 and 2021 Annual Groundwater Report, Figures 1 - 11**
324.11123(2)	504(1)(d), 506(2)(e), 508(1)(b)				GWM ENG REPORT	Location and depth of all observation wells and evidence that they are effectively located.		**Appendix F, Figure 1**
324.11123(2)	504(1)(d), 506(2)(f), 508(1)(b)				GWM ENG REPORT	Continuously sample, log, and classify lithology of each boring that is to be completed as an observation well.		**Appendix H & Appendix I**
324.11123(2)	504(1)(d), 506(3)(a), 508(1)(b)	612		264.98(a)	DETECTION MONITORING	List of primary and secondary parameters and monitoring frequencies.		**Appendix F, Section 1**
324.11123(2)	504(1)(d), 506(3)(b), 508(1)(b)	612		264.98	DETECTION MONITORING	Proposed GW monitoring system.		**Appendix F, Section 1**
324.11123(2)	504(1)(d), 506(3)(c), 508(1)(b)	612, 611(2)(a)(xi)		264.97(g)	DETECTION MONITORING	Background or procedures to calculate background for primary and secondary parameters.		**Appendix F-3**
324.11123(2)	504(1)(d), 506(3)(d), 508(1)(b)	612		264.98	DETECTION MONITORING	Description of GW sampling, analysis, and statistical comparisons to evaluate data.		**Appendix F-2 and F-3**
324.11123(2)	504(1)(d), 506(3)(e), 508(1)(b)	612		264.98	DETECTION MONITORING	Procedures for preventing cross-contamination in wells.		**Appendix F-2**
324.11123(2)	504(1)(d), 506(3)(f), 508(1)(b)	612		264.98	DETECTION MONITORING	Evidence that sampling procedures and well construction materials are compatible with monitoring parameters.		**Appendix F-2**
324.11123(2)	504(1)(d), 506(4)(a), 508(1)(b)	612		264.99	COMPLIANCE MONITORING	Description of wastes previously managed at the site.		**Section 2.10**
324.11123(2)	504(1)(d), 506(4)(b), 508(1)(b)	612		264.99	COMPLIANCE MONITORING	Characterization of contaminated GW.		**2021 Annual Groundwater Report, Groundwater Quality and Purge System Sections**
324.11123(2)	504(1)(d), 506(4)(c), 508(1)(b)	612		264.97, 264.99	COMPLIANCE MONITORING	List of hazardous constituents for monitoring.		**Appendix F, Section 1.3.2**
324.11123(2)	504(1)(d), 506(4)(d), 508(1)(b)	612		264.99	COMPLIANCE MONITORING	Proposed concentration limits for each constituent.		**Appendix F-3, Table 2**
324.11123(2)	504(1)(d), 506(4)(e), 508(1)(b)	612		264.99	COMPLIANCE MONITORING	Detailed plans and engineering report describing GWM system.		**Appendix F**
324.11123(2)	504(1)(d), 506(4)(f), 508(1)(b)	612		264.99	COMPLIANCE MONITORING	Description of sampling, analysis, and statistical comparison to evaluate GWM data.		**Appendix F-3**
324.11123(2)	504(1)(d), 506(5)(a), 508(1)(b)				GW CORRECTIVE ACTION	Characterization of contaminated GW.		**Section 3.2**
324.11123(2)	504(1)(d), 506(5)(b), 508(1)(b)				GW CORRECTIVE ACTION	Concentration limits.		**Appendix F-3**
324.11123(2)	504(1)(d), 506(5)(c), 508(1)(b)				GW CORRECTIVE ACTION	Detailed plans and engineering report of corrective action to be taken.		**No changes from previsouly approved system**
324.11123(2)	504(1)(d), 506(5)(d), 508(1)(b)				GW CORRECTIVE ACTION	Description of how GWM program will demonstrate adequacy of CA.		**No changes from previsouly approved system**
324.11123(2)	504(1)(d), 506(6), 508(1)(b)				HYDROGEO	Additional hydrogeological information for land-based units.		**NA - no new hydrogeological information**
324.11123(2)	504(1)(f), 508(1)(b)	611			ENVIRONMENTAL MONITORING	ENVIRONMENTAL MONITORING PROGRAM		**Appendix F**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)			ENVIRONMENTAL MONITORING	SAP. Sampling and Analysis Plan for each environmental monitoring program		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(i)			ENVIRONMENTAL MONITORING	SAP. Sampling location map.		**Appendix F, Figure 1**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(ii)			ENVIRONMENTAL MONITORING	SAP. Sampling schedule.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(iii)			ENVIRONMENTAL MONITORING	SAP. Parameters to be analyzed.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(iv)			ENVIRONMENTAL MONITORING	SAP. Sampling equipment, well purging, and sample collection procedures.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(v)			ENVIRONMENTAL MONITORING	SAP. Field measured parameters.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(vi)			ENVIRONMENTAL MONITORING	SAP. Sample preservation and handling techniques.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(vii)			ENVIRONMENTAL MONITORING	SAP. Sampling analytical protocols.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(viii)			ENVIRONMENTAL MONITORING	SAP. Field and laboratory QA/QC.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(ix)			ENVIRONMENTAL MONITORING	SAP. Chain of custody procedures.		**Appendix F-2**

PART 111 STATUTE	ONTENT PART 111 RUL	ECHNICAL PART 111 RUL	CONTENT RCRA RULE	TECHNICAL RCRA RULE	CATEGORY	CONTENT REQUIREMENT	TECHNICAL REQUIREMENT	LOCATION
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(x)			ENVIRONMENTAL MONITORING	SAP. Decontamination procedures.		**Appendix F-2**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(a)(xi)			ENVIRONMENTAL MONITORING	SAP. Data analysis, including statistical method used.		**Appendix F-2 and F-3**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(b)			ENVIRONMENTAL MONITORING	Groundwater monitoring program per R 299.9612.		**Appendix F, Section 1**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(c)			ENVIRONMENTAL MONITORING	Ambient air monitoring program per Part 55 of Act 451.		**NA - Section 3.1**
324.11123(2)	504(1)(f), 508(1)(b)	611(2)(d)			ENVIRONMENTAL MONITORING	Soil monitoring program.		**NA - Section 3.1**
324.11123(2)	504(1)(e), 508(1)(b)				ENVIRONMENTAL ASSESSMENT	Environmental Assessment.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(a)		PART A	Description of activities that require a RCRA permit.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(b)		PART A	Address, location (including latitude and longitude).		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(c)		PART A	SIC codes.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(d)		PART A	Operator name, address, telephone, ownership status,...		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(e)		PART A	Owner name, address, telephone.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(f)		PART A	Is facility located in Indian lands?		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(g)		PART A	Indicate whether new or existing facility, first or revised application.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(h)		PART A	For existing facilities, scale drawing and photographs.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(i)		PART A	Process description and design capacity.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(j)		PART A	Specify hazardous wastes to be managed, and estimated annual quantities.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(k)		PART A	Identify all other environmental permits, applications, or approvals.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(l)		PART A	Topographic map extending one mile beyond property boundaries...		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(m)		PART A	Description of business.		**NA - post-closure operation**
324.11123(2)	504(1)(b), 508(1)(b)		270.13(n)		PART A	For hazardous debris, description of debris and contaminant categories.		**NA - post-closure operation**
324.11123(2)	508(1)(f)				OTHER PERMITS	Proof of issuance of all other state environmental permits		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(1)		GENERAL	General facility description.		**Section 2.1**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(2)	264.13(a)(1)	C&P ANALYSIS	Chemical and physical analyses of hazardous waste and hazardous debris. Must have all information needed to treat, store, or dispose of the waste.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b) and (c)	WASTE ANALYSIS	WASTE ANALYSIS PLAN		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(1)	WASTE ANALYSIS	Specify the parameters for which each waste will be analyzed and the rationale for selection of these parameters.	Must be sufficient to comply with chemical and physical analysis requirements of 264.13(a).	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(2)	WASTE ANALYSIS	The test methods for each parameter analyzed.	Must be specified in R 299.9216.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(3)	WASTE ANALYSIS	The sampling method to obtain a representative sample of waste.	Must be described in Appendix I of Part 261 or be equivalent.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(4)	WASTE ANALYSIS	The frequency of review and reanalysis of wastes to ensure that the characterizations are accurate.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(5)	WASTE ANALYSIS	The waste analyses supplied by generators.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods to comply with 264.17.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods to ensure that no free liquids are disposed in a landfill per 264.314.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods for incinerator waste feed analysis per 264.341.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods for organic content measurement to comply with Subpart AA, 264.1034(d).		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods for organic content measurement to comply with Subpart BB, 264.1063(d).		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods for average VO measurement to comply with Subpart CC, 264.1083.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(6)	WASTE ANALYSIS	Methods to comply with LDRs, 268.7.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(8)(i)	WASTE ANALYSIS	Procedures and schedules for waste analysis to justify exemption from Subpart CC.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(8)(ii)	WASTE ANALYSIS	Notice and VO analysis from each off-site generator to justify exemption from Subpart CC.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(b)(7)	WASTE ANALYSIS	Special requirements for surface impoundments exempt from LDRs.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(c)(1)	WASTE ANALYSIS	Procedures to determine the identity of each movement of off-site waste managed.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(c)(2)	WASTE ANALYSIS	Sampling method to obtain a representative sample of off-site waste when necessary to determine the identity of off-site waste.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(3)	264.13(c)(3)	WASTE ANALYSIS	For landfills, the procedures to determine whether the off-site generator added sorbent to containerized waste.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(4)	264.14	SECURITY	Description of security procedures and equipment under 264.14.		**Section 2.2**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(5)	264.15(b)	INSPECTION	General inspection schedule under 264.15(b).		**Section 2.3**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(5)	264.15(b)(3)	INSPECTION	Identify the types of problems which are to be looked for during the inspection.		**Section 2.3**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(5)	264.15(b)(4)	INSPECTION	Identify the frequency of inspection to comply with container management requirements in 264.174.		**NA - no containers, post-closure**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(5)	264.15(d)	INSPECTION	Provisions for an inspection log and the information that will be recorded for each inspection and maintaining the records.		**Section 2.3**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(5)	264.15(b)(4)	INSPECTION	Identify the frequency of inspection to comply with tank management requirements in 264.193 and 264.195.		**NA - no tanks, post-closure**
324.11123(2)	504(1)(c), 508(1)(b)	605(1)	270.14(b)(5)	264.15(b)(4), 264.1088	INSPECTION	Identify the frequency of inspection to comply with Subparts AA, BB, and CC air emission standards.		**NA - Section 2.3.2**
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(7)	264.51	CONTINGENCY PLAN	CONTINGENCY PLAN		**Appendix J**
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(7)	264.52(a)	CONTINGENCY PLAN	Describe the actions of personnel to comply with 264.51 and 264.56.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	607(2)	270.14(b)(7)	264.52(a) 264.56(a)(2)	CONTINGENCY PLAN	Describe the actions of personnel to comply with 264.51 and 264.56.	Notify PEAS at 800-292-4706 if a release could threaten human health or the environment, or if it has reached surface water or groundwater.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(7)	264.52(b)	CONTINGENCY PLAN	Incorporate SPCC plan if applicable.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(7)	264.52(c)	CONTINGENCY PLAN	Describe arrangements with local authorities and emergency response teams per 264.37.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(7)	264.52(d)	CONTINGENCY PLAN	List name, address, and phone of all emergency coordinators, or state that it will be provided in OL application.		**NA - post-closure operation**

PART 111 STATUTE	ONTENT PART 111 RUL	ECHNICAL PART 111 RUL	CONTENT RCRA RULE	TECHNICAL RCRA RULE	CATEGORY	CONTENT REQUIREMENT	TECHNICAL REQUIREMENT	LOCATION
324.11123(2)	504(1)(c), 508(1)(b)	606(1), 607(1)	270.14(b)(7)	264.32, 264.52(e)	CONTINGENCY PLAN	List of all emergency and decon equipment, description, location, and capabilities.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(7)	264.52(f)	CONTINGENCY PLAN	Evacuation plan for personnel, evacuation signals, routes.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	607(1)	270.14(b)(6)		PREPAREDNESS & PREVENTION	Justification of waiver of Subpart C preparedness and prevention requirements.		**Section 2.4**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(8)(i)		PREPAREDNESS & PREVENTION	Description of measures to prevent hazards in unloading operations.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(8)(ii)		PREPAREDNESS & PREVENTION	Description of measures to prevent runoff and flooding.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	604(1)(b)	270.14(b)(8)(ii)		PREPAREDNESS & PREVENTION	Description of measures to prevent runoff and flooding.	Runoff control for 24-hour, 100-year rainfall.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(8)(iii)		PREPAREDNESS & PREVENTION	Description of measures to prevent contamination of water supplies.		**NA - post-closure operation**
324.11123(2)	504(2), 504(3), 508(1)(b)	604(1)(a), 614(1)(a), 615(1)	270.15(a), 270.16(g)	264.175(b)(4), 264.193(e)	PREPAREDNESS & PREVENTION		Run-on control for 24-hour, 25-year rainfall.	**NA - post-closure operation**
324.11123(2)	504(2), 504(3), 508(1)(b)	604(1)(c), 614(1)(a), 615(1)	270.15(a), 270.16(g)	264.31, 264.175(b), 264.193	PREPAREDNESS & PREVENTION		Prevent releases to soil, groundwater, surface water, drains, and sewers.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	606(1)	270.14(b)(8)(iv)	264.31	PREPAREDNESS & PREVENTION	Description of measures to mitigate effects of equipment failures and power outages.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(8)(v)		PREPAREDNESS & PREVENTION	Description of measures to prevent undue exposure of personnel to hazardous waste.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	606(1)	270.14(b)(8)(vi)	264.31	PREPAREDNESS & PREVENTION	Description of measures to prevent releases to the atmosphere.	Minimize possibility of any unplanned sudden or nonsudden release to air.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(9)		PREPAREDNESS & PREVENTION	Description of measures to prevent accidental ignition or reaction of ignitable or incompatible wastes per 264.17, and documentation of compliance with 264.17(c).		**NA - post-closure operation**
324.11123(2)		606		264.35	PREPAREDNESS & PREVENTION		Adequate aisle space to allow unobstructed movement of personnel, emergency equipment, etc.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(10)		TRAFFIC	Traffic pattern, volume, control, access road description, traffic signals.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(11)(i)-(ii)		LOCATION	Compliance with seismic standard.		**Section 2.5**
324.11123(2)	504(1)(c), 508(1)(b)	603(4)	270.14(b)(11)(iii)-(iv)		LOCATION	Compliance with 100-year floodplain provisions.	Not located within a floodplain unless proper demonstrations are made.	**Section 2.5**
324.11123(2)		603(1)(1)			LOCATION		Not within 61 meters of a fault with displacement in Holocene time.	**NA - post-closure operation**
324.11123(2)		603(1)(b)			LOCATION		Not in a floodway designated under Part 31.	**NA - post-closure operation**
324.11123(2)		603(1)(c)			LOCATION		Not in a coastal high-risk area designated under the Shorelands Act.	**NA - post-closure operation**
324.11123(2)		603(1)(d)			LOCATION		Not over a sole-source aquifer or its recharge zone.	**NA - post-closure operation**
324.11123(2)		603(1)(e)			LOCATION		Not within the isolation distance from public water supplies specified in Act 399.	**NA - post-closure operation**
324.11123(2)		603(1)(f)		Vol. 8, Appendix 1.70-1	LOCATION		Not in a wetland.	**NA - post-closure operation**
324.11123(2)		603(2)			LOCATION		60 (150 for landfills) meters from adjacent commercial, residential, and recreational property.	**NA - post-closure operation**
324.11123(2)		603(5)			LOCATION		Land-based units must be in area with not less than 6 meters of 1x10E-6 cm/sec permeability	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(20)	270.3	LOCATION	Considerations under federal law	The Wild and Scenic Rivers Act, The National Historic Preservation Act, The Endangered Species Act, The Coastal Zone Management Act, The Fish and Wildlife Coordination Act	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(12)		TRAINING	Training Program outline per 264.16.		**Appendix J**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(14)		CLOSURE	Documentation of closed units.		**Section 2.6, 2.7**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(1)	CLOSURE	A description of how each unit will be closed in accordance with 264.111.		**Section 2.6, Appendix C**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(2)	CLOSURE	A description of how final closure will be conducted in accordance with 264.111, and identify the maximum extent of operations.		**Section 2.6, Appendix C**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(3)	CLOSURE	An estimate of the maximum inventory of hazardous wastes.		**Section 2.10**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(3)	CLOSURE	A description of the methods to remove, transport, treat or dispose of all hazardous wastes.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(4)	CLOSURE	A detailed description of the steps to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(4)	CLOSURE	A detailed description of the procedures to sample and analyze contaminated soils.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(4)	CLOSURE	The parameters that will be analyzed to verify extent of contamination.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(4)	CLOSURE	Criteria for determining the extent of decontamination required.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(5)	CLOSURE	A detailed description of other activities (run-on and run-off control, GWM, etc.) necessary to ensure that the closure performance standard is satisfied.		**Appendix C**
324.11123(2)	504(1)(c), 508(1)(b)	613(1)	270.14(b)(13)	264.112(b)(6), 264.113	CLOSURE	A schedule for closure of each unit and for final closure.		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	613(2)	270.14(b)(13)		CLOSURE		Notification of closure within 60 days prior to initiating closure.	**Section 2.7 - Appendix D**

PART 111 STATUTE	ONTENT PART 111 RUL	ECHNICAL PART 111 RUL	CONTENT RCRA RULE	TECHNICAL RCRA RULE	CATEGORY	CONTENT REQUIREMENT	TECHNICAL REQUIREMENT	LOCATION
324.11123(2)	504(1)(c), 508(1)(b)	613(3)	270.14(b)(13)		CLOSURE	Provisions for certification of closure and a list of items to document that closure was completed in accordance with the closure plan.		**Section 2.7 - Appendix D**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(13)		POST-CLOSURE	POST-CLOSURE PLAN		**Appndix C**
324.11123(2)	504(1)(c), 508(1)(b)	702(1)	270.14(b)(15)	264.142	FINANCIAL	CLOSURE COST ESTIMATE		**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	702(1)	270.14(b)(15)	264.142(a)	FINANCIAL	Closure cost estimate.	Detailed written estimate in current dollars for the cost of closing the facility.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	702(1)	270.14(b)(15)	264.142(a)(1)	FINANCIAL	Closure cost estimate.	Cost to close the maximum extent of operation.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	702(1)	270.14(b)(15)	264.142(a)(2)	FINANCIAL	Closure cost estimate.	Third-party costs.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	702(1)	270.14(b)(15)	264.142(a)(3)	FINANCIAL	Closure cost estimate.	No salvage value.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)	702(1)	270.14(b)(15)	264.142(a)(4)	FINANCIAL	Closure cost estimate.	Cannot incorporate zero cost for wastes that may have economic value.	**NA - post-closure operation**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(16)		FINANCIAL	Post-Closure cost estimate.		**Section 4.0, Appendix G**
324.11123(2)	508(1)(e)	703	270.14(b)(15)		FINANCIAL	Financial assurance for closure.		**NA - post-closure operation**
324.11123(2)	508(1)(e)	703	270.14(b)(16)		FINANCIAL	Financial assurance for post-closure.		**Section 4.0, Appendix G**
324.111123(2)	508(1)(e)	710	270.14(b)(17)		FINANCIAL	Third-party liability coverage.		
324.11123(2)	504(1)(c), 508(1)(b)		270.14(b)(19)		GENERAL	Topographic Map.		**Figure 1**
324.11123(2)	504(1)(g), 508(1)(b)				ENGINEERING	Engineering plans prepared and sealed by registered PE.		**NA - post-closure operation**
324.11123(2)	504(1)(g)(i), 508(1)(b)				ENGINEERING	Engineering plans include plan views, elevations, sections, and supplementary views necessary for review.		**NA - post-closure operation**
324.11123(2)	504(1)(g)(ii), 508(1)(b)				ENGINEERING	Specifications of all construction materials and installation methods.		**NA - post-closure operation**
324.11123(2)	504(1)(g)(iii), 508(1)(b)				ENGINEERING	Basis of design for all process equipment and containment structures.		**NA - post-closure operation**
324.11123(2)	504(1)(g)(iv), 508(1)(b)				ENGINEERING	Process flow diagram.		**NA - post-closure operation**
324.11123(2)	504(1)(g)(v), 508(1)(b)				ENGINEERING	Process design capacity.		**NA - post-closure operation**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(a)	264.192(a)	TANKS	Tank System Assessment by independent, registered PE.		**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)		270.16(b)		TANKS	Dimensions and capacity of each tank.		**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(c)		TANKS	Description of feed systems, safety cutoff, bypass, and pressure control.		**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(d)		TANKS	Diagram of piping, instrumentation, and process flow for each tank system.		**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(3)	270.16(e)	264.192(a)(3)	TANKS	Description of materials and equipment to provide external corrosion protection.		**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(f)	264.192(b) - (e)	TANKS	Description of installation in compliance with 264.192(b), (c), (d), and (e).	Qualified inspection prior to covering and use, proper backfill, tested for tightness, support for ancillary equipment.	**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193	TANKS	Plans and description of how secondary containment satisfies 264.193		**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(2)(i)	TANKS	Plans and description of how secondary containment satisfies 264.193	Vault must contain 100% of the capacity of the largest tank.	**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(2)(ii)	TANKS	Plans and description of how secondary containment satisfies 264.193	Vault must be designed to prevent run-on and infiltration unless it has additional capacity for a 24- hour, 25-year rainfall.	**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(2)(iii)	TANKS	Plans and description of how secondary containment satisfies 264.193	Vault must be constructed with chemical-resistant water stops in joints.	**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(2)(iv)	TANKS	Plans and description of how secondary containment satisfies 264.193	Vault must have impermeable interior coating that is compatible with materials stored.	**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(2)(v)	TANKS	Plans and description of how secondary containment satisfies 264.193	Vault must have means to protect against formation of and ignition of vapors if waste is ignitable or reactive.	**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(2)(vi)	TANKS	Plans and description of how secondary containment satisfies 264.193	Vault must have external moisture barrier if subject to hydraulic pressure.	**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(e)(3)	TANKS	Plans and description of how secondary containment satisfies 264.193	Double-walled tank requirements.	**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(f)	TANKS	Plans and description of how secondary containment satisfies 264.193	Ancillary equipment must have secondary containment except for aboveground piping, welded connections, sealless equipment, and pressurized system with auto shut-offs that are inspected daily.	**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(c)(1)	TANKS	Plans and description of how secondary containment satisfies 264.193	Containment system must have strength and thickness to prevent failure.	**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(c)(2)	TANKS	Plans and description of how secondary containment satisfies 264.193	Containment system must have adequate foundation.	**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(c)(3)	TANKS	Plans and description of how secondary containment satisfies 264.193	Containment system must have leak detection within 24 hours.	**NA - no tanks, post-closure landfill**

Revisions in RED

PART 111 STATUTE	ONTENT PART 111 RUL	TECHNICAL PART 111 RUL	CONTENT RCRA RULE	TECHNICAL RCRA RULE	CATEGORY	CONTENT REQUIREMENT	TECHNICAL REQUIREMENT	LOCATION
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(g)	264.193(c)(4)	TANKS	Plans and description of how secondary containment satisfies 264.193	Containment system must be sloped or designed and operated to remove liquids within 24 hours.	**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(h)		TANKS	Variance provisions from secondary containment....		**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(i)	264.194(b)	TANKS	Description of controls and practices to prevent spills and overflows per 264.194(b).		**NA - no tanks, post-closure landfill**
324.11123(2)	504(3), 508(1)(b)	615(1)	270.16(j)		TANKS	If ignitables, reactive, or incompatibles are managed, a description of how operating procedures and design will satisfy 264.198 and 264.199.		**NA - no tanks, post-closure landfill**
324.11123(2)		615(4)			TANKS		Compliance with Act 207	**NA - no tanks, post-closure landfill**
			270.16(k)		TANKS	Subpart CC information per 270.27.		**NA - no tanks, post-closure landfill**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(a)(1)		CONTAINERS	Design parameters, dimensions, materials of construction of containment system.		**NA - no containers, post-closure**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(a)(2)		CONTAINERS	How the containment system design promotes drainage and/or how containers are kept out of standing liquids.		**NA - no containers, post-closure**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(a)(3)		CONTAINERS	The capacity of the containment system relative to the number and volume of containers.		**NA - no containers, post-closure**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(a)(4)		CONTAINERS	Provisions for preventing or managing run-on.		**NA - no containers, post-closure**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(a)(5)		CONTAINERS	Provisions for analyzing and removing accumulated liquids in containment system and preventing overflow.		**NA - no containers, post-closure**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(b)		CONTAINERS	For containers of wastes that do not contain free liquids....		**NA - no containers, post-closure**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(c)	264.176	CONTAINERS	Sketches or drawings demonstrating compliance with buffer zone requirement for ignitable and reactive wastes.	50 feet from property boundary.	**NA - no containers, post-closure**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(c)	264.177(c)	CONTAINERS	Sketches or drawings demonstrating compliance with segregation requirements for incompatible wastes.		**NA - no containers, post-closure**
324.11123(2)	504(2), 508(1)(b)	614(1)(a)	270.15(d)		CONTAINERS	For incompatible wastes, a description of the procedures to comply with 264.177(a) and (b) and 264.17(b) and (c).		**NA - no containers, post-closure**
324.11123(2)		614(1)(b)			CONTAINERS		Mark each container with "Hazardous Waste"	**NA - no containers, post-closure**
324.11123(2)		606(1)		264.35	CONTAINERS		Maintain adequate aisle space to allow unobstructed movement of personnel and equipment.	**NA - no containers, post-closure**
			270.15(e)		CONTAINERS	Subpart CC information per 270.27.		**NA - no containers, post-closure**
324.11123(2)	504(8)(a), 508(1)(b)		270.21(a)		LANDFILLS	List of hazardous wastes placed or to be placed in landfill.		**NA - post-closure operation**
324.11123(2)	504(8)(a), 508(1)(b)		270.21(b)		LANDFILLS	Detailed plans and engineering report describing how the landfill is designed and is or will be constructed, operated and maintained to meet the requirements of 264.19 (CQA), 264.301, 264.302 and 264.303, addressing the following items …		**NA - post-closure operation**
324.11123(2)	504(8)(a), 508(1)(b)		270.21(b)(1)(i)	264.301(a) or 264.301(b)	LINER	Liner system must meet the minimum technology requirements of 264.301(a) or an exemption under 264.301(b) must be requested.		**NA - post-closure operation**
324.11123(2)	504(8)(a), 508(1)(b)		270.21(b)(1)(i)	264.301(a)(1)	LINER	Liner system designed, constructed, and installed to prevent migration of wastes out of the landfill to the adjacent subsurface soil or surface water at any time during the active life (including closure period).		**NA - post-closure operation**
324.11123(2)	504(5)(a), 508(1)(b)				TREATMENT	Demonstration of how the treatment will change the physical, chemical, or biological character or composition of the waste; neutralize the waste; recover energy or material resources from the waste; render the waste nonhazardous, safer, etc.		**NA - no treatment system**
324.11123(2)	504(5)(b), 508(1)(b)				TREATMENT	The proper treatment technique, feed rates, operating conditions, and accuracy of devices intended to measure treatment parameters.		**NA - no treatment system**
324.11123(2)	504(5)(c), 508(1)(b)				TREATMENT	Whether the wastes or treatment chemicals will have any detrimental effect on the facility, and measures to control these effects.		**NA - no treatment system**
324.11123(2)	504(5)(d), 508(1)(b)				TREATMENT	Whether the wastes contain contaminants that may interfere with the treatment process and how the interference will be controlled.		**NA - no treatment system**
324.11123(2)	504(5)(e), 508(1)(b)				TREATMENT	Whether the wastes contain contaminants that might cause the release of toxic gases or fumes and how they will be controlled.		**NA - no treatment system**
324.11123(2)	504(5)(f), 508(1)(b)				TREATMENT	Whether the wastes contain contaminants that might form toxic constituents with treatment chemicals and how they will be controlled.		**NA - no treatment system**
324.11123(2)	504(5)(g), 508(1)(b)				TREATMENT	Trial tests.		**NA - no treatment system**
324.11123(2)	504(12), 508(1)(b)		270.24		AIR	Subpart AA.		**NA - Section 5.1**
324.11123(2)	504(13), 508(1)(b)		270.25		AIR	Subpart BB.		**NA - Section 5.2**
324.11123(2)	504(16), 508(1)(b)		270.27		AIR	Subpart CC.		**NA - Section 5.3**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(1)(i)		CORRECTIVE ACTION	Location of each waste management unit.		**Section 2.10, Appendix E**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(1)(ii)		CORRECTIVE ACTION	Designation of type of waste management units.		**Section 2.10, Appendix E**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(1)(iii)		CORRECTIVE ACTION	Dimensions and structural description of waste management units.		**Section 2.10, Appendix E**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(1)(iv)		CORRECTIVE ACTION	Dates of operation for waste management units.		**Section 2.10, Appendix E**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(1)(v)		CORRECTIVE ACTION	Description of wastes managed in waste management units.		**Section 2.10, Appendix E**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(2)		CORRECTIVE ACTION	Release information for waste management units.		**Section 2.10, Appendix E**
324.11123(2)	504(1)(c), 508(1)(b)		270.14(d)(3)		CORRECTIVE ACTION	Results of investigations required to determine if a more complete investigation of waste management units is necessary.		**Section 2.10, Appendix E**

ATTACHMENT F

2021 Annual Groundwater Report

GRANGER

16980 Wood Road
Lansing, Michigan 48906-1044
1-888-9GRANGER (1-888-947-2643)
P 517-372-2800
F 517-372-9220
www.grangernet.com

February 17, 2022

Ms. Christine Matlock
Waste and Hazardous Materials Division
Michigan Department of Environmental Quality
P.O. Box 30028
Lansing, Michigan 48909

Re: 2021 Annual Groundwater Report
Granger Grand River MID 082 771 700 Landfill

Dear Ms. Matlock

Monitoring and maintenance of the Granger Grand River MID 082 771 700 Landfill continues to be performed in accordance with the terms of the September 30, 1999, post-closure operating license. This report includes a discussion of the results of annual monitoring and maintenance activities conducted at the site in 2021. Reports on each activity are provided in various sections of this report.

Quarterly monitoring of the site was performed on January 12 - 14 (semi-annual), April 7 - 8 (quarterly), July 14 - 19 (annual), and October 5 - 6 (quarterly). The analytical and field data obtained as part of these monitoring events has been provided in earlier correspondence and are not included in this report. However, a summary of the detections for each monitoring well has been compiled and is provided in Attachment A.

Figures 1-11 identify the locations of all the monitoring points at the site and depict groundwater flow directions for each of the monitoring events. These figures are provided at the end of the text. All tables with data summaries of individual monitoring wells or the results of statistical analyses are provided with historical data in Attachment A.

Graphical trend analyses are provided for the total volatile organic concentrations detected in samples from monitoring wells in the purge system, as well as the tertiary parameters in all the monitoring wells. These Figures (1-19) are provided in Attachment B.

Isochem plots have been prepared for the site-wide concentrations of chloride, sodium, and potassium and is discussed in more detail in their respective sections. These plots have been prepared separately for the shallow and deep glacial drift aquifers. The isochem plots are provided in Attachment C as Figures 1-12.

The annual site maintenance and inspection reports are provided in Attachment D. Discussion of the data associated with the monitoring or maintenance programs is provided in the following sections.

SURFACE WATER QUALITY

The only surface water at the site is located near the northern property boundary in a ditch leading north to the Openlander Drain. The ditch and sampling site are located adjacent to the I-96 interstate highway. Monitoring at this station is performed semi-annually in January and July. In each instance, the monitoring consisted of collecting three discrete samples at different times throughout the day.

As is typical, the concentrations of sodium, chloride and nitrate were slightly elevated. Prior investigation has established that the sodium and chloride are present as a result of runoff from the adjacent interstate highway and the nitrate is associated with upgradient agricultural sources. No parameters were reported above their corresponding water quality standards identified in Rule 57 (Rule 323.1057 of Part 4. Water Quality Standards).

GROUNDWATER QUALITY

Bedrock Aquifer

The groundwater quality in the bedrock aquifer is represented by the analytical data from MW-16 (upgradient), MW-17, and MW-18. Monitoring of the bedrock aquifer has historically been performed semi-annually in January and July. Starting in 2021, the monitoring is now conducted in July only. Volatile organic compounds were not detected, and all inorganic parameters were below their respective prediction limits.

Deep Glacial Drift Aquifer

The monitoring wells screened in the deep glacial drift aquifer include MW-44 (upgradient), MW-14dr, MW-20r, MW-22dr, MW-24dr, MW-25r, MW-41r[2], MW-43d, and MW-45. Volatile organic compounds included in the approved sampling plan were not detected. The data continues to indicate that the site activities have not impacted the groundwater in the deep glacial aquifer.

For the monitoring wells adjacent to the interstate highway (primarily MW-14dr, MW-22dr, MW-24dr, and MW-25r), the inorganic data is again dominated by the presence of relatively high concentrations of sodium and chloride. Past investigation has identified the source as salt-impacted runoff from the interstate highway. As a result, the presence of elevated levels of sodium and chloride do not reflect impact from the site. The salt in the glacial drift aquifer is discussed further in the section below.

Shallow Glacial Drift Aquifer

The monitoring wells screened in the shallow glacial drift aquifer include MW-9, MW-14sr, MW-21sr, MW-23sr, MW-40 and MW-43s. The shallow glacial aquifer is thin on the north side and the recharge of groundwater into the wells following evacuation is limited requiring special techniques and extended time to ensure collection of a representative sample.

During both sampling events (i.e., the first and third quarter monitoring), volatile organic compounds were not detected. The concentrations of other detected naturally occurring inorganic parameters not discussed below reflect normal variability associated with un-impacted groundwater.

Relatively high concentrations of sodium, chloride, and to a lesser extent, potassium can be found in MW-14sr, MW-21sr, and MW-23sr. Prior investigation identified the source as salt-impacted runoff from 5.3 acres of interstate highway adjacent to the site. Analytical and hydrogeologic data supports that salting practices on the highway continue to impact the shallow glacial aquifer in the vicinity of MW-14sr. The transport mechanism includes surface water flow dynamics directing roadway runoff towards the vicinity of MW-14sr where it accumulates and eventually infiltrates. This area's geology and thin aquifer limits recharge and mixing/dilution exacerbating the impact of the roadway salting practice. The placement of road salt for deicing purposes is expected to continue for the foreseeable future. Therefore, regionalized salt impact to the groundwater in the vicinity of the north end of the site will also continue.

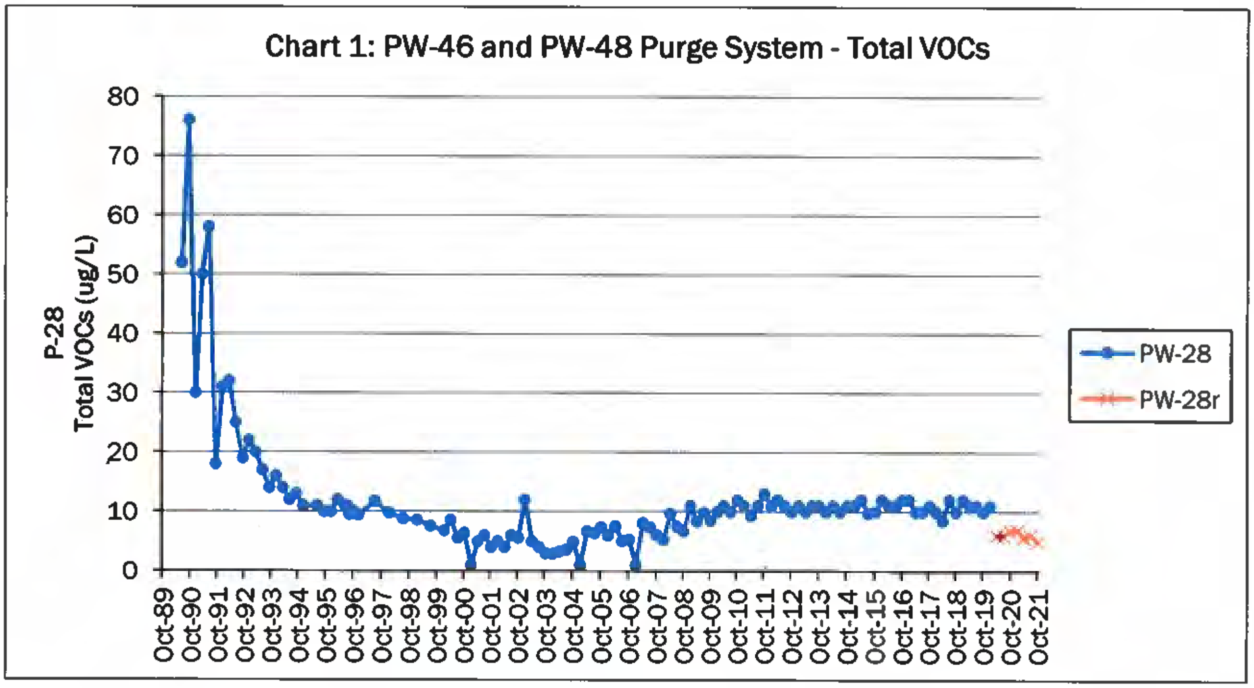
Statistical Exceedances
As noted in the prior paragraphs, there were no exceedances of primary indicator parameters.

PURGE SYSTEMS

Purge water discharges to the sanitary sewer system through the site's leachate handling system. In 2021, the purge well flows were taken once a week. A summary of the evacuation rates of the purge system is provided in Table 1 at the end of the text.

Volatile Organics
A system of two purge wells (PW-38 and PW-39) was installed on the southwest corner of the site in late 1987 after low concentrations of volatile organics were detected in the shallow groundwater. The purge wells were later replaced by PW-46 and PW-48 and the system has consistently operated. Through December 23, 2021, a total of 2,311,476 gallons were evacuated from the two purge wells.

P-28 is located within the influence of the purge system where there is detection of low concentrations of tetrachloroethene. A historical summary of the data is provided in Chart 1. The data shows a sharp reduction of tetrachloroethene followed by sustained lower concentrations. A literature review suggests that the presence of low concentrations of this compound may be partially contributed to landfill gas migration. In response to that potential, the landfill gas collection and control system was expanded into this area and continues to provide sufficient gas migration control, reducing the potential of affecting groundwater. In April 2020 P-28 was abandoned and replaced with P-28r.

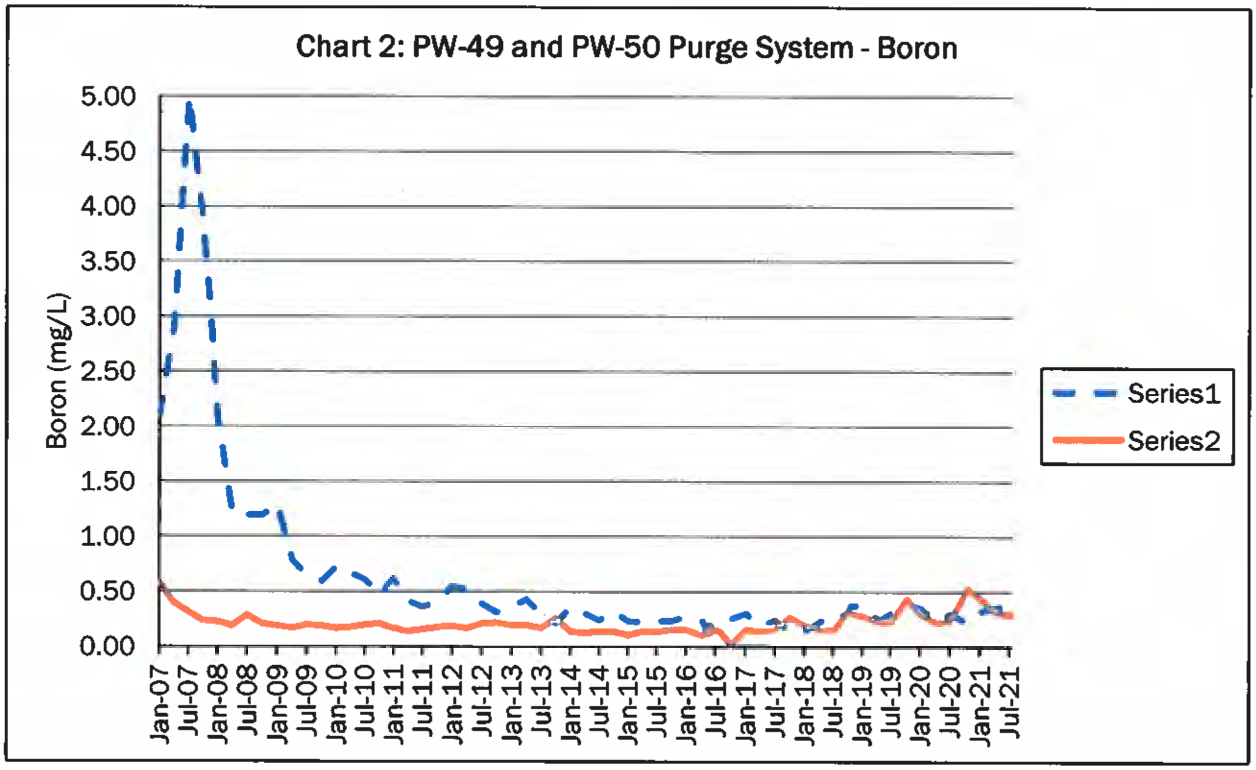


The static groundwater elevations obtained during quarterly monitoring events indicate a cone of depression, as shown in Figures 8 through 11. The groundwater quality data indicate a reduction of volatile organic compounds within the purge area and non-detection of volatile organic compounds outside the immediate purge area. The consistent evacuation rate and monitoring indicate the purge system is consistent and effective.

Boron

Following the identification of exceeding concentrations of boron in the groundwater on the west and north side of the site, purge wells PW-49 and PW-50 were installed in September 2006 to remediate the impacted groundwater. During 2021 (through December 23, 2021), the operation of PW-49 resulted in the evacuation of 423,073 gallons. The operation of PW-50 resulted in the removal of 2,699,499 gallons.

As noted in prior paragraphs, there were no exceedances of any primary indicator parameters, including boron. The purge wells effectively reduce the concentrations of boron in the surrounding wells, groundwater, and purge water. The reduced concentrations are attributable to the consistent evacuation of approximately 0.8 gpm from PW-49 and 5.1 gpm from PW-50. Those evacuations have resulted in the creation of a potentially larger than necessary capture zone in the vicinity of both purge wells.



The improvement of groundwater quality is seen in the monitoring data from both purge wells (Chart 2).

The data indicates a notable reduction of boron during the first three years of pumping. Even though the remediation has been effective, it is likely that there are still residual, low, concentrations of boron in the soil that are being "washed" by percolating storm water. This is indicated by small fluctuations in the monitoring data. The fourth quarter's concentrations range of 0.23 to 0.50 mg/L are well below the calculated health-based residential drinking water criteria for boron of 2.3 mg/L.

Review of the last four years of data from PW-50 suggests there is seasonal variation that occurs with respect to boron concentrations with the lowest being in July and the peak in October. The graph also indicates a general increase over the same time period. However, the surrounding monitoring wells did not have the same trend, and concentrations remain well below Part 201 criteria.

In summary, the data indicate the following:

1. The entire west side of the site is influenced by the purge system and the effectiveness of the capture zones is clearly seen in the groundwater quality data;
2. The purge system on the north side has a significant impact on both the hydrogeologic conditions and the quality of the groundwater; and
3. The impacted groundwater on both the west and north side is being effectively remediated.

GROUNDWATER FLOW DIRECTION

Bedrock Aquifer

The static groundwater elevations for MW-16, MW-17 and MW-18 were used to calculate the direction of flow in the bedrock aquifer. These data were used to identify the contours shown in Figures 2 and 3. Groundwater flow is in a northerly direction which is consistent with that seen in prior years.

Deep Glacial Aquifer

The static elevations from only the monitoring wells screened in the lower (or deep) glacial drift aquifer (MW-14d, MW-20, MW-22d, MW-25, MW-41, MW-43d, MW-44, and MW-45) were utilized to identify the contours shown in Figures 4 and 5. These data indicate the general direction of groundwater flow is also to the north which is similar to that seen in previous years. The contours also portray the capture zone created by the operation of PW-50.

Shallow Glacial Aquifer

The data from the monitoring wells screened in the shallow glacial drift aquifer were utilized to identify the contours shown in Figures 6 and 7. The presence of the purge wells, slurry wall, and dewatering system create isolated areas of unique flow patterns. These unique patterns of flow are similar to those observed in previous years, which are effective in protecting/remediating this area.

LEACHATE MONITORING / LEACHATE EXTRACTION SYSTEM

In accordance with the terms of the Post-Closure Operating License, a leachate extraction system in the form of six extraction points and interconnecting force main was constructed. In September of 2019 Granger explored the potential of adding gas collection to the north end of the MID site. Based on the findings, two gas extraction wells (GW-A and GW-B) were constructed. Significant quantities of liquid were found in GW-A and in the Spring of 2020, GW-A was converted to a seventh extraction well (LMW-7). This well was connected to the existing leachate force main. Based on the September 29, 2003, correspondence from the MDEQ, and because of the consistent non-detection of the herbicides, pesticides, PCB's and the base/neutral/acid compounds in the leachate, the monitoring program was modified as follows: In odd numbered years the annual leachate monitoring will consist of the modified Appendix IX list with the addition of boron and the exclusion of dioxane/furans.

In 2021, we still experienced periods of air entrainment in the leachate force main requiring routine maintenance, but the leachate flow meter was functional and a total of 91,228 gallons of leachate was removed from the site. As intended, it assisted in the management of the system by providing a metric for determining pumping schedules.

FINAL COVER: ON-GOING MAINTENANCE

A formal final cover inspection was performed in November 2021. Reports on the inspection have been placed in the Operating Record and are provided in the Appendices. Follow-up work regarding the results of the inspection will be performed in the spring 2022.

The inspection concluded that, while the landfill cap is in good condition, there were routine on-going maintenance actions which are typically required at a closed landfill. General maintenance of the final cover includes routine mowing and follow-up on the inspections focusing on the following elements:

- Low Areas and Ruts
- Disturbed Areas Sparse and/or Patchy Vegetation
- Standing Water in Gas Control Structure Manholes
- Animal Burrows
- Undesirable Plant Species

These elements are discussed in more detail in the following paragraphs.

Low Areas and Ruts

As noted in previous reports, and as is typically the case for closed landfills, although this process has slowed considerable, subsidence continues to be an on-going maintenance item at the site. These areas are identified and scheduled for maintenance with the landfill operations manager.

- Areas of siltation along the flow paths of the storm water diversion berms on the north side of the site resulted in inconsistent slope and therefore areas of ponding.
- A low area resulting in ponding, stressed vegetation, and ruts near the storm water inlet structure in the northeast corner of the site.
- There are several low areas that have required continued maintenance. These areas are identified by intermittent ponding and periodically the relative height of vegetation due to limited access of the site's mowing equipment.

Disturbed Areas Sparse and/or Patchy Vegetation

Some areas of the cap require the routine passage of maintenance vehicles. It is proposed that Granger identify a specific area/lane to limit traffic as much as possible. This approach is similar to that made to create a roadway for routine access to the leachate pretreatment building on the north side. This allows for focus on the maintenance of vegetation outside of that lane.

Areas of sparse and/or patchy vegetation outside of the travel lanes will be addressed in the spring as weather permits. This schedule will prevent further damage to the cap by truck traffic during wet weather when the cover soils are soft. The landfill manager has been provided with the locations of the areas and they will be addressed according to the size of the affected area. In either case, the area will be addressed by disrupting the soil followed by the addition of topsoil, as appropriate, and reseeding.

Standing Water in Gas Control Structure Manholes
As part of routine quarterly maintenance any accumulated storm water is removed.

Animal Burrows
No burrows were identified in the inspection. The presence of animal burrows is addressed on an on-going basis through the removal of the animals and repair of any damage to the cap. The effectiveness of the program is demonstrated by no burrows being observed during the inspection. Granger continues to retain an animal control specialist to routinely remove animals. Due to the natural presence of burrowing animals in the area removing them serves to minimize the regional population and as a deterrent from attraction to the final cover area. Granger continues to control the numbers and routinely inspects the cap and repairs any damage.

Undesirable Plant Species
Autumn olive bushes have been completely removed on the site's northern slope because of clearing efforts made in 2018. The trees were ground and left in place for slope stabilization. The olive trees on the periphery of the site, outside of those present on the north slope, and in areas where mowing was not feasible, were physically removed.

Concerning the presence of other undesirable plant species (e.g., thistle, red clover, Queen Anne's lace) their lessened presence is attributed primarily to the effectiveness of the mowing program.

SUMMARY AND CONCLUSIONS

The data obtained throughout year 2021 monitoring and maintenance activities indicate the following:

- The operation of the site has not had any impact to surface or ground water.
- The monitoring of wells in the bedrock aquifer (MW-16, MW-17, and MW-18), indicate that the groundwater has not been impacted by site activities.
- Monitoring has shown that the presence of sodium and chloride in the shallow groundwater at MW-14sr is attributable to the impact of salt laden surface water runoff from the adjacent highway. Monitoring of the concentrations of salt at MW-14sr will continue through detection monitoring and trend analyses.
- The direction of groundwater flow in both the bedrock and glacial aquifers continues to be in a northerly to northeasterly direction with relatively little variation.
- The data indicate that purge wells (PW-46 and PW-48) in the southwest corner of the site are very effective in producing a widespread capture zone, and the impact of volatile organics is effectively contained with the detection of low concentrations of volatile organic compound in P-28.
- The purge wells PW-49 and PW-50 on the west and north continue to be effective in the capture and removal of boron impacted groundwater.

- Inspections of the site indicated the presence of effective site security, the continued effective operation of the landfill gas control/collection system, and effective maintenance of the landfill cap (with the understanding that maintenance of on-going items will continue into 2022).

> "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 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 submitting false information, including the possibility of fine and imprisonment for knowing violations."

If you have any questions concerning either this report, or the site in general, please contact our office.

Sincerely,

Stephen R. Blayer

Stephen R. Blayer
Environmental Engineer
sblayer@grangernet.com
517-614-3655

Enclosure

Table 1. Groundwater Purge System Data

The following data were obtained from the flow meters on the discharges from purge wells PW-46, PW-48, PW-49 and PW-50.

Purge Well 46

December 23, 2021	5,330,186
December 28, 2020	4,073,225
Gallons pumped:	***1,256,921***

Purge Well 48

December 23, 2021	3,063,849
December 28, 2020	2,009,334
Gallons pumped:	1,054,515

Purge Well 49

December 23, 2021	2,945,413
December 28, 2020	2,522,340
Gallons pumped:	***423,073***

Purge Well 50

Total gallons pumped:	2,699,499

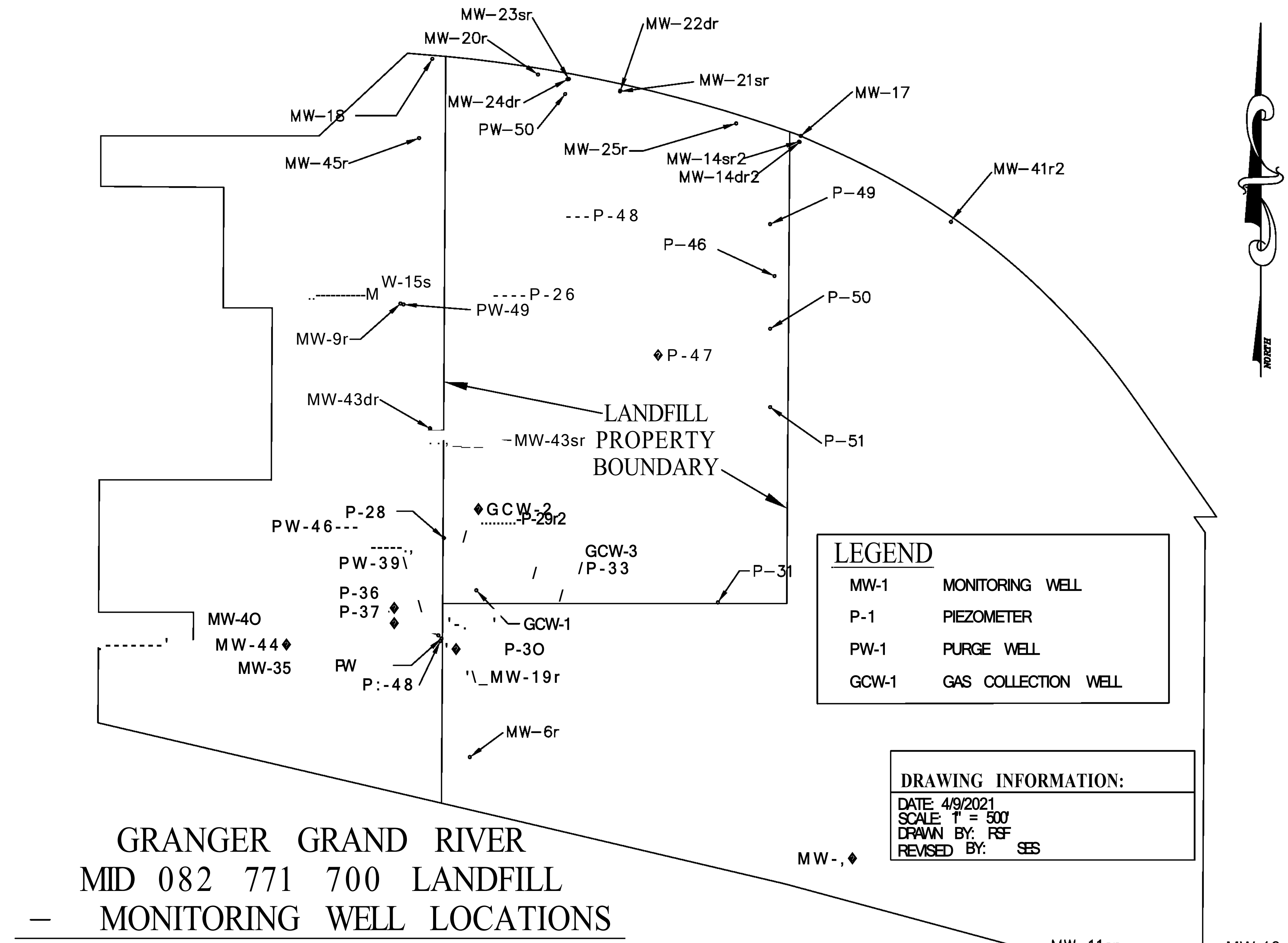
Accumulative gallons evacuated from the glacial drift aquifer from December 28, 2020 to December 23, 2021:

5.434.048

GRANGER GRAND RIVER MID 082 771 700 LANDFILL

2021 ANNUAL REPORT

FIGURES



LEGEND

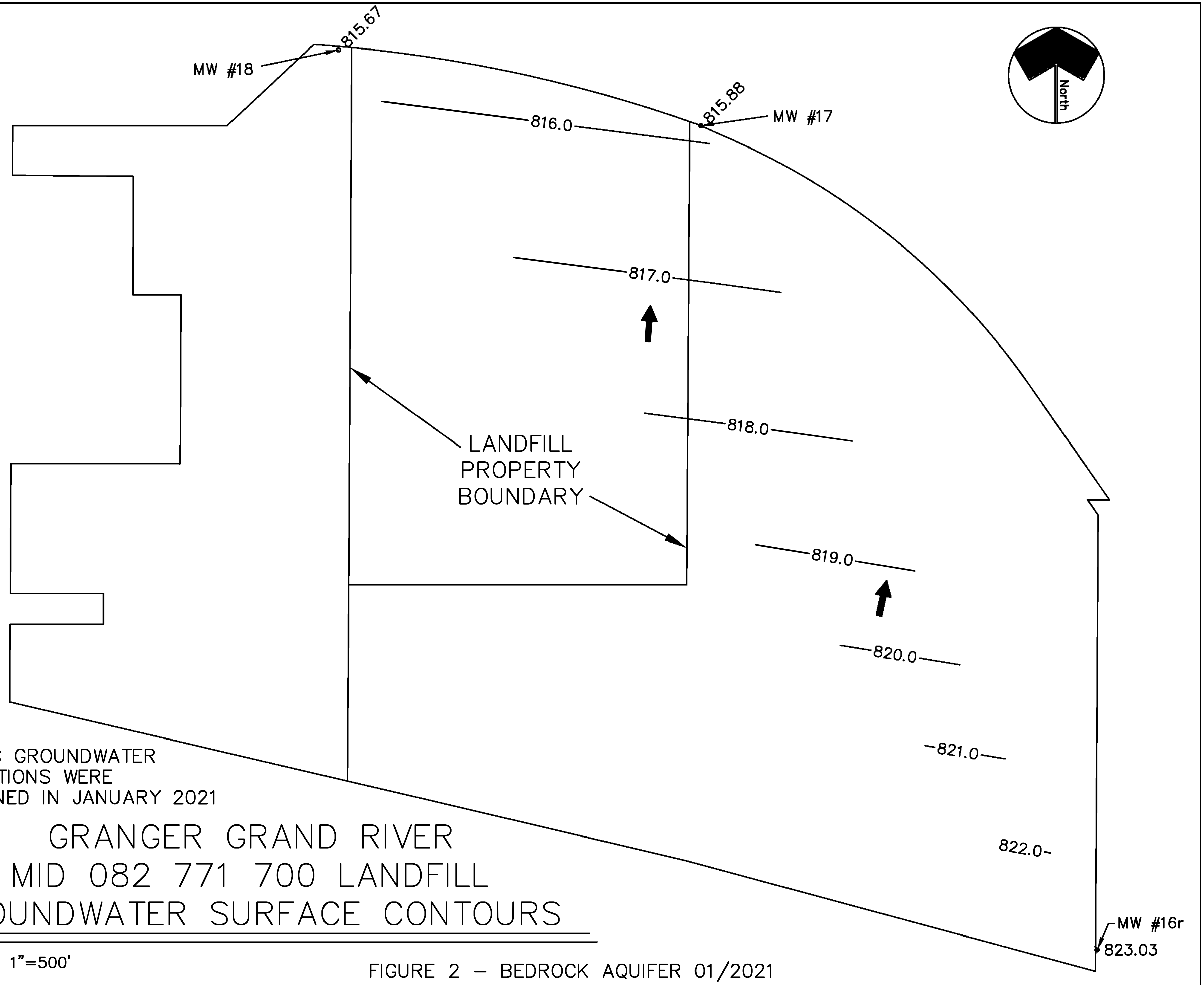
MW-1	MONITORING WELL
P-1	PIEZOMETER
PW-1	PURGE WELL
GCW-1	GAS COLLECTION WELL

DRAWING INFORMATION:

DATE: 4/9/2021
SCALE: 1" = 500'
DRAWN BY: RSF
REVISED BY: SES

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
– MONITORING WELL LOCATIONS

FIGURE 1 - GENERAL LOCATIONS

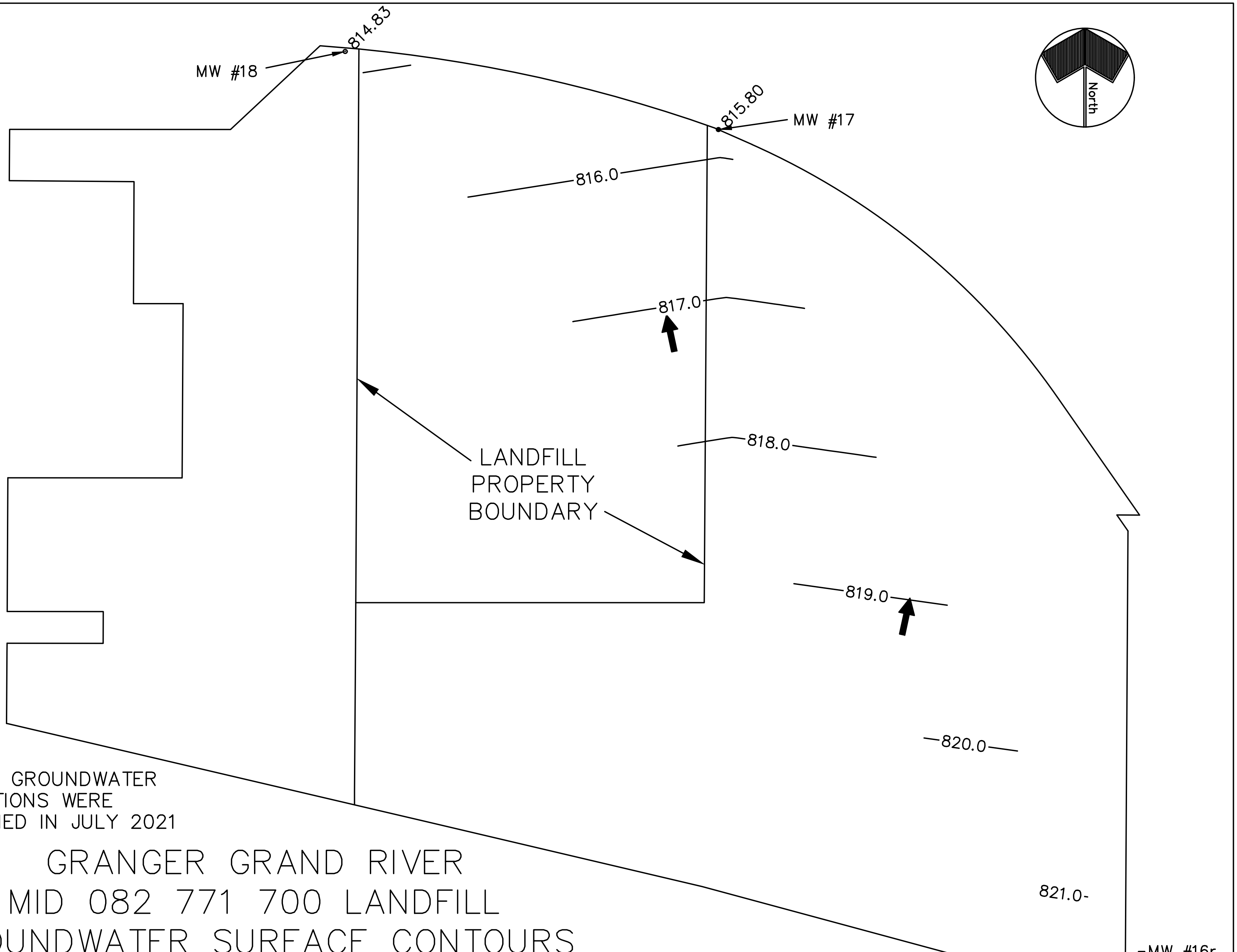


STATIC GROUNDWATER
ELEVATIONS WERE
OBTAINED IN JANUARY 2021

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 2 – BEDROCK AQUIFER 01/2021



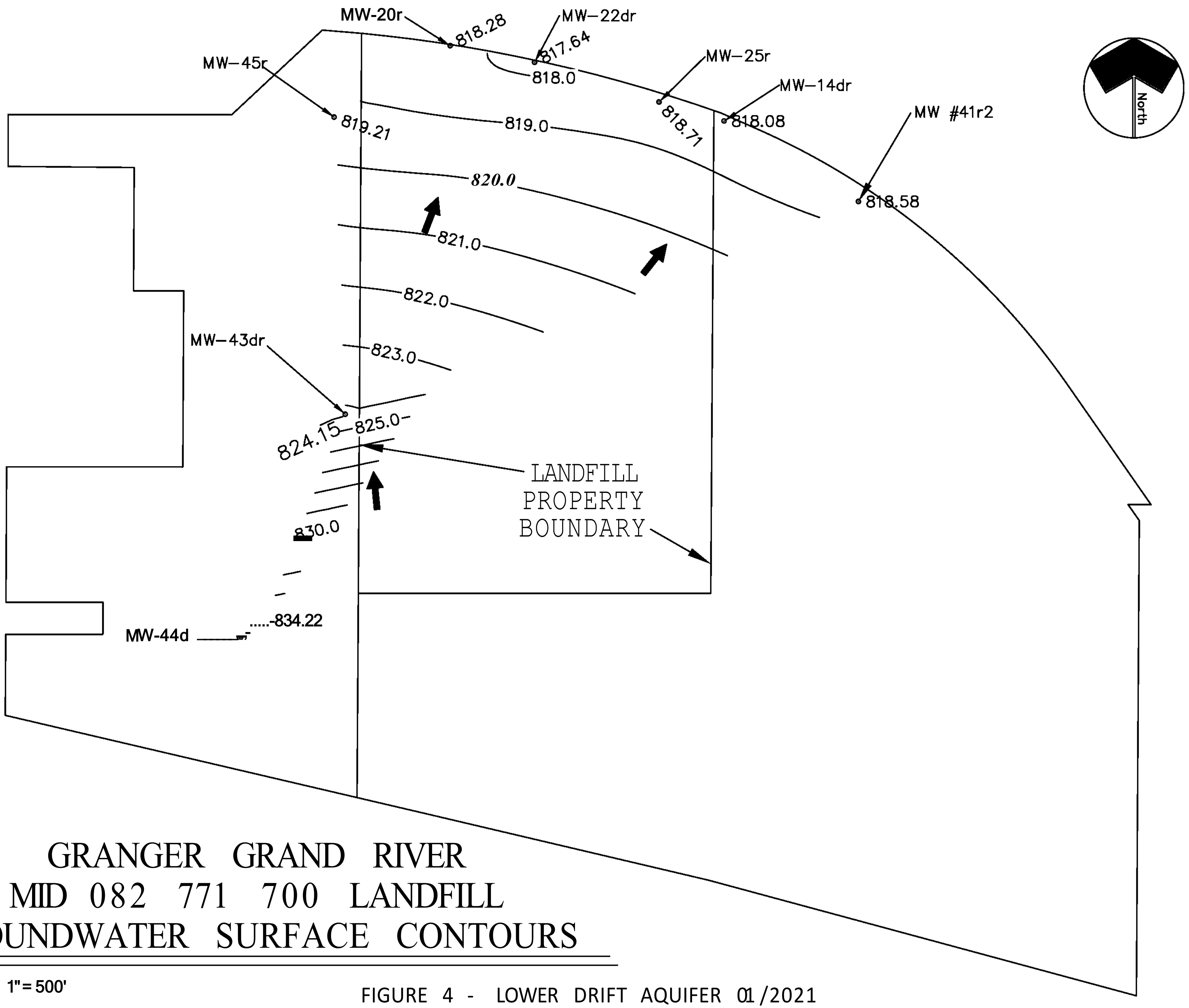
STATIC GROUNDWATER
ELEVATIONS WERE
OBTAINED IN JULY 2021

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 3 – BEDROCK AQUIFER 07/2021

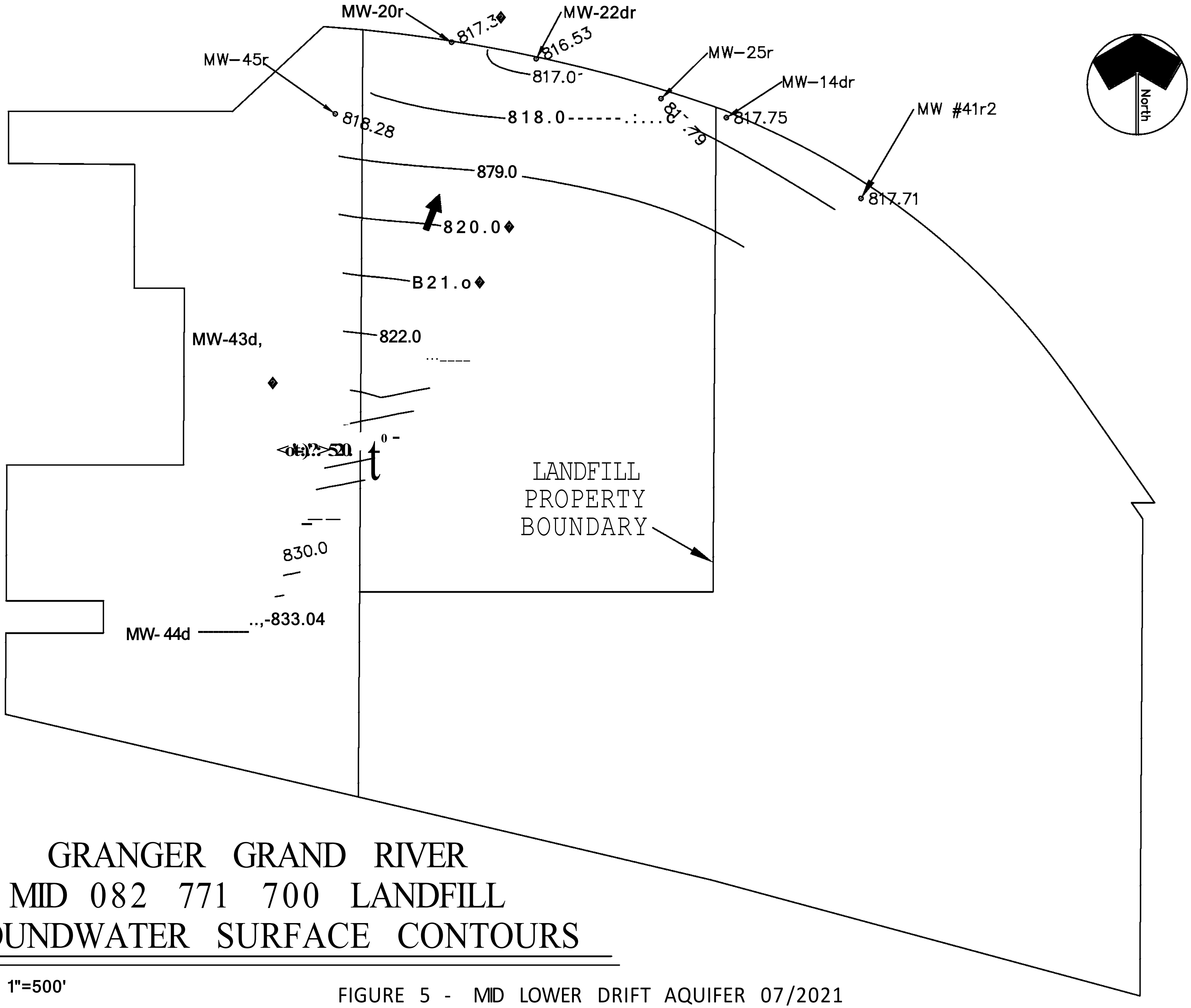
F:\^Landfill\MID\Reports\Quarterly\2021 MID Drawings\Bedrock\2021 07 MID Bedrock.dwg



GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1" = 500'

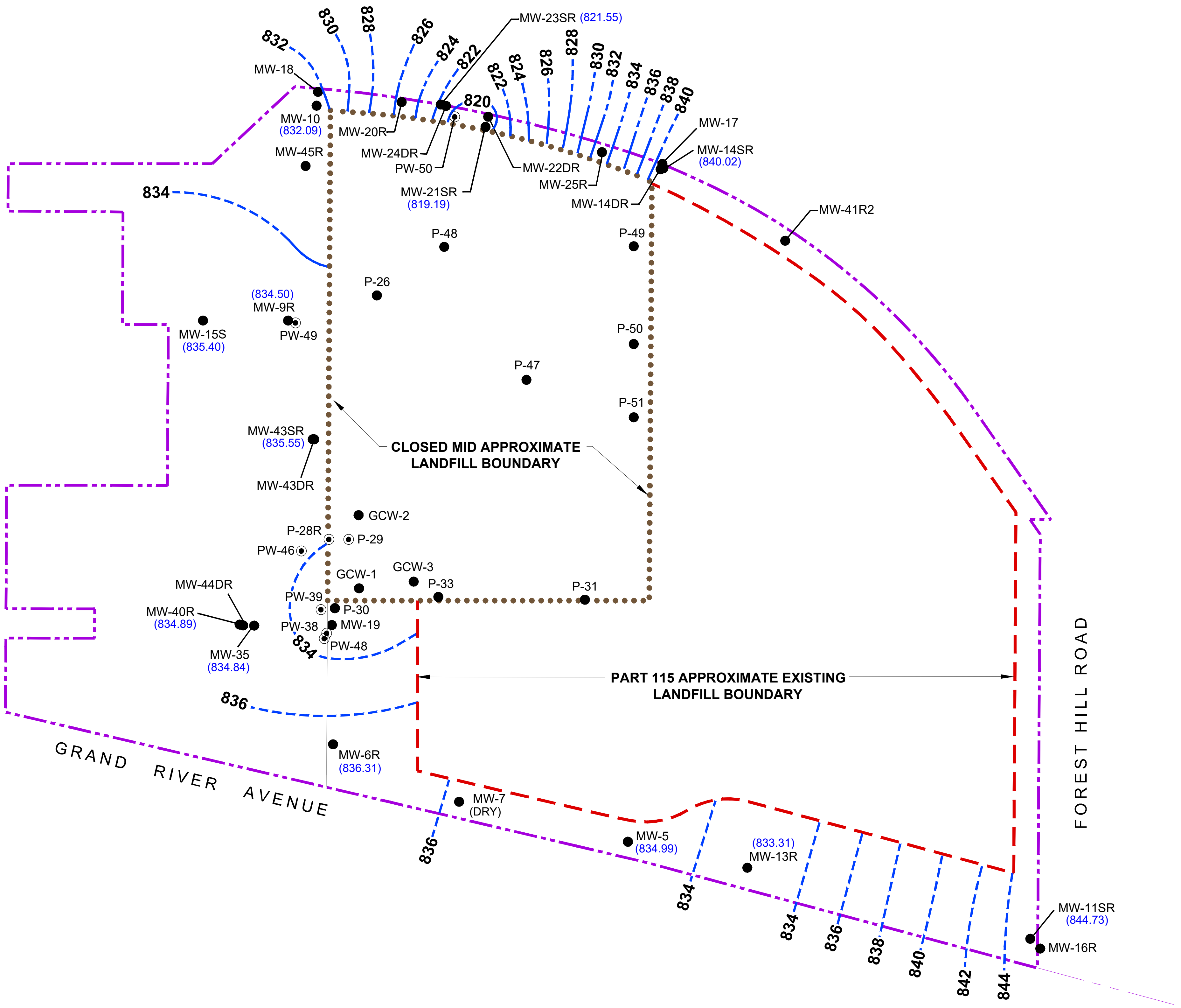
FIGURE 4 - LOWER DRIFT AQUIFER 01/2021



GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 5 - MID LOWER DRIFT AQUIFER 07/2021



LEGEND

MW-1 ●	MONITORING WELL LOCATION AND NUMBER
P-1 ●	PIEZOMETER LOCATION AND NUMBER
PW-39 ⊙	PURGE WELL LOCATION AND NUMBER
GCW-1 ●	GAS COLLECTION WELL LOCATION AND NUMBER
••••••••	CLOSED MID APPROXIMATE LANDFILL BOUNDARY
— — —	PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
—·—·—	APPROXIMATE PROPERTY LINE
838 ——	LINE OF EQUAL ELEVATION
(840.34)	GROUNDWATER ELEVATION

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER CO., DATED 05-04-2007, FIGURE 1 GENERAL LOCATIONS.DWG.
2. CONTOURS REPRESENT INTERPRETATIONS OF GROUNDWATER ELEVATION BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS.

0 500 1000
APPROXIMATE SCALE IN FEET

PROJECT:
GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

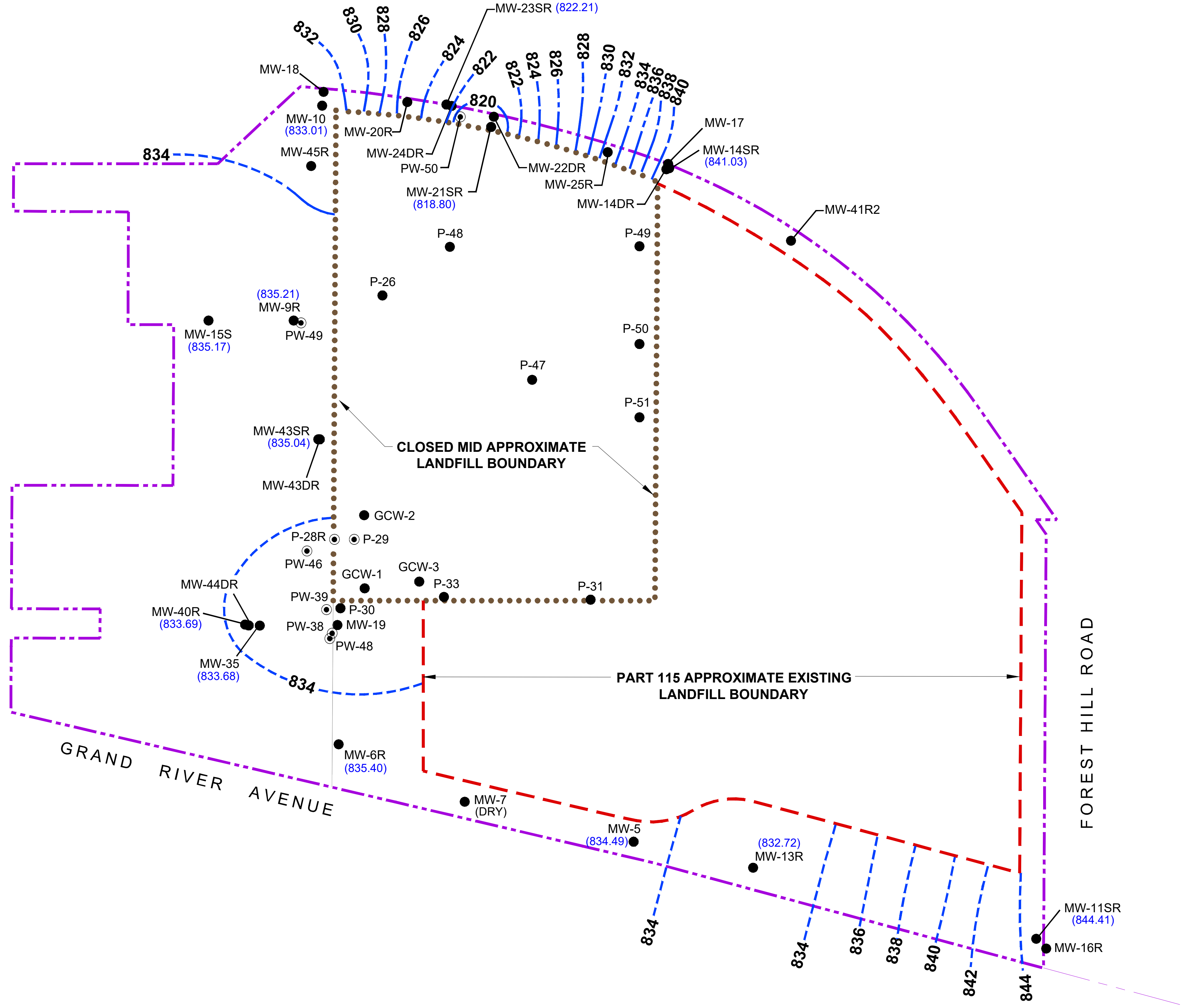
TITLE:
GROUNDWATER CONTOURS
SHALLOW GLACIAL AQUIFER
JANUARY 2021

DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K. LOWERY		**FIGURE 6**
APPROVED BY:	S.HOLMSTROM		
DATE:	MARCH 2021		

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.05 2021 1st SA.dwg



LEGEND

MW-1 ● MONITORING WELL LOCATION AND NUMBER

P-1 ● PIEZOMETER LOCATION AND NUMBER

PW-39 ⊙ PURGE WELL LOCATION AND NUMBER

GCW-1 ● GAS COLLECTION WELL LOCATION AND NUMBER

•••••••• CLOSED MID APPROXIMATE LANDFILL BOUNDARY

— — PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY

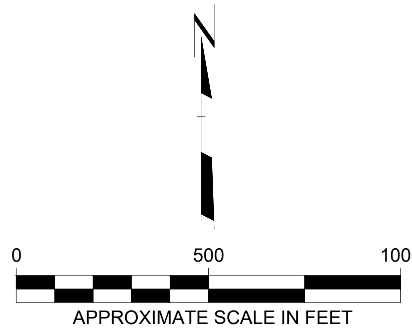
—·—·— APPROXIMATE PROPERTY LINE

838 —— LINE OF EQUAL ELEVATION

(840.34) GROUNDWATER ELEVATION

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER CO., DATED 05-04-2007, FIGURE 1 GENERAL LOCATIONS.DWG.
2. CONTOURS REPRESENT INTERPRETATIONS OF GROUNDWATER ELEVATION BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS.



PROJECT:

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:

GROUNDWATER CONTOURS
SHALLOW GLACIAL AQUIFER
JULY 2021

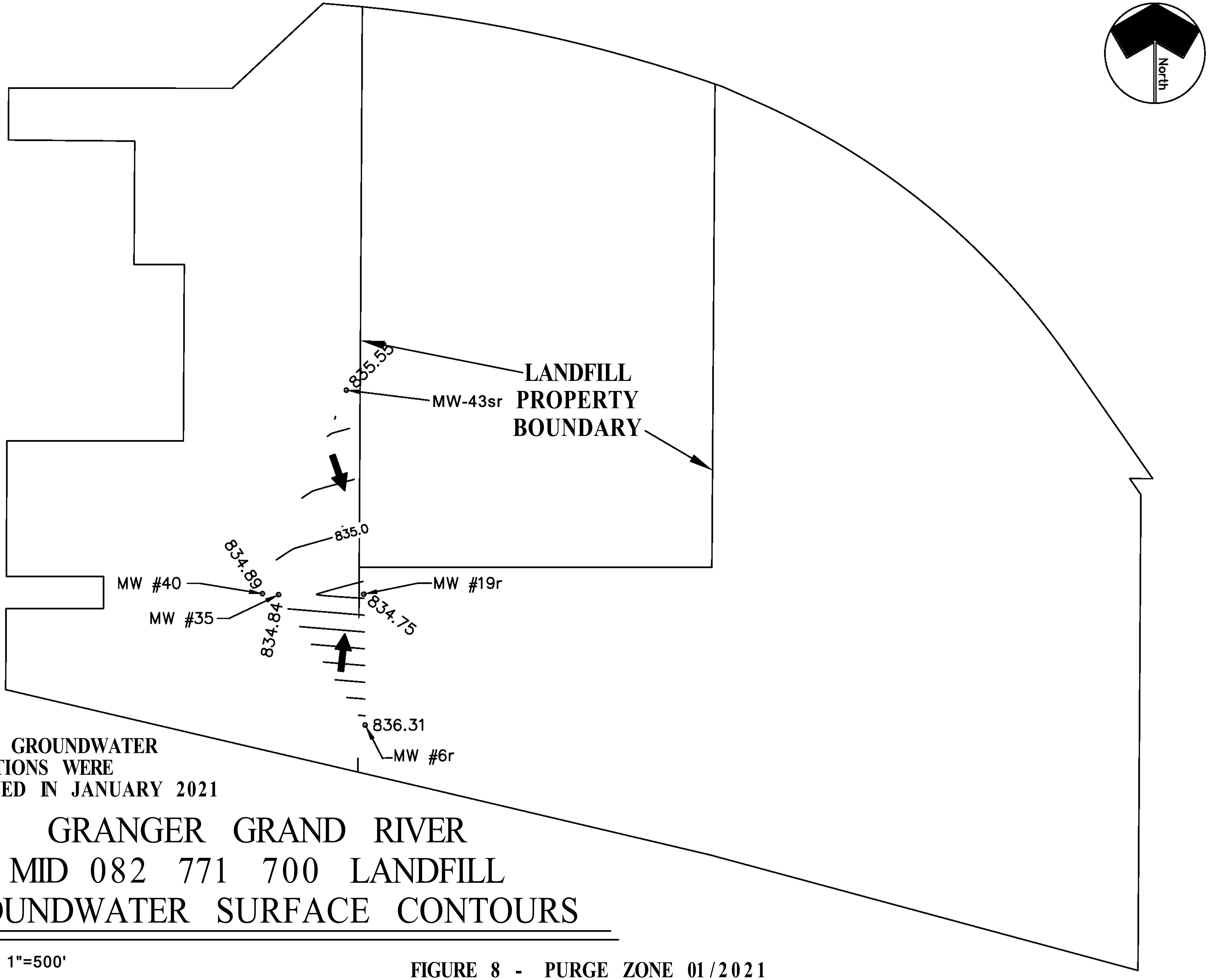
DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K. LOWERY	**FIGURE 7**	
APPROVED BY:	S.HOLMSTROM		
DATE:	SEPTEMBER 2021		

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.05 2021 2nd SA.dwg

11x17 --- ATTACHED XREFS: --- ATTACHED IMAGES:
DRAWING NAME: \\Annarbor-fp2\cadd\PJT\00_TRC\Granger LF\414508\0002\01_2021 2ndSA Rpt\414508.0002.01.05 2021 2nd SA.dwg --- PLOT DATE: August 31, 2021 - 4:11AM --- LAYOUT: FIG05 GW Contours Shallow Jul 2021

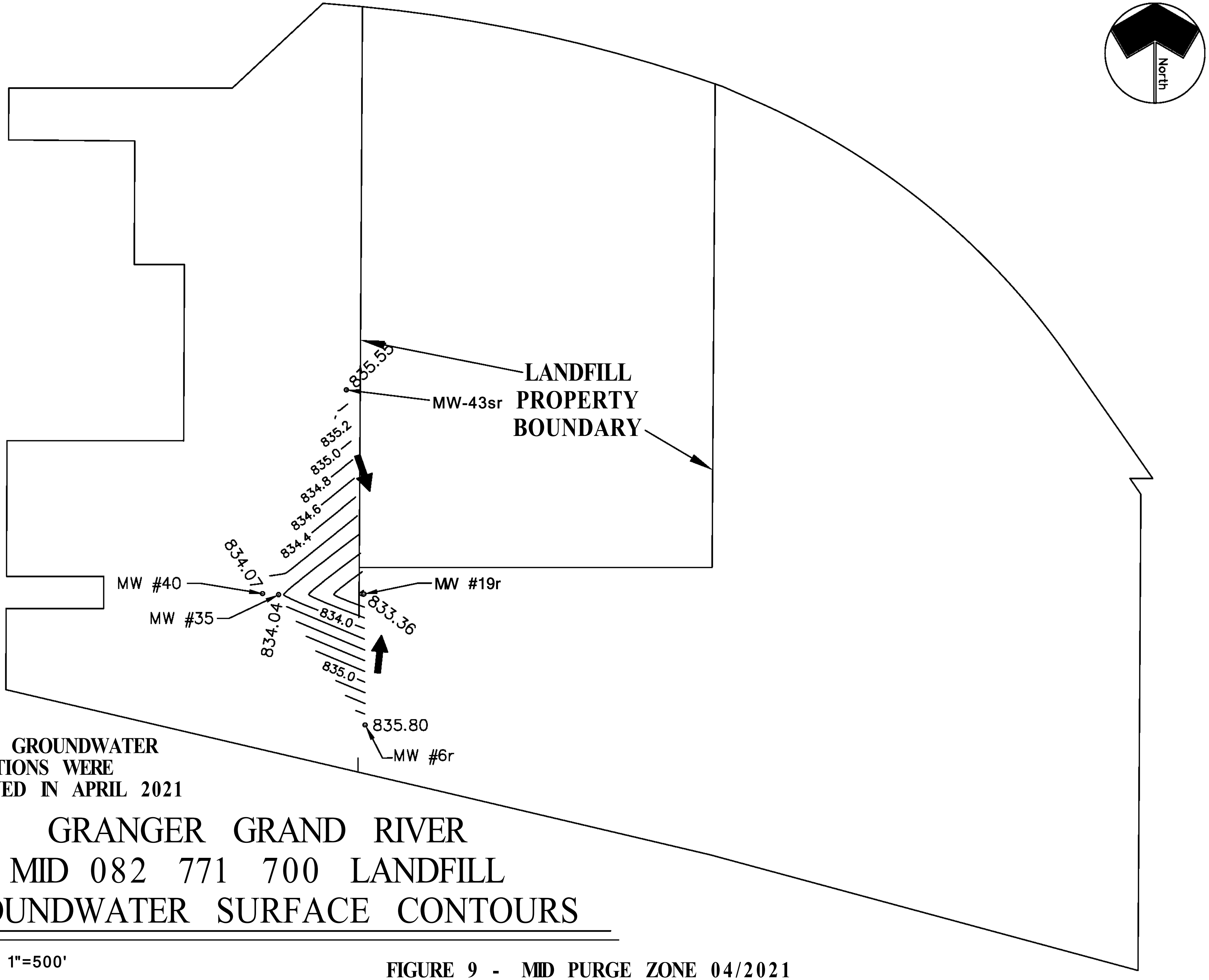


**STATIC GROUNDWATER
ELEVATIONS WERE
OBTAINED IN JANUARY 2021**

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 8 - PURGE ZONE 01/2021

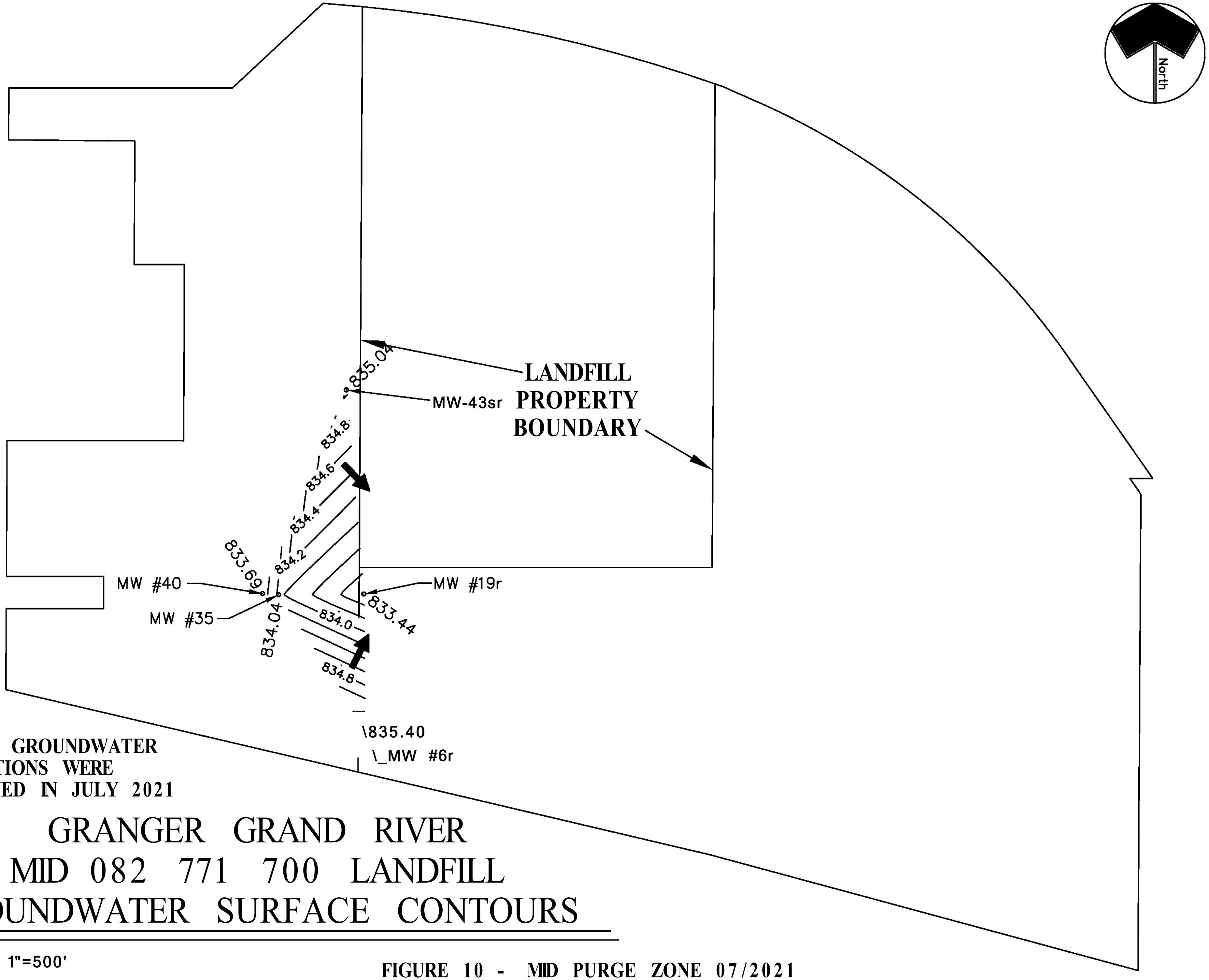


**STATIC GROUNDWATER
ELEVATIONS WERE
OBTAINED IN APRIL 2021**

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 9 - MID PURGE ZONE 04/2021

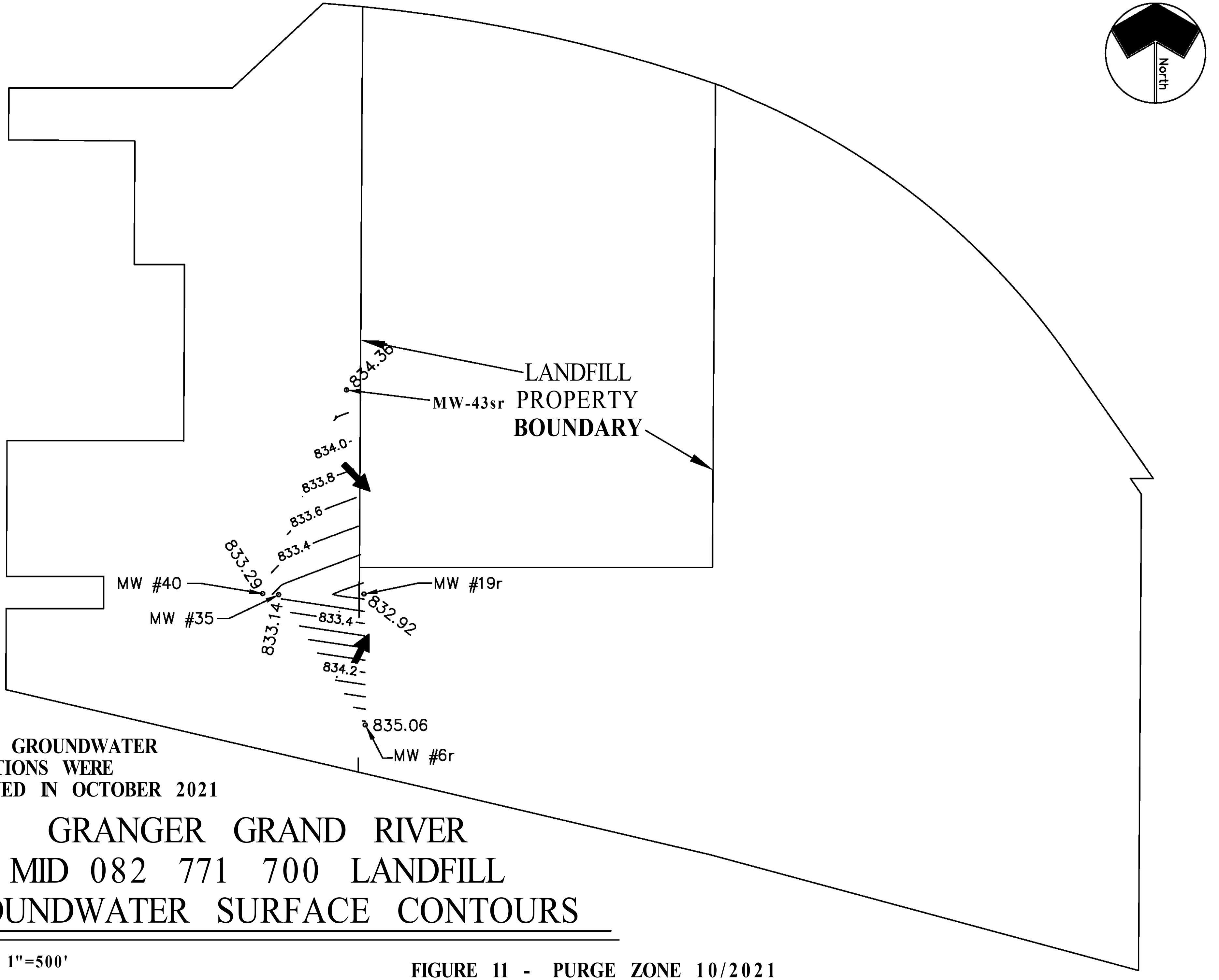


STATIC GROUNDWATER
ELEVATIONS WERE
OBTAINED IN JULY 2021

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 10 - MID PURGE ZONE 07/2021



**STATIC GROUNDWATER
ELEVATIONS WERE
OBTAINED IN OCTOBER 2021**

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
GROUNDWATER SURFACE CONTOURS

SCALE: 1"=500'

FIGURE 11 - PURGE ZONE 10/2021

GRANGER GRAND RIVER MID 082 771 700 LANDFILL

2021 ANNUAL REPORT

ATTACHMENT A

GROUNDWATER ANALYTICAL DATA SUMMARY TABLE

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-06R	04/15/03	mg/L	1.74	0.13	341	84.9	36.9	46.2	2.15						6.8		0.012	23.2	<0.003	
MW-06R	07/10/03	mg/L	2.38	0.13	329	86.1	37.3	54.3	3.04	<0.0002	<0.001	<0.001	0.036		6		0.029	50.6	0.01	0.204
MW-06R	10/14/03	mg/L	3.15	0.1	300	83.5	38.7	53.1	2.62						20		0.021	33.5	0.004	
MW-06R	01/15/04	mg/L	<0.05	3.6	530	110	36	71	1.8	<0.0002	0.0032	<0.001	<0.05	<0.001	54		0.03	45	0.036	0.22
MW-06R	04/15/04	mg/L	<0.05	2.7	550	100	36	74	2.8						28		0.04	47	<0.02	
MW-06R	07/15/04	mg/L	<0.05	2.7	600	100	34	63	2.4	0.00026	0.0035	<0.001	0.083		21	160	0.03	46	<0.02	0.1
MW-06R	10/15/04	mg/L	<0.05	2.1	610	87	28	55	2.2						25		0.03	48	<0.02	
MW-06R	01/15/05	mg/L	<0.05	2.3	540	95	33	52	2.6	0.001	0.0024	<0.001	0.066		22		0.05	48	0.0058	0.054
MW-06R	04/15/05	mg/L	<0.05	1.8	500	97	30	51	2.1						42		0.025	46	<0.02	
MW-06R	07/15/05	mg/L	<0.05	1.8	650	110	38	63	2.3	0.00051	0.0086	<0.001	0.051		25		<0.02	49	0.021	0.15
MW-06R	10/15/05	mg/L	<0.05	2	610	120	36	59	2.5						71		0.03	46	0.051	
MW-06R	01/18/06	mg/L	<0.05	<0.023	610	130	35	68	2.2	0.00034	0.005	<0.001	<0.05	<0.001	54		0.12	52	<0.02	0.065
MW-06R	04/27/06	mg/L	<0.05	1.7	560	150	35	74	2.5				0.032		22		0.02	46	<0.02	
MW-06R	07/19/06	mg/L	<0.05		540	120		63	2.9	0.00088	<0.001	<0.001	<0.05	<0.001	32		0.03		<0.02	0.32
MW-06R	10/19/06	mg/L	<0.05	42	570	250	41	61	1.9				0.057		<5		<0.02	52	<0.05	
MW-06R	01/10/07	mg/L	<0.05	2.1	570	120	40	70	1.7	0.00034	0.001	0.0017	<0.05	<0.001	10		<0.02	50	<0.02	0.064
MW-06R	04/12/07	mg/L	<0.05	1.9	530	120	33	64	2.5				0.031		20		0.025	47	<0.05	
MW-06R	07/11/07	mg/L	<0.05	2.6	490	95	38	55	1.9	<0.0002	<0.001	<0.001	<0.05	<0.001	23		0.03	46	<0.02	0.25
MW-06R	10/19/07	mg/L	<0.05	2.5	530	160	37	64	2.1				<0.05		<5		0.05	51	<0.02	
MW-06R	01/31/08	mg/L	<0.05	2.3	1000	100	32	52	2.3	<0.0002	0.0012	<0.001	<0.05	<0.001	13		0.04	50	<0.02	0.083
MW-06R	04/24/08	mg/L	<0.05	1.9	520	92	34	51	2.2				<0.05		17		0.055	48	<0.02	
MW-06R	07/10/08	mg/L	<0.05	2.1	450	99	37	53	2.2	0.0003	0.0014	<0.001	<0.05	<0.001	15		0.05	45	<0.02	0.81
MW-06R	10/17/08	mg/L	<0.05	2.1	530	99	34	54	2.3				<0.05		10		0.032	47	<0.02	
MW-06R	01/29/09	mg/L	<0.05	2	560	110	30	51	2.7	0.00037	0.0022	<0.001	<0.05	<0.001	<5		0.08	49	<0.02	0.098
MW-06R	04/14/09	mg/L	<0.05	2.3	520	120	34	47	2.3				<0.05		10		0.02	48	<0.02	
MW-06R	07/23/09	mg/L	<0.05	2.4	530	170	50	61	3.3	0.00023	<0.001	<0.001	<0.05	<0.001	18		0.022	51	<0.02	2.1
MW-06R	10/16/09	mg/L	<0.05	2.7	580	150	43	74	3.2				<0.05		14		0.037	48	<0.02	0.82
MW-06R	01/20/10	mg/L	<0.05	1.9	510	150	46	67	3.2	0.00027	0.0047	<0.001	<0.05	<0.001	21		0.06	50	<0.02	1.4
MW-06R	04/12/10	mg/L	<0.05	2.2	520	160	46	82	3.7				<0.05		17		0.046	50	<0.02	
MW-06R	07/07/10	mg/L	<0.05	2	560	150	45	73	2.8	<0.0002	<0.001	<0.001	<0.05	<0.001	5		0.068	47	<0.02	0.87
MW-06R	10/14/10	mg/L	<0.05	1.6	630	160	50	65	3.1				<0.05		6		<0.02	44	<0.02	0.21
MW-06R	01/18/11	mg/L	<0.05	1.7	490	120	38	60	3.1	0.00025	<0.001	<0.001	<0.05	<0.001	<5		0.037	40	<0.02	0.059
MW-06R	04/11/11	mg/L	<0.05	3	480	100	36	57	3.2				<0.05		<5		0.061	45	<0.02	
MW-06R	07/07/11	mg/L	<0.05	2.2	540	130	42	130	5.5	0.00023	<0.001	<0.001	<0.05	<0.001	<5		0.031	100	<0.02	0.75
MW-06R	10/19/11	mg/L	<0.05	2.6	490	200	51	80	3.5				<0.05		<5		0.14	48	<0.02	0.81
MW-06R	01/10/12	mg/L	<0.05	0.054	530	180	46	82	3.5	<0.0002	<0.001	<0.001	<0.05	<0.001	<5		<0.02	46	<0.02	0.73
MW-06R	04/09/12	mg/L	<0.05	1.8	150	140	53	71	4.2				<0.05		12		0.022	47	<0.02	1.1
MW-06R	07/17/12	mg/L	<0.05	2.2	510	98	46	47	3.1	<0.0002	<0.001	<0.001	<0.05	<0.001	<5		0.035	46	<0.02	0.76
MW-06R	10/04/12	mg/L	<0.05	1.2	510	100	49	51	3.2				<0.05		13		0.066	45	<0.02	1
MW-06R	01/10/13	mg/L	<0.05	0.83	470	120	42	62	3.3	<0.0002	<0.001	<0.001	<0.05	<0.001	11		0.091	41	<0.02	0.21
MW-06R	04/12/13	mg/L	<0.05	1.9	460	170	43	83	3.9				<0.05		<5		<0.02	44	<0.02	
MW-06R	07/10/13	mg/L	<0.1	2.1	540	120	42	57	3.5	<0.0002	<0.001	<0.001	<0.05	<0.001	<5		0.16	43	<0.02	0.59
MW-06R	10/14/13	mg/L	<0.1	1.9	480	140	39	69	3.7				<0.05		<5		0.027	43	<0.02	
MW-06R	01/14/14	mg/L	<0.05	2.1	540	140	36	69	3.9	<0.0002	<0.001	<0.001	<0.05	<0.001	<5		0.035	42	<0.02	0.2
MW-06R	04/04/14	mg/L	<0.05	1.8	500	89	31	60	2.5				<0.05		<5		0.18	43	<0.02	
MW-06R	07/09/14	mg/L	0.011	1.7	490	90	28	52	2.9	<0.0002	<0.001	<0.001	<0.05	<0.001	11	150	0.14	41	<0.02	0.36
MW-06R	10/20/14	mg/L	<0.01	1.9	450	92	27	54	2.7				<0.05		<5		<0.02	42	<0.02	
MW-06R	01/20/15	mg/L	0.045	2.1	540	95	25	30	6.0	<0.0002	<0.001	<0.001	0.13	0.0013	13	81	0.86	26	0.13	<0.0040
MW-06R	04/01/15	mg/L	0.028	2.3	500	94		50	2.6				<0.05				0.042			
MW-06R	07/29/15	mg/L	0.044	1.8	560	100	26	52	2.6	<0.0002	<0.001	<0.001	<0.05	<0.001	<5		0.031	43	<0.02	0.19
MW-06R	10/12/15	mg/L	0.020		600	87		51	2.4				<0.05		9		0.036		<0.02	
MW-06R	01/05/16	mg/L	0.024						2.6	0.00024	<0.001	<0.001	<0.05	<0.001			0.058			0.047
MW-06R	04/12/16	mg/L	0.054						2.5				<0.05	<0.001			<0.02			
MW-06R	07/26/16	mg/L	0.03						2	<0.0002	<0.001	<0.001	<0.05	<0.001			<0.02			0.71
MW-06R	10/06/16	mg/L	0.015						2.8				<0.05				<0.02			0.25
MW-06R	01/05/17	mg/L	0.023						2.2	<0.0002	<0.001	<0.001	<0.05	<0.001			<0.025			0.098
MW-06R	04/03/17	mg/L	0.018						2.6				<0.05				0.092			0.18
MW-06R	07/12/17	mg/L	0.041						2.6	<0.0002	<0.001	<0.001	<0.05	<0.001			0.32			0.33
MW-06R	10/06/17	mg/L	0.026						2.6				<0.05				0.031			0.41
MW-06R	01/23/18	mg/L	0.21						2.5	<0.0002	<0.001	<0.001	<0.05	<0.001			0.038			0.25
MW-06R	04/05/18	mg/L	0.029						2.9				<0.05				0.05			0.14
MW-06R	07/12/18	mg/L	0.011						2.4	<0.0002	<0.001	<0.001	<0.05	<0.001			<0.025			0.25

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-06R	10/09/18	mg/L	0.011						2.6				0.027				0.42			0.19
MW-06R	01/10/19	mg/L	<0.01						2.8	<0.0002	<0.001	<0.001	0.031	<0.001			0.13			0.19
MW-06R	04/23/19	mg/L	<0.01						2.9				0.038				<0.05			0.15
MW-06R	07/10/19	mg/L	<0.01						2.7	<0.0002	<0.001	<0.001	0.039	<0.001			0.026			0.22
MW-06R	10/10/19	mg/L	<0.01						3.0				0.036				0.056			
MW-06R	01/07/20	mg/L	<0.01						2.7	<0.0002	<0.001	<0.001	0.038	<0.001			0.065			0.25
MW-06R	04/16/20	mg/L	<0.01						2.4				0.029				<0.02			
MW-06R	07/08/20	mg/L	<0.01						2.3	<0.0002	<0.001	<0.001	0.026	<0.001			<0.02			0.45
MW-06R	10/09/20	mg/L	0.018						2.1				0.025				0.1			0.2
MW-06R	01/13/21	mg/L	<0.01						2.4	<0.0002	<0.001	0.0011	0.031	<0.001			0.05			0.12
MW-06R	04/08/21	mg/L	<0.01						2.9				0.032				0.029			0.073
MW-06R	07/15/21	mg/L	<0.01						2.5	<0.0002	<0.001	<0.001	0.04	<0.001			0.065			0.056
MW-06R	10/06/21	mg/L	<0.01						2.5				0.043				0.043			0.026
MW-09	03/07/95	mg/L	0.01	0.02	470		57	11							<3		0.38	36		
MW-09	06/07/95	mg/L	0.08	0.02	480		64	11	1.8	0.0006	<0.001	<0.001		<0.001	<3		3.5	41		
MW-09	09/08/95	mg/L	0.64	0.06	510		72	14	2.9	0.0003	<0.001	<0.001		<0.001	<3		1.7	47	0.89	4
MW-09	10/23/95	mg/L	0.11	0.12	470		65	13	2.2	<0.0002	<0.001	<0.001		<0.001	5		0.71	40	0.76	7.9
MW-09	11/27/95	mg/L	0.02	0.04	410		66	16	2.6	<0.0002	<0.001	<0.001		<0.001	<3	120	4.2	41	0.81	6.4
MW-09	01/22/96	mg/L	0.04	<0.01	390		77	12	2	0.0002	<0.001	<0.001		<0.001	<5		3.4	28	0.58	6.9
MW-09	03/06/96	mg/L	0.04	<0.01	410		76	11	1.8	0.0002	<0.001	<0.001		<0.001	10	120	3	37	0.59	6.4
MW-09	04/24/96	mg/L	0.03	0.02	410		72	13	1.7	0.0005	<0.001	<0.001		<0.001	15		1.2	29	0.6	6.3
MW-09	06/04/96	mg/L	0.03	<0.01	390		69	11	1.8	0.0004	<0.001	<0.001		<0.001	<5	110	2	33	0.52	5.7
MW-09	07/15/96	mg/L	0.24	0.01	410		81	14	2	0.0002	<0.001	<0.001		<0.001	<5		2.5	31	0.65	9
MW-09	09/01/96	mg/L	1.1	<0.01	420		56	12	2	0.0011	<0.001	<0.001		<0.001	<5	120	4.1	39	0.65	12
MW-09	12/01/96	mg/L	0.14	<0.01	460		91	13	1.7	<0.0002	<0.001	<0.001		<0.001	<5	140	2	28	0.52	4.1
MW-09	01/01/97	mg/L	0.02	0.08	420		100	11	2	<0.0002	<0.001	<0.001		<0.001	<5	130	3.4	37	0.57	4.9
MW-09	04/01/97	mg/L	0.02	<0.01	360		76	13	1.9						<5	140	0.17	26	0.5	
MW-09	07/01/97	mg/L	0.02	<0.01	380		75	4.6	1.6	0.0007	<0.001	<0.001		<0.001	<5	120	0.52	33	0.42	3.6
MW-09	10/01/97	mg/L	0.03	<0.01	350		66	30	2.1						<5	110	0.14	25	0.46	
MW-09	01/05/98	mg/L	0.03	0.03	310		66	15	1.6	<0.0002	<0.001	<0.001		<0.001	<5	120	4.1	25		2.3
MW-09	04/06/98	mg/L			310		76	23								110	0.14	33		
MW-09	07/01/98	mg/L	0.34	0.11	300	23	64	16	1.9	<0.0002	<0.001	<0.001		<0.001	<5	90	2.8	32		1.8
MW-09	10/05/98	mg/L			270		42	12								95	7.3	31		
MW-09	01/05/99	mg/L	0.01	0.02	190	28	40	16	1.8	<0.0002	<0.001	<0.001		<0.001	<5	42	<0.02	28		0.25
MW-09	04/05/99	mg/L			230		32	14								35	0.38	24		
MW-09	07/06/99	mg/L			230	24				<0.0002				<0.001		36				
MW-09	10/01/99	mg/L																		
MW-09	01/05/00	mg/L	0.03	<0.01	310	30	52	14	2	<0.0002	<0.001	<0.001	0.055	<0.001	87	50	0.32	29		0.065
MW-09	04/05/00	mg/L																		
MW-09	07/06/00	mg/L	0.02	<0.01	190	28	12	16	2.1	<0.0002	<0.001	<0.001	<0.05	<0.001	<5	38	0.17	34	0.06	0.08
MW-09	10/21/00	mg/L																		
MW-09	01/10/01	mg/L	1.97	<0.1	207	16.9	58	13.2	2.77	1.03	<0.001	0.005	0.071		21	50.4	2.34	25.2		0.577
MW-09	04/23/01	mg/L																		
MW-09	07/25/01	mg/L	1.02	<0.1	185	19.3	58.5	19.9	1.87	0.84	0.001	0.002	0.09		23	106	4.06	24		0.426
MW-09	10/11/01	mg/L																		
MW-09	01/15/02	mg/L																		
MW-09	04/11/02	mg/L																		
MW-09	07/16/02	mg/L	0.07	<0.1	176	23	59.5	17.8	2.86	<0.2	<0.001	<0.001	0.114		39	79.7	1.16	31.9	0.17	0.037
MW-09	10/11/02	mg/L																		
MW-09	01/13/03	mg/L	0.12	<0.1	128	17.1	41.2	12.9	2.39	0.56	0.001	0.001	0.079		20	44	1.47	16.4		0.156
MW-09	04/15/03	mg/L	0.11	0.77	158	19	44.1	15.7	2.1						40.9		0.015	11.8	0.014	
MW-09	07/09/03	mg/L	0.23	0.1	149	29.2	55.5	14.1	2.4	<0.0002	<0.001	<0.001	0.129		28	73.5	0.521	21.9	0.134	0.073
MW-09	07/09/03	mg/L	0.22	0.13	152	29.8	54	20.4	2.66	<0.0002	<0.001	<0.001	0.132		21		0.496	26.7	0.13	0.066
MW-09	10/15/03	mg/L	0.494	0.34	151	22.4	57.2	32.2	3.73						31		0.44	25.1	0.126	
MW-09	01/15/04	mg/L	<0.05	<0.023	240	28	62	18	2.4	<0.0002	0.0027	<0.001	0.17		38	80	0.61	27	0.13	0.035
MW-09	04/15/04	mg/L	<0.05	<0.023	230	35	81	25	2.6						24		0.89	27	0.16	
MW-09	07/15/04	mg/L	<0.05	0.027	250	26	65	27	2.4	0.00033	<0.001	<0.001	0.36		17	79	1	22	0.18	0.1
MW-09	10/15/04	mg/L	<0.05	0.047	290	25	51	23	2.6						16		1.8	25	0.21	
MW-09	01/15/05	mg/L	<0.05	<0.023	270	27	82	22	3	0.00039	0.0018	<0.001	0.47		21	93	0.99	27	0.18	0.3
MW-09R	04/15/05	mg/L	<0.05	0.2	310	19	71	18	3.2		0.0014				12		<0.02	25	<0.02	
MW-09R	07/15/05	mg/L	<0.05	0.13	900	14	58	16	3.1	<0.0002	0.0051	<0.001	0.51		<5	110	<0.02	24	0.0059	0.032
MW-09R	10/15/05	mg/L	<0.05	0.17	290	15	61	18	2.9						9		0.04	21	<0.05	

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-09R	01/19/06	mg/L	<0.05	0.042	330	28	98	22	2.8	<0.0002	<0.001	<0.001	1.3	<0.001	20		<0.02	24	<0.02	0.075
MW-09R	05/01/06	mg/L	<0.05	0.15	280	22	93	25	2.8				1.9		25		0.04	21	<0.02	
MW-09R	07/20/06	mg/L	<0.05	<0.023	300	14	71	24	2.9	<0.0002	<0.001	<0.001	2.3	<0.001	15	110	0.05	23	<0.005	0.03
MW-09R	10/19/06	mg/L	<0.05	0.074	310	16	82	22	2.7				2.2		<5		<0.02	23	<0.05	
MW-09R	01/10/07	mg/L	<0.05	0.068	350	19	74	24	2.5	<0.0002	<0.001	<0.001	2.7	<0.001	<5	130	0.04	27	<0.005	0.012
MW-09R	04/13/07	mg/L	<0.05	0.035	330	21	100	48	5.2				3.4		15		0.08	49	<0.05	
MW-09R	07/12/07	mg/L	<0.05	<0.023	300	22	130	31	2.2	<0.0002	0.002	<0.001	6.2	<0.001	22	110	<0.02	22	<0.005	0.014
MW-09R	10/19/07	mg/L	<0.05	0.065	300	20	120	31	3.2				4.4		6		<0.02	20	0.04	
MW-09R	02/01/08	mg/L	<0.05	0.29	740	21	100	24	3	<0.0002	<0.001	<0.001	2.5	<0.001	12	130	0.04	28	<0.005	0.02
MW-09R	04/25/08	mg/L	<0.05	0.34	270	20	57	38	6.5				1.3		13		0.02	44	<0.02	
MW-09R	07/10/08	mg/L	<0.05	0.18	<200	16	50	22	3.2	<0.0002	<0.001	<0.001	1.3	<0.001	<5	93	<0.02	21	0.045	0.0076
MW-09R	10/17/08	mg/L	<0.05	0.19	280	15	53	20	3.4				1.3		9		0.02	22	<0.02	
MW-09R	01/29/09	mg/L	<0.05	<0.023	300	15	89	21	4	<0.0002	0.0014	<0.001	1.4	<0.001	<5	130	<0.02	28	0.019	0.018
MW-09R	04/14/09	mg/L	<0.05	0.066	250	17	52	17	2.5				0.85		20		<0.02	22	<0.02	
MW-09R	07/22/09	mg/L	<0.05	0.38	280	17	50	21	2.7	<0.0002	<0.001	<0.001	0.76	<0.001	11	93	0.062	19	<0.005	0.0056
MW-09R	10/16/09	mg/L	<0.05	0.5	300	6.4	23	11	3.4				0.57		12		<0.02	20	<0.02	
MW-09R	01/20/10	mg/L	<0.05	0.15	340	16	63	18	3.7	<0.0002	0.0049	<0.001	0.88	<0.001	14	120	0.021	27	0.0086	0.022
MW-09R	04/13/10	mg/L	<0.05	0.029	380	23	72	19	3				0.72		<5		0.02	30	<0.02	
MW-09R	07/08/10	mg/L	<0.05	0.16	310	15	68	22	3	<0.0002	0.0015	<0.001	0.71	<0.001	8	110	<0.05	23	0.019	0.025
MW-09R	10/14/10	mg/L	<0.05	0.22	370	8.6	36	10	3				0.49		<5		<0.02	24	<0.02	0.0094
MW-09R	01/18/11	mg/L	<0.05	0.37	360	21	79	16	3.4	<0.0002	<0.001	<0.001	0.7	<0.001	9	140	0.034	29	0.016	0.052
MW-09R	04/12/11	mg/L	<0.05	0.042	280	24	80	21	2.6				0.52		5		0.058	23	<0.02	
MW-09R	07/08/11	mg/L	<0.05	0.068	330	17	63	36	5	<0.0002	0.0011	<0.001	0.41	<0.001	<5	230	0.22	50	<0.02	0.015
MW-09R	10/21/11	mg/L	<0.05	0.23	270	12	43	16	2.5				0.43		7		0.27	21	<0.02	
MW-09R	01/12/12	mg/L	<0.05	<0.023	440	22	69	22	3.1	<0.0002	<0.001	<0.001	0.66	<0.001	7	160	0.045	33	<0.005	0.011
MW-09R	04/10/12	mg/L	<0.05	<0.023	380	33	87	25	3				0.65		<5		0.038	31	<0.02	
MW-09R	07/18/12	mg/L	<0.05	0.37	330	12	38	20	2.7	<0.0002	<0.001	<0.001	0.45	<0.001	6	120	0.037	23	0.0055	0.02
MW-09R	10/04/12	mg/L	<0.05	0.26	320	9.3	30	13	2.7				0.35		<5		0.026	23	<0.02	
MW-09R	01/10/13	mg/L	<0.05	<0.023	350	29	87	24	3.2	<0.0002	<0.001	<0.001	0.47	<0.001	<5	140	0.022	26	0.013	0.038
MW-09R	04/12/13	mg/L	<0.05	0.044	390	27	84	22	2.8				0.44		<5		<0.02	28	<0.02	
MW-09R	07/11/13	mg/L	<0.1	0.1	360	17	67	22	2.5	<0.0002	<0.001	<0.001	0.36	<0.001	<5	120	0.79	25	<0.005	0.026
MW-09R	10/15/13	mg/L	<0.1	0.16	360	6.6	28	11	2.5	<0.0002	<0.001	<0.001	0.25	<0.001	<5		0.035	23	<0.02	0.0065
MW-09R	01/14/14	mg/L	<0.05	0.041	430	20	84	23	3.5	<0.0002	<0.001	<0.001	0.44	<0.001	<5	160	0.024	29	<0.005	0.022
MW-09R	04/04/14	mg/L	<0.05	0.11	350	16	93	20	2				0.41		<5		<0.1	27	<0.02	
MW-09R	07/11/14	mg/L	0.013	0.036	310	13	75	17	1.6	<0.0002	<0.001	<0.001	0.3	<0.001	<5	120	<0.02	23	<0.005	0.031
MW-09R	10/21/14	mg/L	<0.01	0.13	350	9.8	57	15	1.8				0.43		<5		<0.02	23	<0.02	
MW-09R	01/22/15	mg/L	0.021	0.19	440	11	49	15	2	<0.0002	<0.001	<0.001	0.34	<0.001	25	140	<0.020	29	<0.005	0.042
MW-09R	04/02/15	mg/L	0.019	0.17	450	9.3		13	2				0.3				0.029			
MW-09R	07/29/15	mg/L	0.021	0.15	430	9.7	58	14	2	<0.0002	<0.001	<0.001	0.37	<0.001	<5	130	<0.025	27	0.0068	0.01
MW-09R	10/13/15	mg/L	0.016		420	5.1		10	1.9				0.3		<5		<0.02		<0.02	
MW-09R	01/07/16	mg/L	0.027	0.064	410	8.1	50	13	2	<0.0002	<0.001	<0.001	0.43	<0.001	<5	140	<0.02	29	0.0074	0.014
MW-09R	04/12/16	mg/L	0.034						1.8				0.37				0.025			
MW-09R	07/28/16	mg/L	0.011	0.33	360	5.5	41	10	1.5	<0.0002	<0.001	<0.001	0.23	<0.001		120	<0.02	23	<0.005	0.058
MW-09R	01/06/17	mg/L	0.43	0.019	450	9.5	65	16	1.6	<0.0002	<0.001	<0.001	0.45	<0.001	<5	160	0.041	28	0.0076	0.042
MW-09R	07/13/17	mg/L	0.036	0.14	310	6.7	59	13	1.5	<0.0002	<0.001	<0.001	0.27	<0.001		130	0.082	24	0.015	0.054
MW-09R	01/24/18	mg/L	0.052	0.077	330	7.5	62	11	1.2	<0.0002	<0.001	<0.001	0.28	<0.001	<5	120	0.057	21	<0.005	0.014
MW-09R	07/10/18	mg/L	0.013	0.045	280	7.6	61	11	1.1	<0.0002	<0.001	<0.001	0.27	<0.001		100	0.029	19	<0.005	0.053
MW-09R	01/09/19	mg/L	<0.01	<0.01	300	9.3	67	13	1.5	<0.0002	<0.001	<0.001	0.40	<0.001	<5	120	0.041	23	<0.005	0.021
MW-09R	07/10/19	mg/L	<0.01	0.010	310	6.5	54	12	1.5	<0.0002	<0.001	<0.001	0.36	<0.001		100	0.027	21	<0.005	0.0078
MW-09R	01/08/20	mg/L	<0.01	0.029	230	6.7	60	9.3	2	<0.0002	<0.001	<0.001	0.39	<0.001	<5	93	<0.02	19	<0.005	0.0091
MW-09R	07/08/20	mg/L	<0.01	0.05	290	6.7	59	11	1.6	<0.0002	<0.001	<0.001	0.33	<0.001		110	<0.02	22	<0.005	0.004
MW-09R	01/14/21	mg/L	<0.01	0.084	310	5.9	45	11	2.2	<0.0002	<0.001	<0.001	0.38	<0.001	15	100	0.026	22	<0.005	0.0056
MW-09R	07/16/21	mg/L	<0.01	0.036	290	5.1	47	11	1.5	<0.0002	<0.001	<0.001	0.46	<0.001		110	0.033	21	<0.005	0.0068
MW-14D	03/07/95	mg/L																		
MW-14D	06/07/95	mg/L																		
MW-14D	09/08/95	mg/L																		
MW-14D	10/23/95	mg/L																		
MW-14D	11/27/95	mg/L																		
MW-14D	01/22/96	mg/L																		
MW-14D	03/06/96	mg/L																		
MW-14D	04/24/96	mg/L																		
MW-14D	06/04/96	mg/L																		

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-14D	07/15/96	mg/L																		
MW-14D	09/01/96	mg/L																		
MW-14D	12/01/96	mg/L																		
MW-14D	01/01/97	mg/L																		
MW-14D	04/01/97	mg/L																		
MW-14D	07/01/97	mg/L																		
MW-14D	10/01/97	mg/L																		
MW-14D	01/05/98	mg/L																		
MW-14D	04/06/98	mg/L																		
MW-14D	07/01/98	mg/L																		
MW-14D	10/05/98	mg/L																		
MW-14D	01/05/99	mg/L																		
MW-14D	04/05/99	mg/L																		
MW-14D	07/06/99	mg/L																		
MW-14D	10/01/99	mg/L																		
MW-14D	01/05/00	mg/L	0.03	<0.01	11	17	14	16	0.6	<0.0002	<0.001	0.002	<0.05	<0.001	8.3	6.5	<0.02	3.8		0.076
MW-14D	04/05/00	mg/L																		
MW-14D	07/06/00	mg/L	0.02	<0.01	<5	18	20	18	1.3	<0.0002	<0.001	0.003	<0.05	<0.001	<5	4.6	<0.02	8.7	<0.02	0.099
MW-14D	10/21/00	mg/L																		
MW-14DR	01/10/01	mg/L	1.51	<0.1	268	22.5	52.6	7.48	1.5	0.4	<0.001	<0.001	0.019		20	94.2	0.274	30.8		9.69
MW-14DR	04/23/01	mg/L																		
MW-14DR	07/25/01	mg/L	0.72	<0.1	192	21.7	55.8	23.5	1.51	0.23	0.002	<0.001	0.024		25	106	0.391	31.4		1.33
MW-14DR	10/11/01	mg/L																		
MW-14DR	01/15/02	mg/L	0.13	<0.1	212	22.6	52.8	16.2	1.72	0.57	0.001	<0.001	<0.01		<5	89.7	0.385	32.4		10
MW-14DR	04/11/02	mg/L																		
MW-14DR	07/16/02	mg/L	0.12	<0.1	201	18.6	53.5	5.8	1.53	<0.2	<0.001	<0.001	0.023		35	126	0.414	42.5	0.026	5.14
MW-14DR	10/11/02	mg/L																		
MW-14DR	01/13/03	mg/L	0.11	<0.1	213	15.5	49.3	10.8	1.53	<0.2	<0.001	<0.001	<0.01		22	50	0.329	21.7		4.33
MW-14DR	07/09/03	mg/L	<0.1	0.1	171	21.6	40.9	20.4	2.6	<0.0002	<0.001	0.001	0.052		112	92.6	0.129	33.2	0.021	2.59
MW-14DR	01/15/04	mg/L	<0.05	<0.023	280	14	49	25	1.9	0.00022	0.0042	<0.001	0.036		43	83	0.36	34	0.025	0.047
MW-14DR	07/15/04	mg/L	<0.05	0.09	340	17	56	15	2	<0.0002	0.0015	<0.001	0.053		83	99	0.67	33	0.034	0.87
MW-14DR	01/21/05	mg/L	<0.05	0.024	320	20	130	6.3	1.7	<0.0002	0.0013	<0.001	<0.02	0.0021	12	100	0.62	34	0.033	0.88
MW-14DR	07/15/05	mg/L	<0.05	<0.023	320	20	62	8	1.9	<0.0002	0.0039	<0.001	0.043		33	110	0.57	35	0.036	0.63
MW-14DR	01/20/06	mg/L	<0.05	<0.023	330	27	52	8.2	1.6	<0.0002	0.002	<0.001	<0.02	0.0022	6	97	0.88	33	0.043	0.028
MW-14DR	07/21/06	mg/L	<0.05	<0.023	300	31	55	7.7	1.9	<0.0002	<0.001	<0.001	0.02	0.0023	79	110	0.88	37	0.041	0.012
MW-14DR	01/11/07	mg/L	<0.05	0.025	350	34	65	8.7	1.6	<0.0002	<0.001	<0.001	0.027	0.0027	7	110	0.93	36	0.049	0.028
MW-14DR	07/13/07	mg/L	<0.05	<0.023	320	34	58	7.9	1.4	<0.0002	<0.001	<0.001	<0.02	0.0023	15	100	0.88	35	0.041	0.015
MW-14DR	02/01/08	mg/L	<0.05	0.091	660	28	62	7.7	1.7	<0.0002	0.0016	<0.001	0.025	0.0021	11	110	0.95	35	0.038	0.025
MW-14DR	07/10/08	mg/L	<0.05	<0.023	320	37	56	10	1.9	<0.0002	<0.001	<0.001	0.026	0.0023	<5	110	0.85	36	0.048	0.048
MW-14DR	01/29/09	mg/L	<0.05	0.024	320	34	53	11	2.9	<0.0002	0.0021	<0.001	0.027	0.0021	<5	110	0.8	35	0.041	0.59
MW-14DR	07/23/09	mg/L	0.062	<0.023	320	36	62	9.5	1.9	<0.0002	<0.001	<0.001	<0.02	0.0022	15	110	0.87	36	0.041	0.082
MW-14DR	01/21/10	mg/L	<0.05	<0.023	280	44	59	12	2	<0.0002	<0.001	<0.001	0.025	0.0028	<5	110	0.94	36	0.041	0.084
MW-14DR	07/09/10	mg/L	<0.05	<0.023	260	21	67	8.4	1.9	<0.0002	<0.001	<0.001	<0.02	0.0018	5	110	0.79	35	0.038	0.24
MW-14DR	01/19/11	mg/L	<0.05	0.18	340	42	56	11	2	<0.0002	<0.001	<0.001	<0.02	0.0023	6	110	0.92	35	0.038	0.16
MW-14DR	07/07/11	mg/L	0.063	0.024	320	43	52	26	5.2	<0.0002	0.0086	<0.001	<0.02	0.0027	<5	230	2.3	79	0.039	0.25
MW-14DR	01/11/12	mg/L	0.054	<0.023	330	36	52	11	1.8	<0.0002	<0.001	<0.001	0.021	0.0023	<5	110	0.88	35	0.037	0.24
MW-14DR	07/19/12	mg/L	<0.05	<0.023	310	48	51	13	1.9	<0.0002	<0.001	<0.001	0.021	0.0021	<5	120	1	37	0.041	0.12
MW-14DR	01/10/13	mg/L	<0.05	<0.023	320	39	53	11	2	<0.0002	<0.001	<0.001	0.024	0.0029	<5	110	0.91	34	0.039	0.19
MW-14DR	07/12/13	mg/L	<0.1	<0.023	330	33	54	11	2.1	<0.0002	<0.001	<0.001	0.021	0.0022	<5	120	0.97	37	0.04	0.16
MW-14DR	01/16/14	mg/L	<0.05	<0.023	330	51	51	16	2.4	<0.0002	<0.001	<0.001	0.021	0.0026	<5	120	1.3	38	0.044	0.092
MW-14DR	07/11/14	mg/L	0.035	<0.02	350	28	58	9.5	1.6	<0.0002	<0.001	<0.001	<0.02	0.0017	<5	110	0.86	37	0.035	0.0094
MW-14DR	01/22/15	mg/L	0.039	<0.01	370	47	49	11	1.6	<0.0002	<0.001	<0.001	<0.02	0.0022	23	110	1	37	0.032	0.0063
MW-14DR	07/30/15	mg/L	0.037	<0.01	370	44	52	12	1.8	<0.0002	<0.001	<0.001	0.021	0.0023		120	1.1	38	0.039	0.013
MW-14DR	01/06/16	mg/L	0.084	<0.01	340	26	50	11	1.7	<0.0002	<0.001	<0.001	0.022	0.0023	<5	110	1.1	36	0.038	<0.004
MW-14DR	07/29/16	mg/L	0.025	<0.01	330	42	50	13	1.9	<0.0002	<0.001	<0.001	0.021	0.0027		120	1.2	41	0.055	0.0078
MW-14DR	01/06/17	mg/L	0.035	<0.01	370	47	48	11	2.7	<0.0002	<0.001	<0.001	0.027	0.0023	<5	110	1	37	0.038	0.025
MW-14DR	07/14/17	mg/L	0.041	<0.01	360	44	55	13	1.8	<0.0002	<0.001	<0.001	<0.02	0.0028		130	1.2	38	0.036	0.0083
MW-14DR	01/24/18	mg/L	0.14	<0.01	360	41	27	12	1.6	<0.0002	<0.001	<0.001	0.021	0.0019	<5	120	1	41	0.034	0.087
MW-14DR	07/11/18	mg/L	0.039	<0.01	350	50	50	13	1.7	<0.0002	<0.001	<0.001	<0.02	0.0025		110	1.2	36	0.039	0.032
MW-14DR	01/10/19	mg/L	0.028	<0.01	330	51	53	13	1.9	<0.0002	0.0013	<0.001	0.022	0.0024	17	120	1.2	37	0.038	0.043
MW-14DR	07/11/19	mg/L	<0.01	<0.01	380	40	48	13	1.9	<0.0002	<0.001	0.0015	<0.02	0.0028		110	1.2	39	0.043	0.12
MW-14DR	01/08/20	mg/L	0.028	<0.01	410	44	52	12	1.8	<0.0002	0.0012	<0.001	0.023	0.0027	<5	120	1.1	39	0.037	0.22

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-14DR	07/08/20	mg/L	0.046	<0.01	380	53	54	13	1.8	<0.0002	<0.001	<0.001	0.022	0.0038		130	1.5	40	0.039	0.16
MW-14DR	01/14/21	mg/L	0.036	<0.01	390	59	50	13	1.8	<0.0002	<0.001	<0.001	0.024	0.0039	14	140	1.7	45	0.039	0.23
MW-14DR2	07/16/21	mg/L	0.11	0.028	420	46	50	18	4.2	<0.0002	<0.001	0.0045	0.031	0.0028		150	2.3	50	0.053	0.013
MW-14S	03/07/95	mg/L																		
MW-14S	06/07/95	mg/L																		
MW-14S	09/08/95	mg/L																		
MW-14S	10/23/95	mg/L																		
MW-14S	11/27/95	mg/L																		
MW-14S	01/22/96	mg/L																		
MW-14S	03/06/96	mg/L																		
MW-14S	04/24/96	mg/L																		
MW-14S	06/04/96	mg/L																		
MW-14S	07/15/96	mg/L																		
MW-14S	09/01/96	mg/L																		
MW-14S	12/01/96	mg/L																		
MW-14S	01/01/97	mg/L																		
MW-14S	04/01/97	mg/L																		
MW-14S	07/01/97	mg/L																		
MW-14S	10/01/97	mg/L																		
MW-14S	01/05/98	mg/L																		
MW-14S	04/06/98	mg/L																		
MW-14S	07/01/98	mg/L																		
MW-14S	10/05/98	mg/L																		
MW-14S	01/05/99	mg/L																		
MW-14S	04/05/99	mg/L																		
MW-14S	07/06/99	mg/L																		
MW-14S	10/01/99	mg/L																		
MW-14S	01/05/00	mg/L	0.02	<0.01	200	740	<1	300	3.4	0.0028	<0.001	0.001	<0.05	0.003	11	120	1	59		22
MW-14S	04/05/00	mg/L																		
MW-14S	07/06/00	mg/L	0.01	<0.01	150	800	8.1	410	3.5	<0.0002	<0.001	<0.001	<0.05	0.002	<5	100	0.08	62	0.02	2.3
MW-14S	10/21/00	mg/L																		
MW-14SR	01/10/01	mg/L	1.67	1.55	263	1000	45	472	5.57	0.77	0.002	0.009	<0.01		23	204	0.075	51.2		0.482
MW-14SR	04/23/01	mg/L																		
MW-14SR	07/25/01	mg/L	1.25	0.98	292	886	37	402	6.88	0.53	0.007	<0.001	0.034		45	162	0.049	29		0.159
MW-14SR	10/11/01	mg/L																		
MW-14SR	01/15/02	mg/L	0.13	1.38	329	1000	33.6	585	5.51	0.49	0.002	<0.001	0.02		7	159	0.012	40.8		0.379
MW-14SR	04/11/02	mg/L																		
MW-14SR	07/16/02	mg/L																		
MW-14SR	10/11/02	mg/L																		
MW-14SR	01/13/03	mg/L	0.11	1.84	268	1270	41.6	371	6.99	<0.2	<0.001	<0.001	<0.01		7	114	0.032	35.2		0.144
MW-14SR	07/09/03	mg/L	1	0.07	244	945	41.9	530	5.52	<0.0002	<0.001	<0.001	0.057		23	159	0.035	46.4	0.012	0.31
MW-14SR	01/15/04	mg/L	<0.05	1.2	480	870	39	480	5.1	0.00037	0.0075	<0.001	0.041		57	180	0.025	35	0.015	0.12
MW-14SR	07/15/04	mg/L	<0.05	0.15	450	370	20	330	4.5	0.0011	0.0015	<0.001	0.1		62	63	0.05	8.6	0.0067	0.072
MW-14SR	01/21/05	mg/L	<0.05	0.58	380	370	24	210	4.4	<0.0002	0.0015	<0.001	0.02	0.002	55	130	<0.02	27	0.011	0.23
MW-14SR	07/15/05	mg/L	<0.05	1.1	480	1100	48	700	4.1	0.0002	0.011	<0.001	0.047		64	210	0.075	43	0.018	0.13
MW-14SR	01/18/06	mg/L	<0.05	0.19	290	1300	38	590	6.6	0.00045	0.003	<0.001	0.048	0.0074	120	210	0.1	31	0.029	0.12
MW-14SR	07/21/06	mg/L	<0.05	<0.023	320	640	19	370	2.6	<0.0002	0.001	<0.001	0.023	0.0023	100	84	0.1	14	<0.005	0.054
MW-14SR	01/10/07	mg/L	<0.05	<0.023	370	190	16	190	2.6	<0.0002	0.001	<0.001	0.027	0.0011	8	81	0.03	14	0.0055	0.068
MW-14SR	07/11/07	mg/L	<0.05	0.2	290	790	29	470	3.5	<0.0002	<0.001	<0.001	<0.02	0.0027	340	140	<0.02	21	<0.005	0.068
MW-14SR	02/01/08	mg/L	<0.05	0.4	640	750	21	340	5.1	<0.0002	<0.001	<0.001	0.03	0.01	33	200	0.04	39	0.018	0.4
MW-14SR	07/09/08	mg/L	<0.05	0.34	410	1000	34	600	7.7	<0.0002	<0.001	<0.001	0.023	0.0029	38	190	0.03	36	<0.005	0.15
MW-14SR	01/29/09	mg/L	<0.05	0.31	420	710	25	9.3	2.2	<0.0002	0.0019	<0.001	0.024	0.003	13	120	1.5	39	0.089	0.015
MW-14SR	07/23/09	mg/L	<0.05	0.31	380	940	28	560	6.1	<0.0002	0.0011	0.0013	<0.02	0.0034	43	110	0.19	17	0.02	0.52
MW-14SR	01/19/10	mg/L	<0.05	1.1	370	1100	49	550	7.4	0.00049	0.0086	<0.001	0.029	0.0056	100	220	0.064	49	0.039	0.13
MW-14SR	07/09/10	mg/L	<0.05	0.6	450	1200	35	610	7.4	<0.0002	0.0018	<0.001	0.021	0.0064	13	180	0.03	36	<0.005	0.026
MW-14SR	01/19/11	mg/L	<0.05	0.15	460	1100	52	520	7.2	<0.0002	0.001	<0.001	0.025	<0.001	19	200	0.078	46	0.021	0.14
MW-14SR	07/07/11	mg/L	<0.05	0.27	360	600	24	370	11	<0.0002	0.0078	<0.001	<0.02	<0.001	<5	230	0.12	27	0.0051	0.14
MW-14SR	01/10/12	mg/L	<0.05	1.6	500	530	30	330	5.7	<0.0002	<0.001	<0.001	0.034	<0.001	8	150	<0.02	25	0.011	0.091
MW-14SR	07/17/12	mg/L	<0.05	1.1	400	970	29	660	9	0.00024	<0.001	<0.001	<0.02	<0.001	12	160	<0.05	21	0.0071	0.045
MW-14SR	01/10/13	mg/L	<0.05	0.46	470	<1	36	410	6.2	<0.0002	<0.001	<0.001	0.031	0.0044	14	180	0.08	32	0.021	0.14
MW-14SR	07/10/13	mg/L	<0.1	0.081	380	430	17	320	5.3	<0.0002	<0.001	<0.001	<0.02	0.0015	<5	72	0.086	7.3	<0.005	0.23
MW-14SR	01/14/14	mg/L	0.063	1.9	500	610	28	370	7.3	<0.0002	<0.001	<0.001	0.028	<0.001	8	160	0.036	28	<0.005	0.081

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-14SR	07/11/14	mg/L	0.08	0.29	370	730	27	630	3.7	<0.0002	<0.001	<0.001	<0.02	<0.001	12	110	0.12	15	0.29	0.1
MW-14SR	01/20/15	mg/L	<0.01	0.17	720	420	18	410	4.6	<0.0002	<0.001	<0.001	0.032	<0.001	46	110	0.033	16	0.0059	0.068
MW-14SR	07/29/15	mg/L	0.41	<0.01	600	640	18	390	4.2	<0.0002	<0.001	<0.001	<0.02	0.002		160	4.8	28	2.7	0.063
MW-14SR	01/06/16	mg/L	0.26	<0.01	580	450	24	370	6	<0.0002	<0.001	<0.001	0.043	<0.001	<5	160	0.28	17	1.3	0.098
MW-14SR	07/26/16	mg/L	0.25	<0.01	380	1100	22	680	4.9	<0.0002	<0.001	<0.001	<0.02	<0.001		140	1.6	13	1	0.12
MW-14SR	01/05/17	mg/L	0.21	<0.01	480	230	14	240	3.6	<0.0002	<0.001	<0.001	0.033	<0.001	<5	120	0.49	10	1.8	0.036
MW-14SR	07/11/17	mg/L	0.15	<0.01	380	660	21	480	4	<0.0002	<0.001	<0.001	<0.02	0.0018		120	1.3	9.7	2.2	0.089
MW-14SR	01/24/18	mg/L	0.14	<0.01	310	260	17	210	2.7	<0.0002	<0.001	<0.001	<0.02	<0.001	5	98	0.32	11	1.8	0.047
MW-14SR	07/11/18	mg/L	0.13	0.16	300	<1	31	660	3.8	<0.0002	<0.001	<0.001	<0.02	0.0011		120	0.49	12	2	0.071
MW-14SR	01/08/19	mg/L	0.016	0.19	500	480	26	350	4.6	0.00022	<0.001	<0.001	0.026	<0.001	8.0	140	0.23	16	2.1	0.084
MW-14SR	07/09/19	mg/L	<0.01	0.062	520	400	20	430	3.2	<0.0002	<0.001	<0.001	<0.02	<0.001		93	0.038	11	1.1	0.10
MW-14SR	01/07/20	mg/L	0.022	0.46	460	280	18	260	3.2	<0.0002	<0.001	<0.001	0.028	<0.001	<5	100	0.14	12	1.3	0.11
MW-14SR	07/07/20	mg/L	0.045	0.053	350	1100	29	530	4.6	<0.0002	<0.001	<0.001	<0.02	<0.001		190	0.26	29	1.7	0.067
MW-14SR	01/13/21	mg/L	0.011	0.6	530	450	27	360	3.6	0.00034	<0.001	<0.001	0.03	<0.001	23	150	0.52	26	1.1	0.14
MW-14SR	07/16/21	mg/L	0.032	0.52	440	650	26	530	3.5	<0.0002	<0.001	<0.001	0.023	<0.001		140	0.046	18	0.0061	0.0055
MW-16	03/07/95	mg/L																		
MW-16	06/07/95	mg/L	0.1	<0.01	300	2.4	24	6.9	1.4	<0.0002	<0.001	<0.001		0.006	18		0.3	35		
MW-16	09/08/95	mg/L	0.16	0.01	290	2	10	8.7	1.4	<0.0002	<0.001	<0.001		<0.001	<3		0.32	42	0.03	0.2
MW-16	10/23/95	mg/L	0.09	<0.01	300	1.8	24	7.1	1.6	<0.0002	0.001	<0.001		0.007	<5		2.5	33	<0.02	0.042
MW-16	11/27/95	mg/L	0.12	<0.01	310	2.2	19	6.6	1.5	<0.0002	<0.001	<0.001		0.004	<5		1.8	37	<0.02	0.42
MW-16	01/22/96	mg/L	0.08	<0.01	310	2.1	18	7.2	1.5	<0.0002	<0.001	<0.001		0.006	20		1.5	32	<0.02	0.18
MW-16	03/06/96	mg/L	0.16	<0.01	310	2.2	21	6.3	1.3	<0.0002	<0.001	<0.001		0.005	12		1.4	38	<0.02	0.36
MW-16	04/24/96	mg/L	0.08	<0.01	310	2.9	15	6.9	1.2	<0.0002	<0.001	<0.001		0.002	21		0.54	32	<0.02	0.046
MW-16	06/04/96	mg/L	0.07	<0.01	320	2.2	18	6.2	1.4	<0.0002	<0.001	<0.001		0.004	<5		1.4	35	<0.02	0.76
MW-16	07/15/96	mg/L	0.06	<0.01	320	2.3	23	6.8	1.3	<0.0002	<0.001	<0.001		0.005	<5		1.7	37	0.08	0.03
MW-16	09/01/96	mg/L	0.11	0.04	300	2.2	21	7.2	1.3	<0.0002	<0.001	<0.001		0.006	<5		1	33	<0.02	0.33
MW-16	12/01/96	mg/L	0.04	<0.01	360	2.5	19	6.7	1.2	<0.0002	<0.001	<0.001		0.005	<5		0.22	32	<0.02	0.074
MW-16	01/01/97	mg/L																		
MW-16	04/01/97	mg/L																		
MW-16	07/01/97	mg/L	0.08	<0.01	300	1.8	17	5.9	1.2	<0.0002	<0.001	<0.001		0.004	10		0.76	37	<0.02	0.011
MW-16	10/01/97	mg/L																		
MW-16	01/05/98	mg/L																		
MW-16	04/06/98	mg/L																		
MW-16	07/01/98	mg/L	0.08	<0.01	260	2.8	11	6.2	1.4	<0.0002	<0.001	<0.001		0.002	<5	49	0.24	37		0.068
MW-16	10/05/98	mg/L																		
MW-16	01/05/99	mg/L																		
MW-16	04/05/99	mg/L																		
MW-16	07/06/99	mg/L	0.01	<0.01	320	5	9.8	7	1.4	<0.0002	<0.001	<0.001		0.002	<5	58	0.57	39		0.02
MW-16	10/01/99	mg/L																		
MW-16	01/05/00	mg/L	0.14	<0.01	360	3	22	6.5	1.3	<0.0002	<0.001	<0.001	<0.05	0.002	6.6	64	0.22	39		0.029
MW-16	04/05/00	mg/L																		
MW-16	07/06/00	mg/L	0.06	<0.01	300	3.7	11	5.2	1.3	<0.0002	<0.001	<0.001	<0.05	<0.001	<5	69	0.07	40	<0.02	0.57
MW-16	10/21/00	mg/L																		
MW-16	01/10/01	mg/L	1	<0.1	192	2.86	24.9	5.92	1.25	<0.2	<0.001	<0.001	0.027		<5	79.2	0.383	32.1		0.175
MW-16	04/23/01	mg/L																		
MW-16	07/25/01	mg/L	0.19	<0.1	201	3.57	28	18.3	3.27	<0.2	0.005	<0.001	0.046	0.009	<5	101	0.59	33.5		0.364
MW-16	10/11/01	mg/L																		
MW-16	01/15/02	mg/L	0.14	<0.1	212	2.86	28.7	21.2	1.8	<0.2	<0.001	<0.001	0.029	0.015	7	79.2	0.304	29.1		<0.002
MW-16	04/11/02	mg/L																		
MW-16	07/16/02	mg/L	0.14	<0.1	201	3.03	27.3	5.92	1.35	<0.2	0.001	<0.001	0.044	0.012	7	79.8	0.821	36.3	0.023	0.167
MW-16	10/11/02	mg/L																		
MW-16	01/13/03	mg/L	0.38	<0.1	207	3.3	27.6	21.2	2.28	0.46	<0.001	0.001	<0.01		<5	39.9	0.701	20.5		0.317
MW-16	07/10/03	mg/L	<0.1	0.15	207	3.78	27.8	12.1	1.95	<0.0002	<0.001	0.002	<0.01		<5		0.815	33.5	0.026	1.51
MW-16	07/10/03	mg/L	<0.1	0.23	201	3.55	27.7	7.22	1.7	<0.0002	<0.001	<0.001	<0.01	0.01	<5	93	0.841	33.2	0.023	1.75
MW-16	01/15/04	mg/L	0.092	<0.023	340	3.3	27	5.9	1.2	<0.0002	0.0072	<0.001	0.036		9	87	0.52	33	0.016	1.5
MW-16	07/15/04	mg/L	0.09	0.036	340	4	8.1	8.1	1.4	<0.0002	0.0014	<0.001	0.063		24	87	1	31	0.017	0.31
MW-16	10/15/04	mg/L												13						
MW-16	01/15/05	mg/L	0.072	0.042	330	3.3	32	8.4	1.6	0.00025	<0.001	<0.001	<0.05		15	93	0.83	33	0.015	0.61
MW-16	07/15/05	mg/L	0.12	<0.023	330	3.4	32	7.3	1.3	<0.0002	0.0049	<0.001	0.029		5	94	1	33	0.02	0.34
MW-16	01/18/06	mg/L	0.1	<0.023	350	4.5	30	8.2	1.3	<0.0002	0.004	<0.001	0.028	0.012	17	86	1.1	31	<0.005	0.3
MW-16	07/19/06	mg/L	0.068	<0.023	340	3.8	27	8.3	1.5	<0.0002	0.001	<0.001	0.021	0.0078	7	95	0.7	34	0.021	0.54
MW-16	01/10/07	mg/L	0.069	<0.023	330	2.9	30	7.2	1.4	<0.0002	0.001	<0.001	0.027	0.014	<5	93	1.3	34	0.018	0.41

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-16	07/11/07	mg/L	0.085	<0.023	330	4.8	28	7.2	1.5	<0.0002	<0.001	<0.001	<0.02	0.012	9	89	1	32	<0.005	0.32
MW-16	02/01/08	mg/L	0.095	0.051	600	4.7	28	7.6	1.4	<0.0002	0.0068	<0.001	0.025	0.011	<5	94	1.1	34	0.0068	0.42
MW-16	07/09/08	mg/L	0.062	<0.023	370	4.5	27	7.9	1.4	<0.0002	<0.001	<0.001	0.034	0.012	5	91	0.94	33	0.023	0.62
MW-16	01/28/09	mg/L	0.11		380	5.9	29	10	3	<0.0002	0.0023	0.0011	0.027	0.014	<5	88	0.77	31	0.018	1.3
MW-16	07/23/09	mg/L	0.13	<0.023	330	4.6	31	7.7	1.5	<0.0002	<0.001	<0.001	<0.05	0.014	13	91	1.1	33	<0.02	0.37
MW-16	01/19/10	mg/L	0.097	<0.023	310	4.7	50	7.1	1.4	<0.0002	0.0042	<0.001	0.026	0.011	8	86	0.61	31	0.014	1.6
MW-16	07/07/10	mg/L	<0.05	<0.023	330	4	29	8.5	1.5	<0.0002	0.0011	<0.001	0.03	0.014	<5	90	1.1	33	0.015	0.4
MW-16	01/18/11	mg/L	0.11	<0.023	330	4.3	28	7.6	1.5	<0.0002	<0.001	<0.001	0.024	0.0093	<5	88	0.64	31	0.016	1.8
MW-16	07/05/11	mg/L	0.21	0.21	320	4.8	26	7.8	1.4	0.00022	<0.001	0.0016	0.036	0.0085	37	89	1	30	0.015	0.31
MW-16	10/21/11	mg/L								<0.0002										
MW-16	01/10/12	mg/L	0.1	<0.023	320	4.6	27	7.6	1.4	<0.0002	<0.001	<0.001	0.024	0.0097	<5	94	0.45	33	0.013	1.1
MW-16	07/17/12	mg/L	0.083	<0.023	320	4.7	26	8.1	1.5	<0.0002	<0.001	<0.001	0.025	0.0071	<5	92	0.56	33	0.012	1.1
MW-16	01/08/13	mg/L	0.15	<0.023	330	5.1	26	8.3	1.6	<0.0002	<0.001	<0.001	0.028	0.011	<5	94	0.58	34	0.012	0.21
MW-16	07/09/13	mg/L	0.1	<0.023	310	4.7	25	7.7	1.5	<0.0002	<0.001	<0.001	0.051	0.011	8	85	0.55	31	0.01	0.23
MW-16	01/14/14	mg/L	0.12	<0.023	330	5.5	28	8.3	1.6	<0.0002	<0.001	<0.001	0.023	0.013	<5	95	0.57	33	0.012	0.31
MW-16	07/09/14	mg/L	0.094	<0.01	330	5.4	26	6.9	1.2	<0.0005	<0.001	<0.001	<0.02	0.0043	<5	96	0.13	35	0.012	0.49
MW-16	01/20/15	mg/L	0.085	0.018	350	5.6	27	7.2	1.3	<0.0002	<0.001	<0.001	0.02	0.0069	9	88	0.43	33	0.01	0.97
MW-16	07/28/15	mg/L	0.1	<0.01	340	5.5	27	6.8	1.2	<0.0002	<0.001	<0.001	0.023	0.013	<5	86	0.53	32	0.01	0.4
MW-16	01/05/16	mg/L	0.088	<0.01	320	5.2	28	6.4	1.3	<0.0002	<0.001	<0.001	0.024	0.014	<5	88	0.55	32	0.011	0.39
MW-16	07/26/16	mg/L	0.1	<0.01	330	5.2	27	6.9	1.2	<0.0002	<0.001	<0.001	0.023	0.013		92	0.55	33	0.012	0.5
MW-16	01/04/17	mg/L	0.13	<0.01	310	5.6	27	7.1	1.3	<0.0002	<0.001	<0.001	<0.02	0.013	<5	90	0.47	31	0.013	0.99
MW-16	07/11/17	mg/L	0.2	<0.01	330	6.4	30	7	1.2	<0.0002	<0.001	<0.001	0.023	0.012		93	0.58	33	0.011	0.35
MW-16	01/23/18	mg/L	0.13	<0.01	330	6.6	32	7.1	1.1	<0.0002	<0.001	<0.001	0.022	0.01	<5	93	0.43	33	0.011	0.49
MW-16	07/10/18	mg/L	0.091	<0.01	330	6.5	28	6.9	1.3	<0.0002	<0.001	<0.001	0.023	0.011		87	0.54	31	0.013	0.32
MW-16	01/08/19	mg/L	0.10	<0.01	360	6.9	31	6.7	1.2	<0.0002	<0.001	<0.001	0.022	0.011	<5	91	0.54	33	0.015	0.31
MW-16R	07/11/19	mg/L	0.084	<0.01	340	8.4	32	7.7	1.8	<0.0002	<0.001	<0.001	0.021	0.014		82	0.33	30	0.039	0.019
MW-16R	01/09/20	mg/L	0.11	<0.01	350	8.4	31	8	1.5	<0.0002	0.0013	<0.001	0.025	0.01	<5	92	0.55	32	0.031	0.017
MW-16R	07/09/20	mg/L	0.11	<0.01	340	9	34	7.1	1.3	<0.0002	<0.001	<0.001	0.024	0.018		95	0.52	33	0.024	0.019
MW-16R	07/19/21	mg/L	0.12	<0.01	340	9	33	7	1.4	<0.0002	<0.001	<0.001	0.021	0.017		100	0.53	36	0.021	0.0076
MW-17	03/07/95	mg/L																		
MW-17	06/07/95	mg/L	0.15	<0.01	320	<1	5.2	6.8	2.4	<0.0002	<0.001	<0.001		0.001	<3		1.1	30		
MW-17	09/08/95	mg/L	0.15	<0.01	340	<1	5	8.8	2.1	<0.0002	<0.001	<0.001		0.002	<3		0.65	32	0.08	0.071
MW-17	10/23/95	mg/L	0.14	<0.01	320	<1	6.1	7	0.53	<0.0002	<0.001	<0.001		0.001	<5		0.65	30	<0.02	0.14
MW-17	11/27/95	mg/L	0.2	<0.01	330	<1	7.5	6.8	2.6	<0.0002	<0.001	<0.001		0.001	<5		0.89	35	<0.02	0.11
MW-17	01/22/96	mg/L	0.13	<0.01	340	<1	5.6	6.7	2.3	<0.0002	<0.001	<0.001		0.002	<5		0.79	29	<0.02	0.12
MW-17	03/06/96	mg/L	0.16	<0.01	330	<1	6	6.4	2.3	<0.0002	<0.001	<0.001		0.001	<5		0.75	34	<0.02	0.097
MW-17	04/24/96	mg/L	0.13	<0.01	340	<1	5.7	7.1	2.1	<0.0002	<0.001	<0.001		0.001	<5		0.78	30	<0.02	0.09
MW-17	06/04/96	mg/L	0.11	<0.01	340	<1	5.8	7	2.1	<0.0002	<0.001	<0.001		0.001	<5		0.83	30	<0.02	0.14
MW-17	07/15/96	mg/L	0.11	<0.01	340	<1	5.7	7.1	2.2	<0.0002	<0.001	<0.001		0.001	<5		0.64	31	<0.02	0.076
MW-17	09/01/96	mg/L	0.16	<0.01	320	<1	3.8	6.9	2.4	<0.0002	<0.001	<0.001		0.002	<5		0.74	37	<0.02	0.14
MW-17	12/01/96	mg/L	0.15	<0.01	360	<1	6.8	6.6	2.1	<0.0002	<0.001	<0.001		0.001	<5		0.7	32	<0.02	0.093
MW-17	01/01/97	mg/L																		
MW-17	04/01/97	mg/L																		
MW-17	07/01/97	mg/L	0.15	<0.01	330	<82	5.5	7.2	2.2	<0.0002	<0.001	<0.001		0.002	<5		0.75	33	<0.02	0.11
MW-17	10/01/97	mg/L																		
MW-17	01/05/98	mg/L																		
MW-17	04/06/98	mg/L																		
MW-17	07/01/98	mg/L	0.14	<0.01	330	<1	5.9	6.3	2.4	<0.0002	<0.001	<0.001		0.002	<5	84	0.76	35		0.1
MW-17	10/05/98	mg/L																		
MW-17	01/05/99	mg/L																		
MW-17	04/05/99	mg/L																		
MW-17	07/06/99	mg/L	0.02	<0.01	370	2.5	5.4	6.5	2.2	<0.0002	<0.001	<0.001		0.002	<5	81	0.72	32		0.078
MW-17	10/01/99	mg/L																		
MW-17	01/05/00	mg/L	0.16	0.02	370	<1	4.7	6.4	2.3	<0.0002	<0.001	<0.001	0.066	0.001	<5	81	0.74	32		0.11
MW-17	04/05/00	mg/L																		
MW-17	07/06/00	mg/L	0.11	<0.01	320	1.3	3.8	6.6	2.2	<0.0002	<0.001	<0.001	0.05	0.002	<5	86	0.71	34	<0.02	0.15
MW-17	10/21/00	mg/L																		
MW-17	01/10/01	mg/L	0.69	<0.1	187	0.878	4.27	6.1	2.8	<0.2	<0.001	<0.001	<0.01		<5	72.8	0.532	28.7		0.104
MW-17	04/23/01	mg/L																		
MW-17	07/25/01	mg/L	0.24	<0.1	201	1.06	4.83	6.59	2.37	<0.2	0.003	<0.001	0.068	0.01	22	92.2	0.66	31.8		0.702
MW-17	10/11/01	mg/L																		
MW-17	01/15/02	mg/L	0.21	<0.1	202	0.52	4.51	19.3	2.73	0.31	0.004	<0.001	0.084	0.003	<5	67.6	0.481	26.3		0.016

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-17	04/11/02	mg/L																		
MW-17	07/16/02	mg/L	0.21	<0.1	238	2.73	<0.5	6.54	2.63	0.38	<0.001	0.001	0.068	0.002	16	78.1	0.625	38	0.032	2.55
MW-17	10/11/02	mg/L																		
MW-17	01/13/03	mg/L	0.4	<0.1	207	5.23	1.27	18.1	2.64	0.65	<0.001	<0.001	0.05		<5	35.6	0.554	19.3		0.168
MW-17	07/09/03	mg/L	0.11	0.12	188	1.94	<0.5	7.03	2.96	<0.0002	<0.001	0.004	0.071		11	52.5	0.526	25.3	0.015	0.226
MW-17	07/09/03	mg/L	<0.1	0.52	198	1.92	<0.5	17	3.15	<0.0002	<0.001	<0.001	0.103		14		0.498	30.5	0.015	0.162
MW-17	01/15/04	mg/L	0.16	<0.023	330	<1	2.8	11	2.2	0.00033	0.0061	<0.001	0.089		10	74	1	30	0.023	2.2
MW-17	07/15/04	mg/L	0.1	0.13	340	<1	3.7	7.5	2.5	0.00029	0.001	0.0016	0.11		11	74	1.1	30	0.029	2.3
MW-17	01/15/05	mg/L	0.15	0.03	330	<1	5.6	7.6	2.6	<0.0002	0.001	<0.001	0.073		<5	77	0.56	32	0.015	0.22
MW-17	07/15/05	mg/L	0.17	<0.023	320	<1	5.7	8	2.6	<0.0002	0.0076	<0.001	0.084		<5	80	0.55	32	0.016	0.12
MW-17	01/20/06	mg/L	0.14	<0.023	340	<1	4.9	8	2.4	<0.0002	0.002	<0.001	0.08	0.0016	<5	71	0.53	29	<0.005	0.12
MW-17	07/20/06	mg/L	0.16	<0.023	340	<1	6.8	8.4	2.8	<0.0002	0.001	<0.001	0.091	0.0017	8	85	0.59	33	0.022	0.13
MW-17	01/11/07	mg/L	0.12	<0.023	360	<1	5.2	7.1	2.3	<0.0002	<0.001	<0.001	0.095	0.0017	6	80	0.54	31	0.018	0.12
MW-17	07/12/07	mg/L	0.14	<0.023	370	2.1	5.2	6.6	2	<0.0002	<0.001	<0.001	0.086	0.0018	5	77	0.51	30	<0.005	0.14
MW-17	02/04/08	mg/L	0.14	<0.023	670	<1	4.9	7.3	2.6	<0.0002	0.0015	<0.001	0.092	0.0015	11	77	0.5	31	<0.005	0.11
MW-17	07/10/08	mg/L	0.15	<0.023	340	1.6	4.5	7.7	2.7	<0.0002	<0.001	<0.001	0.091	0.0018	6	78	0.49	32	<0.005	0.062
MW-17	01/29/09	mg/L	0.22	<0.023	310	<1	4.2	10	4	<0.0002	0.0014	<0.001	0.093	0.0016	<5	78	0.54	30	0.015	0.12
MW-17	07/23/09	mg/L	0.24	<0.023	320	1.6	5	7.3	2.5	<0.0002	<0.001	<0.001	0.068	0.0016	16	77	0.51	31	<0.02	0.09
MW-17	01/21/10	mg/L	0.14	<0.023	280	1.6	4.9	7.3	2.5	<0.0002	<0.001	<0.001	0.1	0.0019	<5	78	0.49	30	0.015	0.082
MW-17	07/09/10	mg/L	0.19	<0.023	270	<1	3.9	7.7	2.7	<0.0002	0.001	<0.001	0.083	0.0017	<5	76	0.49	30	0.017	0.079
MW-17	01/19/11	mg/L	0.17	<0.023	310	<1	4.5	7.1	2.7	<0.0002	<0.001	<0.001	0.072	0.0016	61	75	0.5	29	0.014	0.17
MW-17	07/07/11	mg/L	0.26	<0.023	310	1.4	4.6	16	6.1	<0.0002	0.0089	<0.001	0.077	0.0019	<5	160	1.3	65	0.015	0.14
MW-17	10/21/11	mg/L							2.7		<0.001									
MW-17	01/11/12	mg/L	0.21	<0.023	340	1.3	4.7	7.4	2.5	<0.0002	<0.001	<0.001	0.076	0.0017	<5	80	0.5	30	0.014	0.17
MW-17	07/18/12	mg/L	0.14	<0.023	300	1.3	4.6	7.3	2.6	<0.0002	<0.001	<0.001	0.079	0.0016	<5	77	0.49	29	0.014	0.14
MW-17	01/10/13	mg/L	0.25	<0.023	290	1.2	4.6	7.5	2.6	<0.0002	<0.001	<0.001	0.092	0.0021	<5	77	0.49	29	0.013	0.19
MW-17	07/12/13	mg/L	0.25	<0.023	320	1.1	4.5	7.6	2.8	<0.0002	<0.001	<0.001	0.078	0.0015	<5	82	0.51	32	0.019	0.18
MW-17	01/15/14	mg/L	0.19	<0.023	340	1.5	4.7	7.8	2.8	<0.0002	<0.001	<0.001	0.075	0.0017	<5	80	0.54	29	0.014	0.15
MW-17	07/11/14	mg/L	0.22	<0.02	330	1.5	4.4	6.4	2.2	<0.0002	<0.001	<0.001	0.068	0.0017	<5	82	0.49	31	0.014	0.16
MW-17	01/21/15	mg/L	0.17	<0.01	360	1.6	4.6	6.5	2.3	<0.0002	<0.001	<0.001	0.066	0.0017	<5	77	0.5	31	0.011	0.16
MW-17	07/30/15	mg/L	0.16	<0.01	350	1.5	4.6	6.5	2.3	<0.0002	<0.001	<0.001	0.082	0.0018	<5	77	0.5	29	0.013	0.13
MW-17	01/06/16	mg/L	0.21	<0.01	320	<1	4.7	5.8	2.4	<0.0002	<0.001	<0.001	0.084	0.0017	<5	76	0.5	30	0.014	0.15
MW-17	07/29/16	mg/L	0.2	<0.01	330	<1	4.7	6.2	2.3	<0.0002	0.0075	<0.001	0.079	0.0019		80	0.51	33	0.014	0.15
MW-17	01/06/17	mg/L	0.26	0.011	330	<1	4.7	6.4	2.1	<0.0002	<0.001	<0.001	0.088	0.0018	<5	77	0.52	28	0.013	0.16
MW-17	07/14/17	mg/L	0.18	<0.01	340	<1	5.2	6.8	2.4	<0.0002	<0.001	<0.001	0.074	0.0018		90	0.52	31	0.013	0.17
MW-17	01/25/18	mg/L	0.17	<0.01	320	<1	5.5	6.7	2.1	<0.0002	<0.001	<0.001	0.079	0.0018	<5	82	0.52	30	0.013	0.16
MW-17	07/11/18	mg/L	0.21	<0.01	330	<1	5	6	2.1	<0.0002	<0.001	<0.001	0.072	0.0017		73	0.048	27	0.02	0.14
MW-17	01/10/19	mg/L	0.17	<0.01	330	1.5	4.9	6.2	2.3	<0.0002	<0.001	<0.001	0.077	0.0017	<5	77	0.44	28	0.013	0.16
MW-17	07/10/19	mg/L	0.14	<0.01	330	1.6	4.9	6.8	2.4	<0.0002	<0.001	<0.001	0.084	0.0020		79	0.47	30	0.014	0.17
MW-17	01/08/20	mg/L	0.17	<0.01	340	1.6	4.7	6.1	2.2	<0.0002	<0.001	<0.001	0.082	0.0018	<5	78	0.5	30	0.013	0.16
MW-17	07/08/20	mg/L	0.16	<0.01	330	1.5	5	6.4	2.3	<0.0002	<0.001	<0.001	0.081	0.0019		77	0.49	29	0.013	0.12
MW-17	07/19/21	mg/L	0.16	<0.01	330	<1	4.7	6.3	2.4	<0.0002	<0.001	<0.001	0.076	0.002		85	0.58	33	0.014	0.13
MW-18	03/07/95	mg/L																		
MW-18	06/07/95	mg/L	0.1	<0.01	340	1.1	10	5.3	1.9	<0.0002	<0.001	<0.001		0.003	<3		1.9	31		
MW-18	09/08/95	mg/L	0.09	<0.01	360	<1	9.9	7.5	1.8	<0.0002	<0.001	<0.001		0.003	<3		1.6	34	0.15	0.3
MW-18	10/23/95	mg/L	0.07	<0.01	330	<1	11	5.9	1.9	<0.0002	<0.001	<0.001		0.003	<5		2.1	30	<0.02	0.58
MW-18	11/27/95	mg/L	0.1	<0.01	350	<1	14	5.4	2.1	<0.0002	<0.001	<0.001		0.003	<5		2.3	32	<0.02	0.51
MW-18	01/22/96	mg/L	0.1	<0.01	350	1	10	5.3	1.8	<0.0002	<0.001	<0.001		0.003	<5		2.1	30	<0.02	0.5
MW-18	03/06/96	mg/L	0.07	<0.01	350	<1	11	5	1.8	<0.0002	<0.001	<0.001		0.003	<5		2.1	35	<0.02	0.55
MW-18	04/24/96	mg/L	0.1	<0.01	350	1	11	5.4	1.6	<0.0002	<0.001	<0.001		0.003	10		0.2	29	<0.02	0.32
MW-18	06/04/96	mg/L	0.05	<0.01	340	1.2	9.3	5.1	1.7	<0.0002	<0.001	<0.001		0.003	<5		2.2	23	<0.02	0.41
MW-18	07/15/96	mg/L	0.06	<0.01	350	1	13	5.2	1.7	<0.0002	<0.001	<0.001		0.003	<5		1.9	31	<0.02	0.34
MW-18	09/01/96	mg/L	0.08	0.01	330	1	9.3	5.8	1.8	<0.0002	<0.001	<0.001		0.003	<5		2.2	37	<0.02	0.41
MW-18	12/01/96	mg/L	0.11	<0.01	370	1.2	15	5.3	1.6	<0.0002	<0.001	<0.001		0.002	<5		2.4	28	<0.02	0.39
MW-18	01/01/97	mg/L																		
MW-18	04/01/97	mg/L																		
MW-18	07/01/97	mg/L	0.07	<0.01	340	1.8	10	7.2	1.7	<0.0002	<0.001	<0.001		0.003	<5		2.8	34	<0.02	0.28
MW-18	10/01/97	mg/L																		
MW-18	01/05/98	mg/L																		
MW-18	04/06/98	mg/L																		
MW-18	07/01/98	mg/L	0.06	<0.01	340	<1	11	4.8	1.9	<0.0002	<0.001	<0.001		0.003	<5	93	3.5	41		0.27
MW-18	10/05/98	mg/L																		

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-18	01/05/99	mg/L																		
MW-18	04/05/99	mg/L																		
MW-18	07/06/99	mg/L	0.04	<0.01	380	3.2	12	5.1	1.7	<0.0002	<0.001	<0.001		0.003	<5	96	4.4	34		0.2
MW-18	10/01/99	mg/L																		
MW-18	01/05/00	mg/L	0.07	<0.01	390	1.5	14	5	1.8	<0.0002	<0.001	<0.001	<0.05	0.003	<5	91	4.4	33		0.16
MW-18	04/05/00	mg/L																		
MW-18	07/06/00	mg/L	0.05	<0.01	340	1.6	10	5.2	1.7	<0.0002	<0.001	<0.001	<0.05	0.003	<5	90	6.4	35	0.02	0.2
MW-18	10/21/00	mg/L																		
MW-18	01/10/01	mg/L	0.52	<0.1	209	1.48	7.91	4.8	1.67	<0.2	<0.001	<0.001	0.034		<5	75.2	4.36	29.8		0.098
MW-18	04/23/01	mg/L																		
MW-18	07/25/01	mg/L	0.23	<0.1	207	1.82	9.24	17.6	1.85	<0.2	0.002	0.001	0.057	0.002	<5	83.8	3.84	31.7		0.133
MW-18	10/11/01	mg/L																		
MW-18	01/15/02	mg/L	0.12	<0.1	209	1.27	10.5	18	2.09	<0.2	<0.001	<0.001	0.045	0.002	<5	75	2.58	28		0.044
MW-18	04/11/02	mg/L																		
MW-18	07/16/02	mg/L	0.12	<0.1	195	1.54	8.51	7.14	1.9	<0.2	0.002	<0.001	0.052	0.002	<5	57.6	4.78	30.7	0.02	0.072
MW-18	10/11/02	mg/L																		
MW-18	01/13/03	mg/L	0.19	<0.1	207	1.74	9.95	8.11	1.92	0.99	<0.001	<0.001	<0.01		<5	45.3	4.61	21		0.091
MW-18	07/09/03	mg/L	0.12	0.12	190	3.38	<0.5	6.3	2.14	<0.0002	<0.001	<0.001	0.023		9	56.4	0.01	32	0.017	0.083
MW-18	07/09/03	mg/L	0.11	0.1	201	3.22	0.93	6.42	2.28	0.000262	<0.001	0.001	0.057		7		3.82	32.7	0.017	0.116
MW-18	01/15/04	mg/L	0.057	0.037	330	3.7	3	10	1.9	0.00051	0.0063	<0.001	0.053		18		0.76	31	0.024	1.9
MW-18	07/15/04	mg/L	0.08	0.07	340	2.1	8.5	6.9	2	0.00082	0.0015	<0.001	0.074		6	84	2.4	31	0.021	0.45
MW-18	01/15/05	mg/L	0.059	<0.023	350	1.4	13	6.1	2	<0.0002	<0.001	<0.001	<0.05		7	93	2.9	33	0.02	0.1
MW-18	07/15/05	mg/L	0.094	<0.023	340	1.6	14	6.2	1.9	<0.0002	0.0053	<0.001	0.036		6	92	2.7	33	0.021	0.14
MW-18	01/19/06	mg/L	0.074	<0.023	360	1.8	13	6.2	1.8	<0.0002	0.001	<0.001	0.042	0.0025	7	81	2.8	30	0.023	0.13
MW-18	07/20/06	mg/L	0.057	<0.023	350	1.5	17	7.2	2.3	<0.0002	<0.001	<0.001	0.041	0.0026	47	100	2.9	35	0.023	0.2
MW-18	01/11/07	mg/L	0.06	<0.023	370	<1	16	5.7	1.7	<0.0002	<0.001	<0.001	0.05	0.0026	5	92	2.4	33	0.023	0.18
MW-18	07/12/07	mg/L	0.06	<0.023	340	2.2	15	5.2	1.9	<0.0002	<0.001	<0.001	0.073	0.0025	<5	88	2.2	31	<0.005	0.25
MW-18	02/01/08	mg/L	0.074	0.078	680	2.2	15	5.3	1.8	<0.0002	<0.001	<0.001	0.054	0.0025	<5	99	2.2	35	0.02	0.3
MW-18	07/11/08	mg/L	0.067	<0.023	320	2.6	15	5.3	2	<0.0002	<0.001	0.0012	0.04	0.0024	<5	93	1.8	33	0.022	0.32
MW-18	01/30/09	mg/L	0.079	<0.023	390	2	16	12	4.2	<0.0002	<0.001	<0.001	0.043	0.0024	<5	180	3.8	65	0.018	0.24
MW-18	07/22/09	mg/L	0.068	0.071	300	2.7	17	6.6	1.9	<0.0002	<0.001	<0.001	0.041	0.0024	<5	95	1.7	33	0.019	0.32
MW-18	01/20/10	mg/L	0.069	<0.023	300	2.7	17	5.9	1.9	<0.0002	0.0026	<0.001	0.038	0.0025	9	87	1.5	31	0.018	0.44
MW-18	07/08/10	mg/L	0.086	<0.023	310	1.9	15	6.7	2.2	<0.0002	0.0014	<0.001	0.045	0.0028	<5	91	1.5	32	0.019	0.59
MW-18	01/19/11	mg/L	0.096	0.2	340	2.1	17	6	2.1	<0.0002	<0.001	<0.001	0.034	0.0019	5	88	1.4	31	0.018	0.37
MW-18	07/07/11	mg/L	0.13	<0.023	350	2.6	16	13	4.7	<0.0002	0.0071	<0.001	0.035	0.0024	<5	190	3	69	0.018	0.4
MW-18	10/21/11	mg/L							2.1											
MW-18	01/11/12	mg/L	0.11	<0.023	330	2.4	17	5.9	2	<0.0002	<0.001	<0.001	0.038	0.0021	<5	94	1.3	33	0.017	0.37
MW-18	07/18/12	mg/L	0.071	<0.023	310	2.5	17	6	2	<0.0002	<0.001	<0.001	0.037	0.0021	<5	92	1.2	31	0.018	0.42
MW-18	01/10/13	mg/L	0.11	<0.023	310	2.4	17	6.1	2.1	<0.0002	<0.001	<0.001	0.041	0.002	<5	91	1.1	31	0.016	0.45
MW-18	07/11/13	mg/L	0.15	<0.023	370	2.3	17	6.3	2.1	<0.0002	<0.001	<0.001	0.038	0.002	<5	87	1.2	31	0.019	0.4
MW-18	01/15/14	mg/L	0.12	<0.023	350	2.8	19	6.8	2.4	<0.0002	<0.001	<0.001	0.038	0.0022	8	100	1.5	34	0.02	0.4
MW-18	07/11/14	mg/L	0.089	<0.02	350	2.8	18	5.1	1.7	<0.0002	<0.001	<0.001	0.03	0.0022	<5	98	1.2	34	0.017	0.47
MW-18	01/21/15	mg/L	0.13	<0.01	380	3	20	4.7	1.7	<0.0002	<0.001	<0.001	0.033	0.0021	8	92	1.3	34	0.015	0.34
MW-18	07/30/15	mg/L	0.19	<0.01	380	2.9	20	5.2	1.8	<0.0002	<0.001	<0.001	0.038	0.0021	<5	91	1.2	32	0.017	0.49
MW-18	01/07/16	mg/L	0.079	<0.01	320	9.5	14	4.6	1.8	<0.0002	<0.001	<0.001	0.042	0.0022	<5	90	1.1	31	0.017	0.45
MW-18	07/29/16	mg/L	0.094	<0.01	320	2.5	21	5.2	1.8	<0.0002	<0.001	<0.001	0.038	0.0023		96	1.2	36	0.019	0.41
MW-18	01/06/17	mg/L	0.11	<0.01	350	2.9	21	5.6	1.6	<0.0002	<0.001	<0.001	0.039	0.0019	<5	94	1.1	31	0.019	0.44
MW-18	07/13/17	mg/L	0.17	<0.01	330	3.4	23	5.6	1.8	<0.0002	<0.001	<0.001	0.044	0.002		100	1.1	32	0.017	0.37
MW-18	01/24/18	mg/L	0.064	<0.01	370	3.3	24	5.5	1.6	<0.0002	<0.001	<0.001	0.039	0.0019	<5	96	1	33	0.017	0.29
MW-18	07/11/18	mg/L	0.048	<0.01	350	3.3	22	5.3	1.7	<0.0002	<0.001	<0.001	0.036	0.0019		89	0.99	30	0.019	0.23
MW-18	01/09/19	mg/L	0.076	<0.01	340	3.3	23	5.1	1.8	<0.0002	<0.001	<0.001	0.039	0.0018	<5	90	0.97	32	0.018	0.29
MW-18	07/10/19	mg/L	0.061	<0.01	360	3.2	21	5.6	1.9	<0.0002	<0.001	<0.001	0.039	0.0021		99	1.0	34	0.018	0.31
MW-18	01/08/20	mg/L	0.078	<0.01	370	3.2	21	5.3	1.8	<0.0002	<0.001	<0.001	0.039	0.0019	<5	92	0.95	31	0.018	0.33
MW-18	07/08/20	mg/L	0.074	<0.01	350	3.3	24	5.1	1.7	<0.0002	<0.001	<0.001	0.039	0.0019		92	0.92	31	0.017	0.4
MW-18	07/16/21	mg/L	0.27	0.037	350	2.6	22	5.2	1.9	<0.0002	<0.001	<0.001	0.039	0.002		110	0.93	37	0.018	0.36
MW-19	03/07/95	mg/L																		
MW-19	06/07/95	mg/L																		
MW-19	09/08/95	mg/L																		
MW-19	10/23/95	mg/L																		
MW-19	11/27/95	mg/L																		
MW-19	01/22/96	mg/L																		
MW-19	03/06/96	mg/L																		

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-19	04/24/96	mg/L																		
MW-19	06/04/96	mg/L																		
MW-19	07/15/96	mg/L																		
MW-19	09/01/96	mg/L																		
MW-19	12/01/96	mg/L																		
MW-19	01/01/97	mg/L																		
MW-19	04/01/97	mg/L																		
MW-19	07/01/97	mg/L																		
MW-19	10/01/97	mg/L																		
MW-19	01/05/98	mg/L																		
MW-19	04/06/98	mg/L																		
MW-19	07/01/98	mg/L																		
MW-19	10/05/98	mg/L																		
MW-19	01/05/99	mg/L																		
MW-19	04/05/99	mg/L																		
MW-19	07/06/99	mg/L																		
MW-19	10/01/99	mg/L																		
MW-19	01/05/00	mg/L	0.09	0.38	840	39	150	59	2.7	<0.0002	<0.001	<0.001	0.061	<0.001	<5	240	0.27	81		0.014
MW-19	04/05/00	mg/L																		
MW-19	07/06/00	mg/L	0.45	0.01	730	37	110	51	2.4	<0.0002	<0.001	<0.001	<0.05	<0.001	9.7	210	1.2	76	1.7	<0.004
MW-19	10/21/00	mg/L																		
MW-19	01/10/01	mg/L	1.3	0.41	433	47.7	147	43.5	3.35	0.3	<0.001	0.001	0.073		20	197	0.589	63.2		0.834
MW-19	04/23/01	mg/L																		
MW-19	07/25/01	mg/L	0.65	1.39	409	38	147	47.7	3.23	0.33	0.027	0.001	0.062		27	257	0.438	63.7		0.07
MW-19	10/11/01	mg/L																		
MW-19	01/15/02	mg/L	0.07	3.02	412	44.1	159	51	3.14	<0.2	<0.001	0.001	0.045		48	183	0.178	62.3		<0.002
MW-19	04/11/02	mg/L																		
MW-19	07/16/02	mg/L	0.13	4.38	362	26.4	147	48.2	3.26	<0.2	<0.001	<0.001	0.093		61	230	0.139	71.5	1.93	0.034
MW-19	10/11/02	mg/L																		
MW-19	01/13/03	mg/L	0.21	6.44	414	29.7	211	52.6	4.13	<0.2	<0.001	<0.001	0.093		32	108	0.305	41.2		0.014
MW-19	07/10/03	mg/L	1.17	0.17	366	31.1	101	101	5.04	<0.0002	<0.001	<0.001	0.102		45	99.4	0.174	70.8	0.828	0.046
MW-19	01/15/04	mg/L	0.078	3.3	600	29	150	41	2.7	<0.0002	0.012	0.0013	0.16		39	200	0.16	56	1.4	0.12
MW-19	07/15/04	mg/L	0.066	2.7	570	16	120	38	3.7	<0.0002	0.0027	<0.001	0.14		54	180	0.32	55	1.1	0.028
MW-19	01/15/05	mg/L	<0.05	0.23	680	55	170	57	4.2	<0.0002	0.0034	<0.001	0.14		36	230	0.46	63	1.7	0.074
MW-19	07/15/05	mg/L	<0.05	0.44	580	48	140	55	3.1	<0.0002	0.0065	0.0011	0.16		61	200	0.42	57	1.5	0.24
MW-19	01/17/06	mg/L	<0.05	0.082	730	50	160	54	3.3	0.00033	0.004	0.0015	0.15	<0.001	62	200	0.42	61	2.6	0.52
MW-19	07/18/06	mg/L	<0.05	<0.023	820	42	170	73	3.1	<0.0002	0.004	<0.001	0.14	<0.001	39	240	0.52	77	3	0.014
MW-19	01/09/07	mg/L	<0.05	<0.023	810	52	120	46	2.8	<0.0002	0.003	<0.001	0.2	<0.001	31	240	0.3	75	7.1	<0.004
MW-19	07/11/07	mg/L	<0.05	0.034	760	41	170	67	2.7	<0.0002	<0.001	<0.001	0.22	<0.001	19	220	0.6	69	3	0.21
MW-19	01/31/08	mg/L	<0.05	0.048	1600	58	140	39	3.6	<0.0002	<0.001	<0.001	0.089	<0.001	13	240	0.33	72	3.9	0.15
MW-19	07/09/08	mg/L	<0.05	0.027	800	38	180	58	3.3	<0.0002	<0.001	<0.001	0.21	<0.001	19	220	0.48	75	3.5	0.24
MW-19	01/29/09	mg/L	<0.05		730	76	130	48	3.7	<0.0002	0.0028	<0.001	0.093	<0.001	6	240	0.42	71	3.5	0.65
MW-19	07/21/09	mg/L	0.18	1.7	490	11	82	13	2	<0.0002	<0.001	<0.001	0.069	0.0011	18	180	0.21	51	2.5	0.51
MW-19	01/19/10	mg/L	0.25	1.1	500	41	100	34	2.4	0.00091	0.0067	0.0084	0.34	<0.001	13	170	0.17	43	2.4	1.1
MW-19	07/07/10	mg/L	0.15	1.8	480	26	76	31	2.8	<0.0002	<0.001	<0.001	0.39	<0.001	18	150	0.069	37	2	0.45
MW-19	01/18/11	mg/L	<0.05	0.09	610	60	130	40	3.3	<0.0002	<0.001	<0.001	0.19	<0.001	15	210	0.17	59	3.5	0.096
MW-19	07/06/11	mg/L	0.1	2	440	15	90	23	2.8	<0.0002	<0.001	<0.001	0.13	<0.001	<5	170	0.3	44	2	0.39
MW-19	01/10/12	mg/L	0.16	1.9	590	21	99	31	2.6	<0.0002	<0.001	<0.001	0.23	<0.001	13	200	0.14	48	1.8	0.16
MW-19	07/17/12	mg/L	<0.05	4.4	450	12	71	15	2.3	<0.0002	<0.001	0.0011	0.081	<0.001	13	160	0.12	43	1.3	0.29
MW-19	01/09/13	mg/L	0.056	0.35	540	30	130	43	3.1	0.0031	<0.001	0.022	0.15	<0.001	7	180	0.67	54	2.6	2.8
MW-19	07/10/13	mg/L	<0.1	4.2	480	18	80	27	2.6	<0.0002	<0.001	<0.001	0.17	<0.001	11	150	0.19	40	2	0.098
MW-19	01/14/14	mg/L	0.057	3.2	570	31	170	42	3.3	<0.0002	<0.001	<0.001	0.19	<0.001	8	210	0.21	54	2.6	0.16
MW-19	07/09/14	mg/L	0.053	1.3	500	20	98	30	2	<0.0002	<0.001	<0.001	0.11	<0.001	<5	160	0.36	44	2.1	0.062
MW-19	01/20/15	mg/L	0.055	6	520	26	110	32	2	<0.0002	<0.001	<0.001	0.078	<0.001	22	150	0.67	47	2.1	0.11
MW-19	07/29/15	mg/L	0.078	5.7	530	21	110	34	2.1	<0.0002	<0.001	<0.001	0.099	<0.001		150	0.68	41	2.3	0.024
MW-19	01/05/16	mg/L	0.058	0.73	510	19	110	36	2.2	<0.0002	<0.001	<0.001	0.091	<0.001	10	160	0.66	46	2.3	0.039
MW-19	07/26/16	mg/L	0.051	3.3	450	13	66	23	1.8	<0.0002	<0.001	<0.001	0.053	0.0012		150	0.63	44	1.3	0.032
MW-19	01/05/17	mg/L	0.078	6.6	440	17	89	28	1.6	<0.0002	<0.001	<0.001	0.073	<0.001	<5	150	0.88	46	1.7	0.037
MW-19	07/11/17	mg/L	0.044	3.4	470	13	74	15	1.6	<0.0002	<0.001	<0.001	0.053	0.0011		150	0.37	42	0.95	0.063
MW-19R	01/24/18	mg/L	0.19	7.5	510	12	96	53	1.6	<0.0002	<0.001	<0.001	0.058	<0.001	10	150	3.6	47	0.55	0.025
MW-19R	07/11/18	mg/L	0.014	4.2	490	9.2	76	15	1.2	<0.0002	0.001	<0.001	0.058	<0.001		140	0.2	40	0.0076	0.028
MW-19R	01/09/19	mg/L	0.011	6.9	460	13	88	31	1.4	<0.0002	0.0011	<0.001	0.061	<0.001	<5	150	1.9	47	0.1	0.019

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-19R	07/10/19	mg/L	<0.01	5.3	490	12	92	28	1.3	<0.0002	0.0011	<0.001	0.077	<0.001		150	1.4	42	0.012	0.009
MW-19R	01/09/19	mg/L	0.011	6.9	460	13	88	31	1.4	<0.0002	0.0011	<0.001	0.061	<0.001	<5	150	1.9	47	0.10	0.019
MW-19R	07/10/19	mg/L	<0.01	5.3	490	12	92	28	1.3	<0.0002	0.0011	<0.001	0.077	<0.001		150	1.4	42	0.012	0.0090
MW-19R	01/08/20	mg/L	<0.01	8.9	540	14	120	41	1.6	<0.0002	0.0012	<0.001	0.1	<0.001	<5	160	3.7	48	0.15	0.0067
MW-19R	07/08/20	mg/L	<0.01	4.2	440	9.2	86	17	1.3	<0.0002	0.0011	<0.001	0.088	<0.001		140	0.076	40	0.007	0.018
MW-19R	01/14/21	mg/L	<0.01	4.8	540	12	81	41	1.6	<0.0002	0.0011	<0.001	0.096	<0.001	18	160	2.3	49	0.32	0.017
MW-19R	07/14/21	mg/L	<0.01	4.6	560	24	87	29	1.8	<0.0002	<0.001	<0.001	0.074	<0.001		180	0.32	53	0.94	0.014
MW-20	03/07/95	mg/L																		
MW-20	06/07/95	mg/L																		
MW-20	09/08/95	mg/L	0.3	<0.01	250	1.4	29	7.2							<3	71	1.6	25		
MW-20	10/23/95	mg/L																		
MW-20	11/27/95	mg/L	0.04	<0.01	250	2.4	30	4.6		<0.0002	<0.001	0.002			<3	62	1.6	26		
MW-20	01/22/96	mg/L																		
MW-20	03/06/96	mg/L	0.05	<0.01	240	2.3	33	5.4	0.99						<3	63	1.3	26		
MW-20	04/24/96	mg/L																		
MW-20	06/04/96	mg/L	0.03	<0.01	240	2.2	30	3.2	0.84	<0.0002	<0.001	<0.001		0.002	<5	59	1.8	25		
MW-20	07/15/96	mg/L																		
MW-20	09/01/96	mg/L	0.02	<0.01	380	2.2	31	5.2							<3	56	1.8	27		
MW-20	12/01/96	mg/L	0.08	<0.01	270	2.5	33	5.2		<0.0002	<0.001	<0.001			<3	64	1.6	21		
MW-20	01/01/97	mg/L	0.08	<0.01	280	2	28	4.8	0.72	<0.0002	<0.001	<0.001		0.001	<5	53	1.5	27		0.42
MW-20	04/01/97	mg/L			240	2.7	29	5								77	1.5	22		
MW-20	07/01/97	mg/L	0.02	<0.01	250	2.8	26	4.7	0.7	<0.0002	<0.001	<0.001		0.001	<5	72	1.3	22		0.32
MW-20	10/01/97	mg/L			260	2.4	26	5.1								66	1.6	23		
MW-20	01/05/98	mg/L	0.07	<0.01	250	2.7	30	5.1	0.69	<0.0002	<0.001	<0.001		0.002	<5	82	1.4	22		0.34
MW-20	04/06/98	mg/L			250	2.9	29	5.1								77	1.4	27		
MW-20	07/01/98	mg/L	0.02	<0.01	240	2.7	30	4.9	0.86	<0.0002	<0.001	<0.001		0.002	<5	66	1.1	29		0.53
MW-20	10/05/98	mg/L			260	3.1	28	5								76	1.3	26		
MW-20	01/05/99	mg/L	0.11	0.03	250	4.8	37	12	1.9	<0.0002	<0.001	<0.001		<0.001	<5	65	2	30		2.7
MW-20	04/05/99	mg/L			240	2.9	37	5.8								58	0.98	22		
MW-20	07/06/99	mg/L	0.01	<0.01	280	5.2	37	5	0.84	<0.0002	<0.001	<0.001		0.001	<5	76	0.92	28		0.42
MW-20	10/01/99	mg/L																		
MW-20	01/05/00	mg/L	0.07	<0.01	290	3	33	5.4	0.92	<0.0002	<0.001	<0.001	<0.05	0.002	31	74	1.5	28		0.6
MW-20	04/05/00	mg/L																		
MW-20	07/06/00	mg/L	1.2	0.04	240	3.2	34	6.8	1.8	<0.0002	<0.001	<0.001	<0.05	0.002	<5	60	2.7	29	0.05	0.55
MW-20	10/21/00	mg/L																		
MW-20	01/10/01	mg/L	0.33	<0.1	153	2.69	26.9	6.75	0.803	9.59	0.012	0.024	<0.01		26	71.5	23.3	23.9		1.29
MW-20R	04/23/01	mg/L																		
MW-20R	07/25/01	mg/L	0.27	<0.1	189	5.13	21.3	14.6	1.05	0.75	<0.001	<0.001	0.018		20	43	0.116	29.4		0.038
MW-20R	10/11/01	mg/L																		
MW-20R	01/15/02	mg/L	0.08	<0.1	153	4.84	22.6	8.84	1.32	0.49	<0.001	<0.001	0.015		<5	52	0.228	28.4		<0.002
MW-20R	04/11/02	mg/L																		
MW-20R	07/16/02	mg/L	0.07	<0.1	165	4.62	21.4	4.8	1.26	0.61	0.001	<0.001	0.021		9	29.1	0.361	24.1	0.03	0.027
MW-20R	10/11/02	mg/L																		
MW-20R	01/13/03	mg/L	0.07	<0.1	164	5.49	21.5	10.5	<1	<0.2	<0.001	<0.001	<0.01		<5	26.7	0.351	16.7		0.033
MW-20R	07/08/03	mg/L	<0.1	0.05	146	5.33	18.5	15.6	1.46	<0.0002	<0.001	0.002	0.108		18	45.4	0.223	26.9	0.024	0.016
MW-20R	01/15/04	mg/L	<0.05	<0.023	250	4.6	17	9.4	1	0.00086	0.0049	<0.001	0.029		59	62	0.41	29	0.033	0.043
MW-20R	07/15/04	mg/L	<0.05	<0.023	240	5.6	27	11	1.1	0.00022	0.0012	<0.001	0.038		13	64	0.46	26	0.03	0.27
MW-20R	01/15/05	mg/L	<0.05	<0.023	260	5.5	25	6.5	1.2	<0.0002	0.0011	<0.001	<0.05		<5	76	0.8	29	0.042	0.16
MW-20R	07/15/05	mg/L	<0.05	<0.023	260	4.4	26	5.4	0.88	<0.0002	0.0052	<0.001	<0.02		<5	75	0.95	26	0.042	0.13
MW-20R	01/19/06	mg/L	<0.05	0.027	290	6	23	7.1	1.1	<0.0002	0.001	<0.001	0.042	0.0019	<5	67	0.69	24	0.038	0.028
MW-20R	07/19/06	mg/L	<0.05	<0.023	260	6.3	20	6.8	1.3	<0.0002	<0.001	<0.001	0.027	0.0017	7	69	0.53	27	0.05	0.057
MW-20R	01/09/07	mg/L	<0.05	0.027	280	5.7	25	6	0.9	<0.0002	0.003	<0.001	0.071	0.0038	7	72	0.53	27	0.085	0.052
MW-20R	07/12/07	mg/L	<0.05	<0.023	330	7.9	26	4.9	0.72	<0.0002	0.003	<0.001	<0.02	0.0021	<5	71	0.75	26	0.04	0.022
MW-20R	02/01/08	mg/L	<0.05	0.084	480	7.6	25	5.3	1	<0.0002	<0.001	<0.001	0.022	0.0021	<5	78	0.84	30	0.041	0.021
MW-20R	07/09/08	mg/L	<0.05	<0.023	300	6.7	22	5.9	1.1	<0.0002	<0.001	<0.001	<0.02	0.0014	9	69	0.57	28	0.038	0.021
MW-20R	01/28/09	mg/L	<0.05		280	9.2	26	6.3	1.1	<0.0002	0.0016	<0.001	0.022	0.0018	5	74	0.62	27	0.048	0.029
MW-20R	07/21/09	mg/L	<0.05	<0.023	240	7.5	26	5.9	1.1	0.00031	0.0012	<0.001	<0.02	0.0016	12	77	0.59	29	0.043	0.024
MW-20R	01/19/10	mg/L	<0.05	<0.023	240	6.8	24	6.1	1.1	<0.0002	0.0038	<0.001	0.022	0.0019	10	71	0.67	27	0.044	0.18
MW-20R	07/09/10	mg/L	<0.05	<0.023	270	5.8	24	6.5	1.1	<0.0002	0.001	<0.001	<0.02	0.0026	<5	76	0.91	27	0.044	0.046
MW-20R	01/19/11	mg/L	<0.05	<0.023	290	6.2	28	5.8	1	<0.0002	<0.001	<0.001	<0.02	0.0017	<5	70	0.69	25	0.036	0.045
MW-20R	07/06/11	mg/L	<0.05	<0.023	260	6.5	26	6.7	1.3	<0.0002	0.0013	<0.001	<0.02	0.0017	<5	81	1	29	0.043	0.058
MW-20R	01/11/12	mg/L	<0.05	<0.023	300	6.2	28	6.1	1	<0.0002	<0.001	<0.001	<0.02	0.002	<5	83	0.9	27	0.038	0.057

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-20R	07/18/12	mg/L	<0.05	<0.023	86	6.3	26	6.1	1.1	<0.0002	<0.001	<0.001	<0.02	0.002	<5	78	0.86	27	0.037	0.036
MW-20R	01/09/13	mg/L	0.05	<0.023	260	6.5	41	6.4	1.2	<0.0002	<0.001	<0.001	<0.02	0.0021	<5	85	0.97	28	0.04	0.033
MW-20R	07/10/13	mg/L	<0.1	<0.023	290	6	31	6.2	1.1	<0.0002	<0.001	<0.001	<0.02	0.0019	<5	78	0.98	27	0.037	0.046
MW-20R	01/15/14	mg/L	0.088	<0.023	300	6.5	34	6.7	1.4	<0.0002	<0.001	<0.001	<0.02	0.0021	<5	93	1.1	31	0.043	0.05
MW-20R	07/10/14	mg/L	0.015	<0.01	290	6.3	33	5.3	0.93	<0.0002	<0.001	<0.001	<0.02	0.0018	<5	86	0.89	30	0.035	0.071
MW-20R	01/20/15	mg/L	0.014	0.01	340	6.7	35	5.6	0.98	<0.0002	<0.001	<0.001	<0.02	0.0019	6	82	0.94	30	0.032	0.083
MW-20R	07/29/15	mg/L	0.2	<0.01	340	6.5	39	5.3	1	<0.0002	<0.001	<0.001	<0.02	0.002		84	0.93	29	0.037	0.075
MW-20R	01/06/16	mg/L	0.2	<0.01	320	5.7	33	5.1	1	<0.0002	<0.001	<0.001	0.021	0.0022	<5	82	0.94	28	0.037	0.12
MW-20R	07/28/16	mg/L	0.045	<0.01	280	5.4	38	5.6	1	<0.0002	<0.001	<0.001	<0.02	0.0021		87	<0.02	30	0.037	0.24
MW-20R	01/05/17	mg/L	0.049	<0.01	280	5.5	39	5.7	0.91	<0.0002	<0.001	<0.001	<0.02	0.0022	<5	85	1	27	0.036	0.13
MW-20R	07/13/17	mg/L	0.068	<0.01	280	5.9	36	5.9	1	<0.0002	<0.001	<0.001	0.023	0.002		90	0.85	28	0.033	0.22
MW-20R	01/24/18	mg/L	0.11	<0.01	300	6.1	39	5.3	0.93	<0.0002	<0.001	<0.001	<0.02	0.0019	<5	85	0.89	28	0.033	0.12
MW-20R	07/11/18	mg/L	0.035	<0.01	280	5.9	35	4.9	1	<0.0002	<0.001	<0.001	<0.02	0.0019		81	0.73	26	0.031	0.21
MW-20R	01/09/19	mg/L	<0.01	<0.01	260	6.2	41	5.2	1.0	<0.0002	<0.001	<0.001	0.023	0.0022	<5	82	0.93	28	0.046	0.17
MW-20R	07/09/19	mg/L	0.011	<0.01	300	5.7	39	5.6	1.1	<0.0002	<0.001	<0.001	<0.02	0.0022		83	1.1	28	0.034	0.13
MW-20R	01/07/20	mg/L	<0.01	<0.01	300	5.5	38	5.1	1	<0.0002	<0.001	<0.001	<0.02	0.0021	<5	84	0.89	29	0.035	0.11
MW-20R	07/07/20	mg/L	<0.01	<0.01	270	5.7	43	4.3	1	<0.0002	<0.001	<0.001	<0.02	0.0022		81	0.91	28	0.034	0.19
MW-20R	01/13/21	mg/L	0.027	<0.01	280	5	38	5	0.98	<0.0002	<0.001	<0.001	<0.02	0.0022	<5	86	1	27	0.035	0.24
MW-20R	07/14/21	mg/L	<0.01	<0.01	320	6.7	38	5.2	1.1	<0.0002	<0.001	<0.001	<0.02	0.0023		85	1	30	0.04	0.25
MW-21SR	01/10/01	mg/L	0.2	<0.1	285	48.3	88.3	27	1.17	2.1	0.006	0.001	0.054		54	145	1.13	46		1.57
MW-21SR	04/23/01	mg/L																		
MW-21SR	07/25/01	mg/L	0.59	<0.1	1067	47.1	74.8	40.1	1.62	1.5	0.004	<0.001	0.074		61	140	2.51	45.9		0.085
MW-21SR	10/11/01	mg/L																		
MW-21SR	01/15/02	mg/L	0.29	<0.1	305	37.3	68.9	27.8	2.89	<0.2	<0.001	<0.001	0.028		13	117	0.335	26.5		1.47
MW-21SR	04/11/02	mg/L																		
MW-21SR	07/16/02	mg/L	0.45	<0.1	262	45.8	42.3	33.7	2.06	1.49	0.001	<0.001	<0.01		19	143	1.67	41.9	1.47	0.813
MW-21SR	10/11/02	mg/L																		
MW-21SR	01/13/03	mg/L	0.33	0.15	317	41.3	72.2	49.2	2.38	0.99	0.007	0.001	0.044		57	73.9	0.444	28.4		0.306
MW-21SR	07/08/03	mg/L	<0.1	0.08	239	75.1	101	40.6	2.43	0.000759	0.001	0.029	0.124		47	135	1.02	36	1.41	0.513
MW-21SR	07/15/04	mg/L	<0.05	<0.023	440	66	68	46	1.8	<0.0002	0.002	<0.001	0.12		30	160	5.3	44	2.1	0.16
MW-21SR	01/15/05	mg/L	<0.05	0.11	320	38	90	36	2.1	0.00065	0.0012	<0.001	0.169		32	130	0.32	29	0.86	0.77
MW-21SR	07/15/05	mg/L	<0.05	<0.023	370	54	43	37	1.2	0.0014	0.0059	<0.001	0.13		31	130	0.59	30	1.5	0.27
MW-21SR	01/19/06	mg/L	<0.05	0.078	290	32	150	38	1.3	<0.0002	0.001	0.0016	0.36	<0.001	40	110	<0.02	27	0.42	0.19
MW-21SR	07/19/06	mg/L	<0.05	<0.023	500	74	59	50	1	0.00028	0.001	<0.001	0.51	0.0014	20	170	0.73	41	3.5	0.17
MW-21SR	01/09/07	mg/L	<0.05	0.034	320	35	95	37	1.2	0.00021	<0.001	<0.001	0.85	<0.001	16	120	0.03	29	0.44	0.38
MW-21SR	07/11/07	mg/L	<0.05	<0.023	510	53	47	37	1	<0.0002	<0.001	<0.001	0.61	<0.001	28	140	0.76	33	2.2	0.078
MW-21SR	01/31/08	mg/L	<0.05	0.14	680	48	110	41	0.62	0.00043	<0.001	<0.001	0.78	<0.001	37	120	0.4	29	0.46	0.15
MW-21SR	07/09/08	mg/L	<0.05	<0.023	550	92	46	54	0.49	<0.0002	0.001	<0.001	0.96	0.0021	25	170	2.7	40	1.4	0.046
MW-21SR	01/28/09	mg/L	<0.05		530	80	66	54	0.42	<0.0002	0.0025	0.019	0.62	0.0013	10	160	1.2	39	1.5	0.13
MW-21SR	02/27/09	mg/L								<0.0002	0.0036	<0.001	0.44	<0.001						
MW-21SR	07/21/09	mg/L	<0.05	<0.023	530	84	15	45	0.52	<0.0002	0.0012	0.0013	0.51	0.0038	21	180	3.8	41	1.6	0.023
MW-21SR	01/19/10	mg/L	<0.05	<0.023	400	65	31	42	0.36	<0.0002	0.0074	<0.001	0.36	0.0054	24	140	3.5	33	1.9	0.058
MW-21SR	07/09/10	mg/L	<0.05	<0.023	410	48	23	41	0.65	<0.0002	0.001	<0.001	0.38	0.005	19	130	2.5	29	1.2	0.03
MW-21SR	01/19/11	mg/L	<0.05	0.38	520	93	65	49	0.33	<0.0002	<0.001	<0.001	0.31	0.0033	6	180	1.5	41	1	0.08
MW-21SR	07/06/11	mg/L	<0.05	0.39	400	48	13	33	0.66	<0.0002	<0.001	<0.001	0.22	0.0027	9	140	2.4	33	1.2	0.034
MW-21SR	01/10/12	mg/L	<0.05	<0.023	480	62	28	37	0.27	<0.0002	<0.001	<0.001	0.19	0.0037	<5	160	2.8	34	1.7	0.048
MW-21SR	07/17/12	mg/L	<0.05	<0.023	530	95	12	48	0.76	<0.0002	<0.001	<0.001	0.085	0.0058	12	180	4	41	1.3	0.029
MW-21SR	01/09/13	mg/L	<0.05	<0.023	590	140	55	58	0.45	<0.0002	<0.001	<0.001	0.2	0.0041	<5	220	5.1	52	1.6	0.028
MW-21SR	07/10/13	mg/L	<0.1	0.51	560	66	11	38	0.49	<0.0002	<0.001	<0.001	0.16	0.0051	12	150	2.9	34	1.1	0.016
MW-21SR	01/15/14	mg/L	<0.05	0.028	560	110	19	48	0.4	<0.0002	<0.001	<0.001	0.1	0.0031	9	190	1.5	41	1.2	0.068
MW-21SR	07/09/14	mg/L	0.016	<0.01	600	87	10	44	0.27	<0.0002	<0.001	<0.001	0.11	0.0046	11	160	2.8	38	1.2	0.014
MW-21SR	01/21/15	mg/L	0.032	0.011	600	110	13	49	0.25	<0.0002	<0.001	<0.001	0.09	0.0047	25	180	5.7	42	1.6	0.016
MW-21SR	07/29/15	mg/L	0.03	<0.01	690	86	5.6	43	0.42	<0.0002	<0.001	<0.001	0.079	0.0054		190	4.9	41	1.3	0.025
MW-21SR	01/06/16	mg/L	0.07	0.014	520	95	9.8	44	0.26	<0.0002	<0.001	<0.001	0.11	0.0061	<5	150	2.7	35	1	0.032
MW-21SR	07/28/16	mg/L	0.019	<0.01	490	190	7.4	63	0.57	<0.0002	<0.001	<0.001	0.047	0.0048		190	4.4	46	1.6	0.059
MW-21SR	01/05/17	mg/L	0.032	<0.01	570	240	19	68	0.89	<0.0002	<0.001	<0.001	0.063	0.0041	<5	230	2.8	49	2.2	0.089
MW-21SR	07/13/17	mg/L	0.047	<0.01	560	180	3.7	66	0.57	<0.0002	<0.001	<0.001	<0.04	0.0052		220	6.9	46	1.5	0.042
MW-21SR	01/24/18	mg/L	0.17	0.14	500	240	23	77	0.29	<0.0002	<0.001	<0.001	0.054	0.0023	<5	210	0.82	49	1.2	0.074
MW-21SR	07/11/18	mg/L	0.021	0.049	520	250	6.5	78	0.69	<0.0002	<0.001	<0.001	0.049	0.0036		190	4.7	45	1.7	0.044
MW-21SR	01/09/19	mg/L	0.051	<0.01	490	440	38	120	0.54	<0.0002	<0.001	<0.001	0.057	0.0024	9.0	290	0.74	66	2.1	0.051
MW-21SR	04/22/19	mg/L											0.038							
MW-21SR	07/09/19	mg/L	0.024	0.013	580	190	3.3	71	0.60	<0.0002	<0.001	<0.001	0.037	0.0041		190	5.7	45	1.7	0.026

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-21SR	10/10/19	mg/L											0.078							
MW-21SR	01/07/20	mg/L	0.017	<0.01	600	330	8.6	110	0.39	<0.0002	<0.001	<0.001	0.04	0.0024	14	250	1.1	63	2.2	0.084
MW-21SR	04/16/20	mg/L											0.034							
MW-21SR	07/07/20	mg/L	0.043	<0.01	500	280	2.8	92	0.83	<0.0002	<0.001	<0.001	0.039	0.0039		210	5.5	52	2	0.029
MW-21SR	10/08/20	mg/L											0.084							
MW-21SR	01/13/21	mg/L	0.033	0.01	560	380	11	140	0.65	<0.0002	<0.001	<0.001	0.064	0.0054	28	270	16	68	2.2	0.033
MW-21SR	04/08/21	mg/L											<0.02							
MW-21SR	07/15/21	mg/L	0.028	<0.01	530	340	11	120	0.85	<0.0002	<0.001	<0.001	0.068	0.0049		240	8.4	63	2.2	0.028
MW-21SR	10/06/21	mg/L											0.092							
MW-22D	03/07/95	mg/L																		
MW-22D	06/07/95	mg/L																		
MW-22D	09/08/95	mg/L	0.3	<0.01	400	68	18	55							<3	100	0.4	36		
MW-22D	10/23/95	mg/L																		
MW-22D	11/27/95	mg/L	0.03	<0.01	350	48	21	46		<0.0002	0.001	<0.001			<3	76	0.07	36		
MW-22D	01/22/96	mg/L																		
MW-22D	03/06/96	mg/L	0.03	<0.01	340	34	23	46	2						<3	58	0.09	34		
MW-22D	04/24/96	mg/L																		
MW-22D	06/04/96	mg/L	0.02	<0.01	330	42	25	35	1.3	<0.0002	<0.001	<0.001		<0.001	<5	80	0.47	32		
MW-22D	07/15/96	mg/L																		
MW-22D	09/01/96	mg/L	0.4	0.03	330	33	23	40	77						<3		0.24	34		
MW-22D	12/01/96	mg/L	0.02		420	31	25	35		<0.0002	<0.001	<0.001			<3	93	0.11	26		
MW-22D	01/01/97	mg/L	0.04	0.04	380	27	24	32	1.6	<0.0002	<0.001	<0.001		<0.001	<5	71	0.05	35		2.1
MW-22D	04/01/97	mg/L			330	26	28	36								80	<0.02	27		
MW-22D	07/01/97	mg/L	0.02	<0.01	320	29	28	26	1.1	<0.0002	<0.001	<0.001		<0.001	<5	77	0.11	28		2.8
MW-22D	10/01/97	mg/L			320	32	20	31								83	0.03	29		
MW-22D	01/05/98	mg/L	0.02	0.03	320	24	27	24	1	<0.0002	<0.001	<0.001		<0.001	<5	97	0.14	26		2
MW-22D	04/06/98	mg/L			330	27	33	23								76	0.02	34		
MW-22D	07/01/98	mg/L	0.02	<0.01	360	23	28	19	1.9	<0.0002	<0.001	<0.001		<0.001	<5	99	0.31	37		5.6
MW-22D	10/05/98	mg/L			370	29	23	19								100	0.03	35		
MW-22D	01/05/99	mg/L	0.03	0.18	340	29	19	19	1.4	<0.0002	<0.001	<0.001		<0.001	<5	98	<0.02	34		2.5
MW-22D	04/05/99	mg/L			360	31	48	18								62	<0.02	33		
MW-22D	07/06/99	mg/L																		3.5
MW-22D	10/01/99	mg/L																		
MW-22D	01/05/00	mg/L	0.05	0.06	370	26	26	20	1.4	<0.0002	<0.001	<0.001	<0.05	<0.001	<5	85	<0.02	37		2.1
MW-22D	04/05/00	mg/L																		
MW-22D	07/06/00	mg/L	0.6	<0.01	310	37	42	22	3.1	0.0005	<0.001	<0.001	<0.05	<0.001	<5	76	1.3	43	0.8	8.1
MW-22D	10/21/00	mg/L																		
MW-22D	01/10/01	mg/L	0.98	0.67	201	50.7	63.4	16	3.33	0.68	<0.001	0.001	0.043		103	55.6	0.214	33.2		3.65
MW-22DR	04/23/01	mg/L																		
MW-22DR	07/25/01	mg/L	0.41	<0.1	348	51.6	106	43.2	2.37	1.35	0.005	0.002	0.082		16	123	0.689	52.6		0.28
MW-22DR	10/11/01	mg/L																		
MW-22DR	01/15/02	mg/L	0.38	<0.1	244	46	129	33.4	2.83	0.33	<0.001	<0.001	0.042		16	122	0.212	46.6		0.012
MW-22DR	04/11/02	mg/L																		
MW-22DR	07/16/02	mg/L	0.28	<0.1	219	44.5	85.2	24.4	2.19	0.65	0.001	<0.001	0.014		14	76.9	0.208	38.7	0.525	0.022
MW-22DR	10/11/02	mg/L																		
MW-22DR	01/13/03	mg/L	0.62	<0.1	207	48.2	50.5	27.1	2.23	<0.2	<0.001	0.001	0.028		18	43.2	0.181	20.9		0.013
MW-22DR	07/08/03	mg/L	<0.1	0.17	195	56	51	43.2	2.61	0.000352	0.002	0.003	0.14		20	92.1	0.228	35.1	0.41	0.164
MW-22DR	01/15/04	mg/L	0.25	<0.023	330	42	51	32	2.1	<0.0002	0.0064	<0.001	0.073		25	91	0.19	34	0.56	0.025
MW-22DR	07/15/04	mg/L	0.16	<0.023	320	44	57	34	2	<0.0002	0.0013	<0.001	0.096		23	93	0.14	33	0.51	0.026
MW-22DR	01/15/05	mg/L	0.28	<0.023	350	65	68	39	3.1	0.028	<0.001	<0.001	0.079		18	130	0.22	43	0.74	0.02
MW-22DR	07/15/05	mg/L	0.28	<0.023	410	50	76	37	2.4	<0.0002	0.0062	<0.001	0.077		24	120	0.23	45	0.68	0.061
MW-22DR	01/19/06	mg/L	0.35	<0.023	370	59	66	34	2.3	<0.0002	0.001	<0.001	0.098	<0.001	41	100	0.18	33	0.72	0.021
MW-22DR	07/19/06	mg/L	0.23	<0.023	340	51	72	32	2.6	0.00021	<0.001	<0.001	0.076	<0.001	16	110	0.21	36	0.64	0.057
MW-22DR	01/09/07	mg/L	0.33	<0.023	320	46	71	34	2	0.00045	0.001	<0.001	0.14	<0.001	14	110	0.31	38	0.79	0.028
MW-22DR	07/11/07	mg/L	0.43	<0.023	350	52	58	34	2	<0.0002	<0.001	<0.001	0.13	<0.001	31	110	0.46	37	0.68	0.36
MW-22DR	01/31/08	mg/L	0.32	0.027	710	49	60	32	2.6	0.0003	<0.001	<0.001	0.098	0.0012	18	100	0.47	34	0.69	0.56
MW-22DR	07/09/08	mg/L	0.34	0.04	390	59	58	35	2.6	<0.0002	0.0012	<0.001	0.13	<0.001	24	110	0.54	38	0.8	0.64
MW-22DR	01/28/09	mg/L	0.36		280	62	67	34	2.7	<0.0002	0.0018	<0.001	0.1	<0.001	15	110	0.43	35	0.82	0.61
MW-22DR	07/21/09	mg/L	0.6	0.03	390	110	52	49	3.2	0.0003	0.002	0.0012	0.12	0.0014	21	130	0.49	40	0.88	1
MW-22DR	01/19/10	mg/L	0.61	<0.023	390	100	45	49	3.7	0.0004	0.0058	<0.001	0.14	0.0015	20	120	0.58	41	0.91	0.97
MW-22DR	07/09/10	mg/L	0.77	<0.023	370	87	44	50	4.1	<0.0002	0.0012	<0.001	0.15	0.0013	16	100	0.43	42	0.74	0.85
MW-22DR	01/19/11	mg/L	0.61	0.27	400	69	39	37	3.8	<0.0002	<0.001	<0.001	0.13	0.001	10	100	0.55	40	0.71	1.1

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-22DR	07/06/11	mg/L	0.65	<0.023	390	120	42	39	3.8	<0.0002	<0.001	<0.001	0.11	<0.001	<5	120	0.3	50	0.73	1.6
MW-22DR	01/10/12	mg/L	0.69	<0.023	380	80	36	<30	3.4	<0.0002	<0.001	<0.001	0.11	<0.001	8	110	0.35	44	0.66	0.65
MW-22DR	07/17/12	mg/L	0.7	<0.023	380	180	44	48	3.7	<0.0002	<0.001	<0.001	0.11	<0.001	7	140	0.63	52	0.79	0.98
MW-22DR	01/09/13	mg/L	0.66	<0.023	340	57	31	26	3.1	<0.0002	<0.001	<0.001	0.1	<0.001	<5	100	0.36	39	0.57	0.68
MW-22DR	07/10/13	mg/L	0.56	0.25	340	350	39	120	4.7	<0.0002	<0.001	<0.001	0.11	<0.001	6	130	0.75	51	0.9	0.89
MW-22DR	01/15/14	mg/L	0.6	<0.023	370	330	42	110	5.1	<0.0002	<0.001	<0.001	0.1	0.0023	6	170	0.89	60	1	1.5
MW-22DR	07/09/14	mg/L	0.49	<0.01	370	160	38	51	2.6	<0.0002	<0.001	<0.001	0.089	0.0011	10	130	0.6	50	0.74	1.8
MW-22DR	01/21/15	mg/L	0.63	0.023	470	250	41	82	3.1	<0.0002	<0.001	<0.001	0.11	0.0013	41	140	0.7	61	0.71	1.3
MW-22DR	07/29/15	mg/L	0.77	0.36	500	280	44	120	3.3	<0.0002	<0.001	<0.001	0.27	0.0013		130	0.73	50	0.72	1.9
MW-22DR	01/06/16	mg/L	0.78	0.011	500	180	36	81	3.5	<0.0002	<0.001	<0.001	0.17	0.0014	17	130	0.73	53	0.73	1.2
MW-22DR	07/28/16	mg/L	0.64	<0.01	460	170	35	79	3.4	<0.0002	<0.001	<0.001	0.18	0.0016		130	<0.02	55	0.76	1.8
MW-22DR	01/05/17	mg/L	0.92	<0.01	400	130	34	70	3	0.00056	<0.001	<0.001	0.2	0.0015	<5	120	0.73	50	0.59	1.2
MW-22DR	07/13/17	mg/L	0.66	<0.01	380	300	33	150	3.4	<0.0002	<0.001	<0.001	0.17	0.0016		150	1.3	52	0.66	1.6
MW-22DR	01/24/18	mg/L	0.62	0.088	420	280	35	130	3.2	<0.0002	<0.001	<0.001	0.17	0.002	<5	150	1.4	59	0.78	1
MW-22DR	07/11/18	mg/L	0.32	0.017	340	410	27	190	2.7	<0.0002	<0.001	<0.001	0.082	0.0014		120	0.93	42	0.67	1.4
MW-22DR	01/09/19	mg/L	0.38	<0.01	360	430	29	220	3.2	<0.0002	<0.001	<0.001	0.097	0.0018	<5	120	0.80	46	0.76	1.4
MW-22DR	07/09/19	mg/L	0.28	<0.01	380	410	24	250	2.9	<0.0002	<0.001	<0.001	0.085	0.0021		120	1.1	45	0.78	1.1
MW-22DR	01/07/20	mg/L	0.22	<0.01	370	490	24	300	2.9	<0.0002	<0.001	<0.001	0.084	0.0016	9	140	0.84	46	0.77	0.77
MW-22DR	07/07/20	mg/L	0.2	0.03	350	500	25	250	2.5	<0.0002	<0.001	<0.001	0.07	0.0017		130	0.66	38	0.71	0.86
MW-22DR	01/13/21	mg/L	0.22	<0.01	380	410	22	280	2.4	<0.0002	<0.001	<0.001	0.074	0.0016	23	130	0.6	35	0.63	0.77
MW-22DR	07/14/21	mg/L	0.33	<0.1	390	140	27	160	2	<0.0002	<0.001	<0.001	0.085	0.0017		98	0.79	32	0.55	1.3
MW-23S	03/07/95	mg/L																		
MW-23S	06/07/95	mg/L																		
MW-23S	09/08/95	mg/L																		
MW-23S	10/23/95	mg/L																		
MW-23S	11/27/95	mg/L																		
MW-23S	01/22/96	mg/L																		
MW-23S	03/06/96	mg/L																		
MW-23S	04/24/96	mg/L																		
MW-23S	06/04/96	mg/L																		
MW-23S	07/15/96	mg/L																		
MW-23S	09/01/96	mg/L																		
MW-23S	12/01/96	mg/L																		
MW-23S	01/01/97	mg/L																		
MW-23S	04/01/97	mg/L																		
MW-23S	07/01/97	mg/L																		
MW-23S	10/01/97	mg/L																		
MW-23S	01/05/98	mg/L																		
MW-23S	04/06/98	mg/L																		
MW-23S	07/01/98	mg/L																		
MW-23S	10/05/98	mg/L																		
MW-23S	01/05/99	mg/L																		
MW-23S	04/05/99	mg/L																		
MW-23S	07/06/99	mg/L																		
MW-23S	10/01/99	mg/L																		
MW-23S	01/05/00	mg/L																		
MW-23S	04/05/00	mg/L																		
MW-23S	07/06/00	mg/L	0.04	<0.01	240	47	81	190	2.8	<0.0002	<0.001	<0.001	<0.05	0.001	<5	50	<0.02	44	0.06	0.032
MW-23S	10/21/00	mg/L																		
MW-23S	01/10/01	mg/L	0.13	<0.1	268	41	59.7	42.3	2.29	20.6	0.036	0.068	0.101		17	90.2	4.02	31.5		3.26
MW-23S	04/23/01	mg/L																		
MW-23SR	07/25/01	mg/L	0.38	0.14	476	39.5	38.5	34.9	2.78	1.43	0.003	<0.001	0.048		27	54.6	0.054	56.8		0.076
MW-23SR	10/11/01	mg/L																		
MW-23SR	01/15/02	mg/L	0.11	<0.1	192	33.6	49	32.1	2.35	0.815	0.001	<0.001	0.013		7	90.2	0.056	33.4		0.002
MW-23SR	04/11/02	mg/L																		
MW-23SR	07/16/02	mg/L	0.03	<0.1	210	23.1	38.5	26	1.76	1.06	<0.001	<0.001	<0.01		9	81	0.045	33	0.068	0.056
MW-23SR	10/11/02	mg/L																		
MW-23SR	01/13/03	mg/L	0.21	<0.1	317	21.9	26.9	32.6	2.44	0.79	0.001	0.001	0.042		15	42.1	0.078	35.2		0.055
MW-23SR	07/08/03	mg/L	<0.1	0.08	265	58.4	47.6	42.4	2.76	<0.0002	<0.001	0.006	0.096		84	102	1.15	46.7	0.124	0.014
MW-23SR	01/15/04	mg/L	<0.05	<0.023	390	58	110	43	2.1	0.00055	0.0067	0.001	0.057		98	110	0.1	58	0.083	0.049
MW-23SR	07/15/04	mg/L	<0.05	<0.023	570	43	63	36	1.6	<0.0002	0.0012	<0.001	0.062		91	110	0.045	41	0.15	0.031
MW-23SR	01/15/05	mg/L	<0.05	0.036	340	34	33	35	1.5	0.00065	0.0011	<0.001	0.059		17	100	0.24	34	0.16	0.096

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-23SR	07/15/05	mg/L	<0.05	<0.023	340	37	42	32	1.2	0.00039	0.0034	<0.001	0.072		33	100	0.06	32	0.3	0.045
MW-23SR	01/19/06	mg/L	<0.05	<0.023	350	56	84	42	1.2	<0.0002	0.002	<0.001	0.18	<0.001	30	110	0.19	40	0.054	0.028
MW-23SR	07/19/06	mg/L	<0.05	<0.023	360	50	55	36	1.1	0.00029	<0.001	<0.001	0.16	<0.001	16	110	0.14	35	0.12	0.032
MW-23SR	01/09/07	mg/L	<0.05	<0.023	350	47	60	42	0.71	0.00028	0.003	<0.001	1.1	0.0012	9	110	0.1	31	0.11	0.14
MW-23SR	07/11/07	mg/L	<0.05	0.029	380	30	35	32	1.2	<0.0002	<0.001	<0.001	0.45	0.0014	38	96	0.63	28	0.11	0.87
MW-23SR	01/31/08	mg/L	<0.05	0.032	640	52	66	39	0.94	0.0005	<0.001	<0.001	0.72	<0.001	5	110	0.02	31	0.0066	0.069
MW-23SR	07/09/08	mg/L	<0.05	<0.023	360	53	41	36	1	<0.0002	<0.001	<0.001	0.73	<0.001	22	100	0.34	34	0.11	0.051
MW-23SR	01/28/09	mg/L	<0.05		430	56	37	36	1.1	<0.0002	0.0021	<0.001	0.53	0.0019	5	110	0.69	35	0.11	0.07
MW-23SR	07/21/09	mg/L	<0.05	0.037	280	19	9.8	15	0.32	0.00023	0.0018	<0.001	0.15	<0.001	11	82	<0.02	24	0.011	0.13
MW-23SR	01/19/10	mg/L	<0.05	<0.023	290	35	29	32	0.67	0.00048	0.0051	<0.001	0.28	<0.001	13	96	0.11	26	0.063	0.085
MW-23SR	07/09/10	mg/L	<0.05	<0.023	400	36	37	35	1.5	<0.0002	0.0015	<0.001	0.38	0.0021	9	110	0.59	31	0.5	0.044
MW-23SR	01/19/11	mg/L	<0.05	0.11	340	52	72	32	1.1	<0.0002	<0.001	<0.001	0.29	<0.001	<5	110	0.11	31	0.29	0.048
MW-23SR	07/06/11	mg/L	<0.05	0.051	330	19	11	25	0.82	<0.0002	<0.001	<0.001	0.096	<0.001	<5	98	0.069	28	0.041	0.3
MW-23SR	01/10/12	mg/L	<0.05	<0.023	410	67	22	33	0.66	<0.0002	<0.001	<0.001	0.21	<0.001	<5	120	0.064	34	0.074	0.29
MW-23SR	07/17/12	mg/L	<0.05	<0.023	390	32	14	26	0.66	<0.0002	<0.001	<0.001	0.16	0.0017	<5	110	0.46	31	0.17	0.084
MW-23SR	01/09/13	mg/L	<0.05	<0.023	340	53	66	38	1.1	<0.0002	<0.001	<0.001	0.26	0.0011	<5	130	0.3	37	0.34	0.063
MW-23SR	07/10/13	mg/L	<0.1	<0.023	340	26	14	25	0.53	<0.0002	<0.001	<0.001	0.11	<0.001	<5	87	0.051	25	0.038	0.26
MW-23SR	01/15/14	mg/L	0.052	0.03	340	37	29	35	0.58	<0.0002	<0.001	<0.001	0.18	<0.001	<5	110	0.08	28	0.048	0.2
MW-23SR	07/10/14	mg/L	<0.01	0.017	340	67	17	39	0.43	<0.0002	<0.001	<0.001	0.15	<0.001	<5	110	0.022	29	0.037	0.29
MW-23SR	01/21/15	mg/L	0.026	0.01	420	47	20	38	0.57	<0.0002	<0.001	<0.001	0.16	<0.001	10	110	0.19	32	0.14	0.052
MW-23SR	07/29/15	mg/L	0.035	<0.01	370	30	13	27	0.66	<0.0002	<0.001	<0.001	0.14	0.0013		97	0.4	25	0.23	0.015
MW-23SR	01/06/16	mg/L	0.11	<0.01	340	26	22	28	0.43	<0.0002	<0.001	<0.001	0.15	<0.001	<5	96	0.037	25	0.025	0.096
MW-23SR	07/28/16	mg/L	<0.01	<0.01	420	31	9.4	26	0.81	<0.0002	<0.001	<0.001	0.12	0.003		120	0.69	35	0.51	0.038
MW-23SR	01/05/17	mg/L	0.038	<0.01	420	40	15	42	0.55	<0.0002	<0.001	<0.001	0.17	<0.001	<5	110	0.24	29	0.1	0.41
MW-23SR	07/13/17	mg/L	0.045	<0.01	360	35	5.4	26	2	<0.0002	<0.001	<0.001	0.092	<0.001		110	0.074	29	<0.005	0.49
MW-23SR	01/24/18	mg/L	0.13	<0.01	390	54	43	47	0.3	<0.0002	<0.001	<0.001	0.13	<0.001	<5	120	1.6	32	0.052	0.42
MW-23SR	07/11/18	mg/L	0.021	0.016	370	42	9.7	23	0.44	<0.0002	<0.001	<0.001	0.062	0.001		99	0.2	27	0.19	0.054
MW-23SR	01/09/19	mg/L	<0.01	<0.01	330	54	30	41	0.39	<0.0002	<0.001	<0.001	0.13	<0.001	<5	100	0.16	29	0.047	0.22
MW-23SR	04/22/19	mg/L											0.029							
MW-23SR	07/09/19	mg/L	<0.01	<0.01	290	24	2.9	20	0.15	<0.0002	<0.001	<0.001	0.036	<0.001		75	0.035	20	0.027	0.20
MW-23SR	10/10/19	mg/L											0.080							
MW-23SR	01/07/20	mg/L	<0.01	<0.01	390	58	11	36	0.25	<0.0002	<0.001	<0.001	0.066	<0.001	5	100	0.042	33	0.014	0.59
MW-23SR	04/16/20	mg/L											0.038							
MW-23SR	07/07/20	mg/L	<0.01	<0.01	350	24	4.4	24	0.37	<0.0002	<0.001	<0.001	0.05	0.0015		100	0.58	28	0.16	0.014
MW-23SR	10/08/20	mg/L											0.07							
MW-23SR	01/13/21	mg/L	<0.01	<0.01	340	44	21	38	0.79	<0.0002	<0.001	<0.001	0.11	0.0035	15	100	1	30	0.17	0.038
MW-23SR	04/08/21	mg/L											0.084							
MW-23SR	07/15/21	mg/L	0.038	0.041	390	45	33	43	0.76	<0.0002	<0.001	<0.001	0.12	0.0029		110	0.73	33	0.14	0.026
MW-23SR	10/06/21	mg/L											0.16							
MW-24D	03/07/95	mg/L																		
MW-24D	06/07/95	mg/L																		
MW-24D	09/08/95	mg/L																		
MW-24D	10/23/95	mg/L																		
MW-24D	11/27/95	mg/L																		
MW-24D	01/22/96	mg/L																		
MW-24D	03/06/96	mg/L																		
MW-24D	04/24/96	mg/L																		
MW-24D	06/04/96	mg/L																		
MW-24D	07/15/96	mg/L																		
MW-24D	09/01/96	mg/L																		
MW-24D	12/01/96	mg/L																		
MW-24D	01/01/97	mg/L																		
MW-24D	04/01/97	mg/L																		
MW-24D	07/01/97	mg/L																		
MW-24D	10/01/97	mg/L																		
MW-24D	01/05/98	mg/L																		
MW-24D	04/06/98	mg/L																		
MW-24D	07/01/98	mg/L																		
MW-24D	10/05/98	mg/L																		
MW-24D	01/05/99	mg/L																		
MW-24D	04/05/99	mg/L																		
MW-24D	07/06/99	mg/L																		

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-24D	10/01/99	mg/L																		
MW-24D	01/05/00	mg/L	0.14	0.01	<5	140	13	14	5.1	<0.0002	<0.001	0.048	<0.05	<0.001	<5	320	<0.02	<1		1.2
MW-24D	04/05/00	mg/L																		
MW-24D	07/06/00	mg/L	0.1	<0.01	<5	89	15	18	4.4	0.0002	<0.001	0.08	<0.05	<0.001	24	320	<0.02	<1	<0.02	1.5
MW-24D	10/21/00	mg/L																		
MW-24D	01/10/01	mg/L	0.15	<0.1	<2	29.4	49.3	17.7	5.9	33.2	0.098	0.07	0.11		20	117	2.86	4.03		9.34
MW-24D	04/23/01	mg/L																		
MW-24DR	07/25/01	mg/L	0.21	0.1	287	65	21.1	45.7	5.17	1.05	<0.001	<0.001	0.049		16	97.5	1.96	23.9		0.87
MW-24DR	10/11/01	mg/L																		
MW-24DR	01/15/02	mg/L	0.12	<0.1	178	27.8	48.7	23.8	3.93	0.86	<0.001	<0.001	0.032		11	84.1	2.28	22.9		0.301
MW-24DR	04/11/02	mg/L																		
MW-24DR	07/16/02	mg/L	0.05	<0.1	183	50.5	22	37.4	4.38	<0.2	<0.001	<0.001	0.103		28	92.4	2.01	30.3	0.325	0.076
MW-24DR	10/11/02	mg/L																		
MW-24DR	01/13/03	mg/L	0.14	<0.1	225	52.3	26.6	36.5	3.61	<0.2	<0.001	<0.001	0.042		<5	48.8	1.38	17.4		2.69
MW-24DR	07/08/03	mg/L	<0.1	0.08	161	46.8	34.4	40	3.69	<0.0002	<0.001	0.003	0.11		22	66.9	1.16	23.4	0.272	0.058
MW-24DR	01/15/04	mg/L	0.064	0.15	220	29	140	29	3.3	0.00047	0.003	<0.001	0.1		22	80	1.2	30	0.3	0.08
MW-24DR	07/15/04	mg/L	<0.05	<0.023	290	65	12	41	5.3	<0.0002	0.0011	<0.001	0.17		14	92	1.9	22	0.41	0.027
MW-24DR	01/15/05	mg/L	<0.05	0.042	340	38	49	39	6.6	<0.0002	0.0011	<0.001	0.24		12	110	3.9	28	0.56	0.047
MW-24DR	07/15/05	mg/L	<0.05	<0.023	280	41	27	38	3.8	<0.0002	0.0058	<0.001	0.22		11	87	2.7	22	0.55	0.049
MW-24DR	01/19/06	mg/L	<0.05	0.029	250	20	93	23	2.9	<0.0002	0.001	<0.001	0.95	0.0046	10	80	2.9	19	0.53	0.033
MW-24DR	07/19/06	mg/L	<0.05	<0.023	290	60	34	42	5.8	<0.0002	<0.001	<0.001	0.61	0.0045	32	91	2.4	23	0.5	0.011
MW-24DR	01/09/07	mg/L	<0.05	<0.023	280	77	47	41	4.8	<0.0002	0.001	<0.001	0.53	0.0058	13	100	3.2	24	0.74	0.019
MW-24DR	07/11/07	mg/L	<0.05	<0.023	380	380	33	190	5.2	<0.0002	<0.001	<0.001	0.13	0.007	34	150	5.3	34	0.72	0.092
MW-24DR	01/31/08	mg/L	<0.05	0.23	600	520	28	280	7	<0.0002	<0.001	<0.001	0.11	0.0066	23	140	3.3	33	0.69	0.051
MW-24DR	07/09/08	mg/L	<0.05	0.39	340	400	31	290	5.2	<0.0002	0.001	<0.001	0.11	0.0047	21	110	2.1	25	0.36	0.055
MW-24DR	01/28/09	mg/L	<0.05		300	680	31	330	5.5	<0.0002	0.0021	<0.001	0.25	0.0078	21	160	2.8	39	0.46	0.043
MW-24DR	07/21/09	mg/L	<0.05	0.85	360	600	29	320	4.3	<0.0002	0.0015	<0.001	0.14	0.006	22	130	1.4	31	0.3	0.33
MW-24DR	01/19/10	mg/L	<0.05	0.76	280	780	31	370	4.7	<0.0002	0.0061	<0.001	0.094	0.0068	38	150	1.6	37	0.24	0.29
MW-24DR	07/09/10	mg/L	<0.05	0.92	330	710	29	320	4.6	<0.0002	0.0013	<0.001	0.1	0.0052	12	130	1.4	32	0.21	0.23
MW-24DR	01/19/11	mg/L	<0.05	0.85	320	600	28	300	3.7	<0.0002	<0.001	<0.001	0.061	0.0016	12	89	0.68	22	0.093	0.072
MW-24DR	07/06/11	mg/L	<0.05	1.9	300	230	33	100	2.9	<0.0002	<0.001	<0.001	0.09	0.0018	8	130	0.5	31	0.17	0.41
MW-24DR	01/10/12	mg/L	0.068	0.49	400	300	24	230	3.1	<0.0002	<0.001	<0.001	0.08	0.0017	5	94	0.57	22	0.088	0.12
MW-24DR	07/17/12	mg/L	<0.05	0.78	340	320	26	210	3.1	<0.0002	<0.001	<0.001	0.1	0.001	<5	110	0.65	28	0.067	0.22
MW-24DR	01/09/13	mg/L	0.051	0.17	350	330	26	210	3.3	<0.0002	<0.001	<0.001	0.092	0.0019	<5	110	0.54	27	0.057	0.19
MW-24DR	07/10/13	mg/L	<0.1	1.3	350	150	31	95	2.5	<0.0002	<0.001	<0.001	0.073	0.0017	<5	100	0.41	25	0.06	0.31
MW-24DR	01/15/14	mg/L	0.081	0.7	390	440	34	260	3.9	<0.0002	<0.001	<0.001	0.071	0.0027	<5	140	0.36	33	0.084	0.14
MW-24DR	07/10/14	mg/L	0.031	1.2	390	420	30	280	2	<0.0002	<0.001	<0.001	0.062	<0.001	<5	120	0.11	30	0.024	0.23
MW-24DR	01/20/15	mg/L	0.019	1.3	400	440	30	290	2	<0.0002	<0.001	<0.001	0.034	<0.001	36	110	0.1	31	<0.005	0.13
MW-24DR	07/29/15	mg/L	0.066	1.3	440	570	32	300	2.1	<0.0002	<0.001	<0.001	0.04	<0.001		130	0.098	32	<0.005	0.22
MW-24DR	01/06/16	mg/L	0.12	1.2	410	450	28	310	1.9	<0.0002	0.0018	<0.001	0.042	<0.001	<5	100	0.074	24	<0.005	0.43
MW-24DR	07/28/16	mg/L	0.03	1.5	420	450	32	330	2	<0.0002	<0.001	<0.001	0.033	<0.001		110	<0.02	27	<0.005	0.87
MW-24DR	01/05/17	mg/L	0.041	0.93	380	380	22	260	1.7	<0.0002	<0.001	<0.001	0.048	<0.001	<5	120	0.11	26	<0.005	0.4
MW-24DR	07/13/17	mg/L	0.041	0.94	390	360	22	25	0.45	<0.0002	<0.001	<0.001	0.064	<0.001		150	0.21	30	0.096	0.14
MW-24DR	01/24/18	mg/L	0.08	0.61	330	180	30	130	1.3	<0.0002	<0.001	<0.001	0.061	<0.001	<5	110	<0.025	24	<0.005	0.36
MW-24DR	07/11/18	mg/L	0.01	0.18	230	49	23	28	0.83	<0.0002	<0.001	<0.001	0.06	<0.001		73	<0.02	16	<0.005	0.33
MW-24DR	01/09/19	mg/L	<0.01	0.011	280	23	37	27	1.4	<0.0002	<0.001	<0.001	0.10	<0.001	<5	86	<0.02	20	<0.005	0.17
MW-24DR	04/22/19	mg/L											0.087							
MW-24DR	07/09/19	mg/L	<0.01	0.51	300	150	21	65	2.1	<0.0002	<0.001	<0.001	0.097	<0.001		120	0.027	26	<0.005	0.36
MW-24DR	10/10/19	mg/L											0.094							
MW-24DR	01/07/20	mg/L	<0.01	0.41	320	140	12	82	1.8	<0.0002	<0.001	<0.001	0.082	<0.001	6	110	<0.02	25	<0.005	0.52
MW-24DR	04/16/20	mg/L											0.046							
MW-24DR	07/07/20	mg/L	<0.01	2.0	400	380	22	210	2.3	<0.0002	<0.001	<0.001	0.044	<0.001		160	<0.02	32	<0.005	0.67
MW-24DR	10/08/20	mg/L											0.05							
MW-24DR	01/13/21	mg/L	<0.01	0.83	360	170	13	140	2.1	<0.0002	<0.001	<0.001	0.062	<0.001	16	110	0.027	22	<0.005	1.1
MW-24DR	04/08/21	mg/L											0.063							
MW-24DR	07/14/21	mg/L	<0.01	1.4	420	290	21	220	2.1	<0.0002	<0.001	<0.001	0.056	<0.001		140	0.027	33	<0.005	0.34
MW-24DR	10/06/21	mg/L											0.5							
MW-25	03/07/95	mg/L	0.02	<0.01	280	23	46	4							<3		0.5	31		
MW-25	06/07/95	mg/L	0.02	<0.01	260	18	46	4.3	1.4	<0.0002	<0.001	<0.001		0.002	<3		1.2	31		
MW-25	09/08/95	mg/L	1.9	<0.01	310	20	43	6.4	1.9	<0.0002	<0.001	<0.001		0.002	<3		0.77	37	0.03	0.2
MW-25	10/23/95	mg/L	0.51	0.01	290	23	52	4.4	1.6	<0.0002	0.003	<0.001		0.002	<5		0.67	31	0.02	0.14
MW-25	11/27/95	mg/L	0.33	<0.01	300	24	46	4	1.7	<0.0002	<0.001	<0.001		0.002	<3	83	0.63	36	0.02	0.066

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-25	01/22/96	mg/L	0.11	<0.01	300	27	48	4.2	1.4	<0.0002	<0.001	<0.001		0.002	<5		0.53	31	0.02	0.038
MW-25	03/06/96	mg/L	0.07	<0.01	310	26	48	4.2	1.3	<0.0002	<0.001	<0.001		0.002	<5	93	0.56	36	0.02	0.049
MW-25	04/24/96	mg/L	0.04	<0.01	320	26	47	4.6	1.2	<0.0002	<0.001	<0.001		0.002	10		0.59	30	<0.02	0.032
MW-25	06/04/96	mg/L	0.16	<0.01	310	27	46	5.2	1.4	<0.0002	<0.001	<0.001		0.002	<5	73	0.58	31	0.02	0.032
MW-25	07/15/96	mg/L	0.06	<0.01	300	26	50	5.3	1.4	<0.0002	<0.001	<0.001		0.002	<5		0.52	31	0.02	0.032
MW-25	09/01/96	mg/L	0.26	0.11	240	31	44	5.5	2	<0.0002	<0.001	<0.001		0.002	<5	87	0.59	35	0.03	0.35
MW-25	12/01/96	mg/L	0.18	<0.01	370	25	49	6	1.9	<0.0002	<0.001	<0.001		0.002	<5	99	0.51	34	0.02	0.096
MW-25	01/01/97	mg/L	0.04	<0.01	270	24	49	5.3	1.5	<0.0002	<0.001	<0.001		0.002	<5	97	0.57	37	0.02	0.023
MW-25	04/01/97	mg/L														110	7.44	317		
MW-25	07/01/97	mg/L	0.06	<0.01	300	26	47	5.9	1.4	<0.0002	<0.001	<0.001		0.002	<5	100	1.8	35	0.02	0.017
MW-25	10/01/97	mg/L	0.04	<0.01	300	28	45	6.3	1.4						<5	94	0.62	30	0.02	
MW-25	01/05/98	mg/L	0.02	<0.01	300	26	49	6.7	1.3	<0.0002	<0.001	<0.001		0.002	<5	120	0.59	30		0.019
MW-25	04/06/98	mg/L			310	23	48	7								120	0.59	37		
MW-25	07/01/98	mg/L	0.03	<0.01	300	32	46	7.6	1.5	<0.0002	<0.001	<0.001		0.002	<5	110	0.61	41		0.033
MW-25	10/05/98	mg/L			310	22	39	7.8								100	0.56	34		
MW-25	01/05/99	mg/L	0.03	<0.01	310	31	61	8	1.6	<0.0002	<0.001	<0.001		0.001	<5	100	0.32	36		0.032
MW-25	04/05/99	mg/L			310	32	47	8.7								98	0.53	32		
MW-25	07/06/99	mg/L	0.06	<0.01	360	41	55	9.6	1.5	<0.0002	<0.001	<0.001		0.002	<5	120	0.48	40		0.008
MW-25	10/01/99	mg/L																		
MW-25	01/05/00	mg/L	0.03	<0.01	360	25	53	9.7	1.5	<0.0002	<0.001	<0.001	<0.05	0.002	<5	100	0.48	35		0.08
MW-25	04/05/00	mg/L																		
MW-25	07/06/00	mg/L	0.02	<0.01	330	25	60	8.8	1.5	<0.0002	<0.001	<0.001	<0.05	0.002	<5	110	0.43	38	0.02	0.056
MW-25	10/21/00	mg/L																		
MW-25	01/10/01	mg/L	0.97	<0.1	201	28.5	55.4	10.5	1.59	2.91	<0.001	0.004	0.018		11	103	0.423	31.8		0.87
MW-25	04/23/01	mg/L																		
MW-25	07/25/01	mg/L	0.53	<0.1	164	35.1	52.6	20	1.84	1.81	0.001	<0.001	0.035		18	189	0.291	33.3		0.833
MW-25	10/11/01	mg/L																		
MW-25	01/15/02	mg/L	0.2	<0.1	209	38.9	47.7	11.3	2.03	<0.2	<0.001	<0.001	<0.01		20	94.2	0.453	33.3		1.5
MW-25	04/11/02	mg/L																		
MW-25	07/16/02	mg/L	0.09	<0.1	201	38	42.7	13.6	2.04	0.51	<0.001	<0.001	0.02		16	130	0.49	44.2	0.023	0.271
MW-25	10/11/02	mg/L																		
MW-25	01/13/03	mg/L	0.23	<0.1	201	52.3	50.8	14.2	2.42	<0.2	0.031	<0.001	<0.01		<5	48.9	0.196	22.5		2.4
MW-25	04/15/03	mg/L	<0.1	0.22	213	57.5	45.8	19	2.35						6.8		0.012	14.7	0.009	
MW-25	07/09/03	mg/L	0.25	0.11	207	63.3	43.4	26.2	3.02	0.000942	<0.001	0.003	0.048		63	115	0.219	37.6	0.023	4.1
MW-25	07/09/03	mg/L	0.34	0.22	213	55.8	44.1	16.9	2.78	0.000801	<0.001	0.004	0.037		70		0.227	40.1	0.021	4.64
MW-25	01/15/04	mg/L	<0.05	0.04	360	58	55	31	2.5	0.00026	0.0054	0.0024	0.045		180	110	0.66	37	0.037	2.3
MW-25	04/15/04	mg/L	<0.05	<0.023	380	65	53	30	2.6						17		0.8	38	0.028	
MW-25	07/15/04	mg/L	<0.05	<0.023	360	65	53	30	2.8	0.0009	<0.001	<0.001	0.07		6	110	0.52	36	0.037	1.9
MW-25	10/15/04	mg/L	0.099	0.04	240	66	48	31	2.7						43		0.79	36	0.03	
MW-25	01/15/05	mg/L	<0.05	0.041	360	62	60	29	2.8	<0.0002	0.0013	<0.001	<0.05		14	120	0.94	38	0.03	0.37
MW-25	04/15/05	mg/L	0.08	<0.023	320	56	52	27	2.7						<5		0.65	36	0.032	
MW-25	07/15/05	mg/L	0.054	<0.023	360	63	57	29	2.5	<0.0002	0.0075	<0.001	0.036		60	120	0.63	38	0.034	1
MW-25	10/15/05	mg/L	<0.05	<0.023	360	60	53	29	2.7						<5		0.68	35	0.08	
MW-25	01/18/06	mg/L	<0.05	<0.023	360	50	53	35	2.3	<0.0002	0.003	<0.001	<0.05	0.0026	16		0.7	35	0.031	0.33
MW-25	04/28/06	mg/L	<0.05	<0.023	360	59	48	30	2.8				0.023		14		0.72	36	0.034	
MW-25	07/21/06	mg/L	<0.05		350	64		33	3.1	<0.0002	0.0016	0.0027	0.063	0.0029	26		1.6		0.047	1
MW-25R	04/28/06	mg/L	<0.05	<0.023	350	47	48	25	2.5				<0.02		14		0.66	35	0.045	
MW-25R	07/20/06	mg/L	<0.05	<0.023	350	51	48	24	2.7	<0.0002	0.001	<0.001	0.041	0.0032	22	120	0.83	38	0.041	0.019
MW-25R	10/19/06	mg/L	<0.05	<0.023	370	57	58	25	2.6				0.057		<5		0.79	38	<0.05	
MW-25R	01/12/07	mg/L	<0.05	<0.023	330	50	60	23	2.3	<0.0002	<0.001	<0.001	0.038	0.0034	14	110	0.82	37	0.037	0.018
MW-25R	04/12/07	mg/L	<0.05	<0.023	330	55	48	24	2.7				0.048		14		0.83	36	<0.005	
MW-25R	07/12/07	mg/L	<0.05	<0.023	350	61	66	24	1.8	<0.0002	0.002	<0.001	<0.02	0.0034	12	110	0.94	35	0.036	0.025
MW-25R	10/19/07	mg/L	<0.05	<0.023	340	43	65	26	2.2				0.052		8		0.79	35	0.036	
MW-25R	02/04/08	mg/L	<0.05	<0.023	650	32	63	21	2.5	<0.0002	0.0019	<0.001	0.048	0.0031	16	100	0.77	34	0.031	0.02
MW-25R	04/25/08	mg/L	<0.05	0.027	380	36	53	35	4.9				<0.05		12		1.6	66	0.027	
MW-25R	06/08/08	mg/L							2.1								0.77			
MW-25R	07/10/08	mg/L	<0.05	<0.023	240	32	54	18	2.3	<0.0002	<0.001	<0.001	0.043	0.0034	15	110	0.77	34	0.04	0.011
MW-25R	10/17/08	mg/L	0.12	<0.023	320	30	59	17	2.3				<0.05	0.003	8		0.78	34	0.03	
MW-25R	01/28/09	mg/L	<0.05		360	32	66	17	2.3	<0.0002	0.0013	0.004	0.04	0.0035	<5	110	0.79	33	0.036	0.013
MW-25R	02/27/09	mg/L								<0.0002	0.0031	<0.001	0.044	0.0036						
MW-25R	04/14/09	mg/L	<0.05	<0.023	290	28	52	16	2				<0.05		20		0.78	33	0.034	
MW-25R	07/22/09	mg/L	<0.05	0.063	340	33	58	17	2	<0.0002	<0.001	<0.001	0.037	0.0031	7	100	0.76	32	0.032	0.0075

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-25R	10/16/09	mg/L	<0.05	<0.023	310	28	58	17	2.2				<0.05		13		0.83	35	0.031	
MW-25R	01/21/10	mg/L	<0.05	<0.023	300	28	58	17	2.3	<0.0002	<0.001	<0.001	0.042	0.0035	<5	100	0.78	33	0.033	0.012
MW-25R	04/13/10	mg/L	<0.05	<0.023	310	30	52	15	2.1				<0.05		<5		0.85	34	0.036	
MW-25R	07/08/10	mg/L	<0.05	<0.023	280	29	53	17	2.3	<0.0002	<0.001	<0.001	0.035	0.0035	<5	100	0.82	34	0.037	0.017
MW-25R	10/15/10	mg/L	<0.05	<0.023	380	33	55	16	2.1				<0.05		<5		0.76	34	0.038	
MW-25R	01/20/11	mg/L	0.05	<0.023	350	29	56	15	2.3	<0.0002	<0.001	<0.001	0.027	0.0031	<5	100	0.81	33	0.032	0.026
MW-25R	01/20/11	mg/L	0.05	<0.023	350	29	56	15	2.3	<0.0002	<0.001	<0.001	0.027	0.0031	<5	100	0.81	33	0.032	0.026
MW-25R	04/12/11	mg/L	<0.05	0.16	310	26	57	14	2				<0.05		<5		0.78	34	0.033	
MW-25R	04/12/11	mg/L	<0.05	0.16	310	26	57	14	2				<0.05		<5		0.78	34	0.033	
MW-25R	07/07/11	mg/L	0.083	<0.023	320	30	62	34	5.2	<0.0002	0.0012	<0.001	0.042	0.0036	<5	220	1.9	73	0.032	0.024
MW-25R	07/07/11	mg/L	0.071	<0.023	310	29	65	34	5.1	<0.0002	<0.001	<0.001	<0.05	0.0026	<5	220	1.8	72	0.032	0.028
MW-25R	10/21/11	mg/L	0.063	<0.023	320	31	58	16	2.3				<0.05		<5		0.73	35	0.032	
MW-25R	10/21/11	mg/L	0.063	<0.023	320	31	58	16	2.3				<0.05		<5		0.73	35	0.032	
MW-25R	01/12/12	mg/L	<0.05	<0.023	320	29	52	18	2.3	<0.0002	<0.001	<0.001	0.044	0.0036	<5	110	0.8	35	0.035	0.011
MW-25R	04/10/12	mg/L	<0.05	<0.023	350	32	57	18	2.5				<0.05		<5		0.88	34	0.035	
MW-25R	07/18/12	mg/L	<0.05	<0.023	310	34	52	18	2.4	<0.0002	<0.001	<0.001	0.033	0.0035	7	120	0.87	36	0.034	0.019
MW-25R	10/05/12	mg/L	0.056	<0.023	320	38	56	17	2.3				<0.05		10		0.82	34	0.032	
MW-25R	01/10/13	mg/L	0.057	<0.023	340	29	54	16	2.3	<0.0002	<0.001	<0.001	0.03	0.0033	<5	110	0.81	33	0.032	0.039
MW-25R	04/12/13	mg/L	0.086	<0.023	320	30	50	14	2.2				<0.05		<5		0.76	33	0.032	
MW-25R	07/12/13	mg/L	<0.1	<0.023	370	33	55	17	2.4	<0.0002	<0.001	<0.001	0.03	0.0032	<5	120	1.3	36	0.035	0.038
MW-25R	10/15/13	mg/L	<0.1	<0.023	340	40	54	19	2.4	<0.0002	<0.001	<0.001	<0.05	0.0038	<5		0.84	35	0.039	0.015
MW-25R	01/14/14	mg/L	<0.05	<0.023	350	35	59	17	2.4	<0.0002	<0.001	<0.001	0.033	0.0034	<5	120	0.91	35	0.036	0.016
MW-25R	04/04/14	mg/L	<0.05	<0.023	120	31	53	14	1.9				<0.05		<5		0.8	38	0.035	
MW-25R	07/11/14	mg/L	0.044	<0.02	350	31	59	11	1.8	<0.0002	<0.001	<0.001	0.021	0.003	5	120	0.82	37	0.032	0.011
MW-25R	10/21/14	mg/L	0.024	<0.01	350	32	55	11	1.8				<0.05		<5		0.95	35	0.037	
MW-25R	01/22/15	mg/L	0.042	<0.010	380	34	50	12	1.8	<0.00020	<0.0010	<0.0010	0.025	0.0033	26	120	0.93	39	0.029	0.04
MW-25R	04/02/15	mg/L	0.068	0.01	370	39		15	1.9				<0.05				0.93			
MW-25R	07/30/15	mg/L	0.13	<0.01	390	35	53	13	1.9	0.0018	0.0037	0.0034	0.028	0.0051	<5	110	0.87	36	0.045	0.018
MW-25R	10/13/15	mg/L	0.064		400	34		12	1.8				<0.05		<5		0.92		0.036	
MW-25R	01/07/16	mg/L	0.075	0.011	380	2.5	21	12	1.9	<0.0002	<0.001	<0.001	0.031	0.0038	<5	120	0.96	38	0.036	0.023
MW-25R	04/12/16	mg/L	0.034						2.2				<0.05				1			
MW-25R	07/29/16	mg/L	0.034	0.01	370	37	49	12	1.9	<0.0002	<0.001	<0.001	0.027	0.004		120	0.97	42	0.036	0.052
MW-25R	10/07/16	mg/L	0.14						1.9				<0.05				0.97			
MW-25R	01/06/17	mg/L	0.063	<0.01	370	36	49	11	2.1	<0.0002	<0.001	<0.001	<0.05	0.004	<5	120	0.99	36	0.035	0.056
MW-25R	04/04/17	mg/L	0.062						2				<0.05				1			
MW-25R	07/13/17	mg/L	0.043	<0.01	360	51	50	14	2.1	<0.0002	<0.001	<0.001	0.025	0.004		140	1.1	40	0.035	0.075
MW-25R	10/06/17	mg/L	0.16						1.9				<0.05				1.1			
MW-25R	01/25/18	mg/L	0.061	<0.01	390	55	55	13	1.9	<0.0002	<0.001	<0.001	0.029	0.0038	<5	130	1.1	44	0.036	0.027
MW-25R	04/05/18	mg/L	0.026						2.1				<0.05				1.1			
MW-25R	07/11/18	mg/L	0.050	<0.01	370	76	50	14	1.9	<0.0002	<0.001	<0.001	0.03	0.0037		130	1.1	39	0.035	0.066
MW-25R	10/09/18	mg/L	0.03						2				0.033				0.98			
MW-25R	01/10/19	mg/L	0.033	<0.01	360	77	49	19	2.2	<0.0002	<0.001	<0.001	0.036	0.0035	28	140	0.99	43	0.037	0.045
MW-25R	04/23/19	mg/L	0.033						2.7				0.037				1.1			
MW-25R	07/10/19	mg/L	0.030	<0.01	390	91	47	22	2.2	<0.0002	<0.001	<0.001	0.042	0.0039		120	0.96	41	0.033	0.045
MW-25R	10/11/19	mg/L	0.025						2.4				0.046				1			
MW-25R	01/09/20	mg/L	0.042	<0.01	410	100	49	27	2.3	<0.0002	<0.001	<0.001	0.053	0.0034	<5	140	0.99	44	0.035	0.044
MW-25R	07/08/20	mg/L	0.025	<0.01	410	130	50	35	2.5	<0.0002	<0.001	<0.001	0.062	0.004		140	1.2	45	0.038	0.0058
MW-25R	01/14/21	mg/L	0.045	<0.01	410	100	44	37	2.6	<0.0002	<0.001	<0.001	0.068	0.0042	17	150	1.3	50	0.036	0.0075
MW-25R	07/16/21	mg/L	0.053	<0.01	410	110	45	45	2.9	<0.0002	<0.001	<0.001	0.081	0.0042		170	1.5	53	0.039	0.017
MW-40	03/07/95	mg/L																		
MW-40	06/07/95	mg/L																		
MW-40	09/08/95	mg/L	0.06	6.2	370	13	32	6.7							<3	93	0.03	40		
MW-40	10/23/95	mg/L																		
MW-40	11/27/95	mg/L	0.02	5.9	380	14	28	3.6		<0.0002	<0.001	0.001			<3	99	<0.02	42		
MW-40	01/22/96	mg/L																		
MW-40	03/06/96	mg/L	0.03	4.9	400	14	27	3.3	2						<3	110	<0.02	42		
MW-40	04/24/96	mg/L																		
MW-40	06/04/96	mg/L	0.02	6.9	390	14	29	35	2.3	<0.0002	<0.001	<0.001		<0.001	<5	110	0.02	38		
MW-40	07/15/96	mg/L																		
MW-40	09/01/96	mg/L	0.02	5.5	380	10	30	3.8							<3	110	<0.02	50		
MW-40	12/01/96	mg/L	0.04		430	11	25	3.7		0.0003	0.001	<0.001			<3	98	0.02	34		
MW-40	01/01/97	mg/L	0.03	3	450	10	25	3.3	2	<0.0002	<0.001	<0.001		<0.001	<5	120	<0.02	43		0.3

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-40	04/01/97	mg/L			400	9.1	36	3.7								140	<0.02	34		
MW-40	07/01/97	mg/L	0.02	1.5	390	7	29	8	1.8	<0.0002	<0.001	<0.001		<0.001	<5	120	<0.02	34		0.3
MW-40	10/01/97	mg/L			370	6.3	41	3.5								110	<0.02	32		
MW-40	01/05/98	mg/L	0.02	2.1	390	9.8	33	3.6	1.5	<0.0002	<0.001	<0.001		<0.001	<5	140	<0.02	32		0.4
MW-40	04/06/98	mg/L			370	7.8	33	3.8								130	<0.02	38		
MW-40	07/01/98	mg/L	0.02	1.9	390	7.6	29	3.8	1.7	<0.0002	<0.001	<0.001		<0.001	<5	130	<0.02	45		0.28
MW-40	10/05/98	mg/L			390	14	39	3.5								140	0.02	40		
MW-40	01/05/99	mg/L	0.03	1.4	350	9.6	31	3.4	1.5	<0.0002	<0.001	<0.001		<0.001	<5	120	<	36		0.42
MW-40	04/05/99	mg/L			410	9.6	29	3.5								99	0.02	28		
MW-40	07/06/99	mg/L	0.01	1.5	410	10	37	3.1	1.6	<0.0002	<0.001	<0.001		<0.001	<5	120	<0.02	38		0.42
MW-40	10/01/99	mg/L																		
MW-40	01/05/00	mg/L	0.07	1.2	300	4.9	26	3.1	1.5	<0.0002	<0.001	<0.001	<0.05	<0.001	<5	110	0.03	34		0.47
MW-40	04/05/00	mg/L																		
MW-40	07/06/00	mg/L	0.05	1.3	330	3.7	45	3.2	1.5	<0.0002	<0.001	<0.001	<0.05	<0.001	<5	110	<0.02	33	<0.02	0.77
MW-40	10/21/00	mg/L																		
MW-40	01/10/01	mg/L	0.86	1.13	213	5.85	24.3	5.22	1.25	2.15	0.002	0.005	0.041		11	98.2	0.077	29.1		1.67
MW-40	04/23/01	mg/L																		
MW-40	07/25/01	mg/L	0.17	0.66	250	3.54	19.8	15.4	1.51	1.85	0.002	0.001	0.036		11	86	0.05	26.4		0.651
MW-40	10/11/01	mg/L																		
MW-40	01/15/02	mg/L	0.01	0.78	192	3.35	16.6	4.81	1.8	0.3	<0.001	<0.001	0.016		27	80.9	<0.008	27		0.219
MW-40	04/11/02	mg/L																		
MW-40	07/16/02	mg/L	0.05	0.7	195	2.4	17.9	3.83	2	0.35	0.001	<0.001	0.026		<5	77.7	0.03	30.9	0.005	0.428
MW-40	10/11/02	mg/L																		
MW-40	01/13/03	mg/L	0.09	0.52	237	2.75	19	9.68	1.98	0.75	0.002	0.009	<0.01		16	43.8	0.104	17.4		0.658
MW-40	07/08/03	mg/L	0.38	0.27	236	3.87	33.9	12.5	2.66	0.000373	<0.001	0.005	0.061		41	95.7	0.033	29.8	0.273	5.27
MW-40	01/15/04	mg/L	<0.05	0.5	390	2.4	19	10	1.7	0.00035	0.0092	<0.001	0.032		13	110	<0.02	33	0.026	0.66
MW-40	07/15/04	mg/L	<0.05	0.52	360	2.5	21	8.4	2	0.00027	0.0027	<0.001	0.059		7	98	<0.02	31	<0.005	0.62
MW-40	01/15/05	mg/L	<0.05	0.79	340	2.4	22	6	2	0.00022	0.0015	<0.001	<0.05		15	100	<0.02	30	0.014	0.38
MW-40	07/15/05	mg/L	<0.05	0.73	350	2.9	18	3.9	1.7	0.00023	0.005	0.002	0.023		40	110	0.27	33	0.027	0.46
MW-40	01/18/06	mg/L	<0.05	0.76	400	3.5	23	6.3	1.6	0.00035	0.002	<0.001	0.043	<0.001	10	96	<0.02	32	<0.005	0.49
MW-40	07/18/06	mg/L	<0.05	0.83	380	2.4	39	5.3	2.3	0.00092	0.005	<0.001	0.026	<0.001	18	110	<0.02	36	<0.005	0.98
MW-40	01/09/07	mg/L	<0.05	0.81	340	2.2	41	4.2	2.1	0.00035	0.001	0.0028	0.024	<0.001	52	110	<0.02	36	0.0051	0.82
MW-40	07/10/07	mg/L	<0.05	0.34	380	3	29	3.7	1.4	0.00026	<0.001	0.0018	<0.02	<0.001	5	100	0.18	33	<0.005	0.53
MW-40	01/31/08	mg/L	<0.05	0.52	750	2.8	34	4.9	1.8	0.00021	<0.001	0.0024	<0.02	<0.001	10	110	<0.02	34	<0.005	0.77
MW-40	07/08/08	mg/L	<0.05	0.38	320	3.4	28	7.5	3.9	<0.0002	<0.001	0.0015	0.031	<0.001	<5	200	0.03	65	<0.005	0.56
MW-40	01/27/09	mg/L	<0.05		360	3.9	15	3.9	1.7	<0.0002	0.0023	0.0021	<0.02	<0.001	<5	97	0.2	32	0.007	0.61
MW-40	07/21/09	mg/L	<0.05	0.3	260	2.5	14	3.1	1.4	0.00022	<0.001	0.0013	<0.02	<0.001	12	88	<0.02	29	<0.005	0.42
MW-40	01/18/10	mg/L	<0.05	0.54	290	3.4	24	4.3	1.5	0.00026	0.0016	0.0013	<0.02	<0.001	25	96	<0.05	32	<0.005	0.54
MW-40	07/07/10	mg/L	<0.05	0.35	350	1.8	19	6.8	1.8	0.00023	0.0016	<0.001	0.024	<0.001	6	100	<0.05	34	<0.005	1.3
MW-40	01/17/11	mg/L	<0.05	1.1	380	2.9	77	5	1.4	0.00029	<0.001	0.0028	<0.02	<0.001	<5	120	0.041	40	0.01	1.4
MW-40	07/08/11	mg/L	<0.05	0.76	350	3.5	13	7.9	3.6	<0.0002	<0.001	0.0013	<0.02	<0.001	<5	190	0.034	68	<0.005	0.43
MW-40	01/09/12	mg/L	<0.05	0.31	370	2.2	12	3.4	1.7	0.00028	<0.001	0.0012	0.022	<0.001	<5	94	<0.02	31	<0.005	0.59
MW-40	07/23/12	mg/L	<0.05	0.3	370	2.7	18	4.6	2	0.014	<0.001	0.0021	<0.02	<0.001	<5	110	<0.02	36	<0.005	0.82
MW-40	01/10/13	mg/L	<0.05	0.079	380	4	57	4.1	1.7	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	120	0.036	40	<0.005	0.35
MW-40	07/10/13	mg/L	<0.1	0.17	410	1.9	12	3.6	1.6	0.00023	<0.001	<0.001	<0.02	<0.001	<5	97	0.44	34	<0.005	0.61
MW-40	01/14/14	mg/L	<0.05	0.4	400	3.7	26	4.2	1.5	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	120	0.02	36	<0.005	0.59
MW-40	07/10/14	mg/L	<0.01	0.3	460	3.8	57	3	1.2	0.0003	<0.001	0.0019	<0.02	<0.001	7	120	<0.02	40	<0.005	0.98
MW-40	01/20/15	mg/L	0.014	0.34	460	2.4	15	2.8	1.2	<0.0002	<0.001	<0.001	<0.02	<0.001	6	110	<0.02	36	<0.005	0.52
MW-40	07/28/15	mg/L	0.016	0.34	480	2.6	14	3.1	1.3	0.00025	<0.001	0.0013	<0.02	<0.001		110	0.25	36	0.0056	0.96
MW-40	01/05/16	mg/L	0.032	0.39	450	1.9	16	3.1	1.2	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	120	<0.02	37	<0.005	0.58
MW-40	07/26/16	mg/L	0.037	0.27	410	1.7	7	2.8	1.2	<0.0002	<0.001	<0.001	<0.02	<0.001		110	<0.02	35	<0.005	0.69
MW-40	01/04/17	mg/L	0.12	0.28	430	3.7	43	3.3	1.2	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	130	<0.02	40	<0.005	0.74
MW-40	07/11/17	mg/L	0.021	0.13	420	3.2	29	3.1	1.2	<0.0002	<0.001	<0.001	<0.02	<0.001		120	<0.02	38	<0.005	0.66
MW-40	01/23/18	mg/L	0.17	0.23	450	5.2	63	3.3	1.1	0.00023	<0.001	0.0012	<0.02	<0.001	<5	130	0.046	44	<0.005	0.71
MW-40	07/10/18	mg/L	0.018	0.28	410	2.3	10	2.9	1.2	<0.0002	<0.001	<0.001	<0.02	<0.001		110	0.021	33	<0.005	0.95
MW-40	01/08/19	mg/L	<0.01	0.24	460	4.6	49	3.4	1.3	<0.0002	<0.001	0.013	<0.02	<0.001	<5	130	0.26	43	0.011	1.3
MW-40	07/09/19	mg/L	<0.01	0.061	490	3.1	19	4.0	1.4	<0.0002	<0.001	<0.001	<0.02	<0.001		130	0.039	42	<0.005	0.76
MW-40	01/06/20	mg/L	<0.01	0.18	480	3.6	29	3.8	1.3	<0.0002	<0.001	0.0012	<0.02	<0.001	<5	140	<0.02	46	<0.005	0.93
MW-40R	07/07/20	mg/L	<0.01	0.37	420	3.9	37	4.6	0.7	0.00024	0.0012	<0.001	<0.02	0.001		120	0.026	43	<0.005	0.013
MW-40R	01/13/21	mg/L	<0.01	1.1	430	4.6	54	7.7	0.84	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	130	0.038	45	<0.005	0.01
MW-40R	07/15/21	mg/L	<0.01	3.9	490	7.6	100	7.2	1.1	0.00036	<0.001	<0.001	<0.02	<0.001		150	0.036	56	0.006	0.014
MW-41	03/07/95	mg/L	0.14	0.01	340	30	110	15							12		0.1	43		

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-41	06/07/95	mg/L	0.1	<0.01	320	32	99	14	4	<0.0002	0.001	<0.001		0.002	10		1.2	42		
MW-41	09/08/95	mg/L	0.12	0.01	360	29	120	15	3.4	<0.0002	<0.001	0.004		0.001	29		0.56	49	0.06	2.1
MW-41	10/23/95	mg/L	0.07	<0.01	360	28	120	14	3.8	<0.0002	<0.001	0.004		0.002	10		1.2	42	0.03	4.5
MW-41	11/27/95	mg/L	0.08	<0.01	380	27	120	14	4	<0.0002	<0.001	<0.001		0.002	<5		1.9	48	0.05	2.2
MW-41	01/22/96	mg/L	0.08	<0.01	380	28	130	13	3.7	<0.0002	<0.001	<0.001		0.002	<5		1.7	50	0.04	2.6
MW-41	03/06/96	mg/L	0.07	<0.01	380	28	130	13	3.6	<0.0002	<0.001	0.002		0.002	15		1.6	52	0.05	3
MW-41	04/24/96	mg/L	0.07	<0.01	390	30	130	12	3.2	<0.0002	<0.001	0.002		0.002	<5		1.7	45	0.04	2.6
MW-41	06/04/96	mg/L	0.14	<0.01	380	29	120	13	2.3	<0.0002	<0.001	<0.001		0.002	<5		<0.02	33	0.05	7.9
MW-41	07/15/96	mg/L	0.14	<0.01	400	28	120	12	2.9	<0.0002	<0.001	0.002		0.002	10		1.4	60	0.05	1.1
MW-41	09/01/96	mg/L	0.09	<0.01	370	28	110	12	3.5	<0.0002	<0.001	<0.001		0.002	19		1.7	52	0.05	0.56
MW-41	12/01/96	mg/L	0.04	<0.01	420	30	120	14	3.1	<0.0002	<0.001	<0.001		0.002	<5		1.3	44	0.04	0.64
MW-41	01/01/97	mg/L	0.05	<0.01	440	28	120	12	3.5	<0.0002	<0.001	<0.001		0.002	<5	140	1.6	52	0.05	0.32
MW-41	04/01/97	mg/L															7.15	392		
MW-41	07/01/97	mg/L	0.05	<0.01	390	26	120	13	3.1	<0.0002	<0.001	<0.001		0.001	<31	150	1.4	48	0.05	1.7
MW-41	10/01/97	mg/L	0.04	<0.01	390	25	120	14	3.1						10		1.5	41	0.04	
MW-41	01/05/98	mg/L	0.03	<0.01	380	27	130	12	2.9	<0.0002	<0.001	<0.001		0.001	<5	150	1.4	42		0.007
MW-41	04/06/98	mg/L																		
MW-41	07/01/98	mg/L	0.37	<0.01	390	34	120	14	3.3	<0.0002	<0.001	<0.001		0.002	12	150	1.8	51		0.28
MW-41	10/05/98	mg/L																		
MW-41	01/05/99	mg/L	0.09	0.09	400	44	110	17	3.3	<0.0002	<0.001	<0.001		0.001	20	150	1.1	49		0.059
MW-41	04/05/99	mg/L																		
MW-41	07/06/99	mg/L	0.06	<0.01	440	52	110	15	3.2	<0.0002	<0.001	<0.001		0.002	11	150	1.3	46		0.25
MW-41	10/01/99	mg/L																		
MW-41	01/05/00	mg/L	0.06	<0.01	460	45	120	17	3.3	<0.0002	<0.001	<0.001	<0.05	0.002	<5	160	2.2	50		0.42
MW-41	04/05/00	mg/L																		
MW-41	07/06/00	mg/L	0.76	0.17	400	37	110	20	3.4	<0.0002	<0.001	<0.001	<0.05	0.002	21	150	1.4	48	0.06	0.007
MW-41	10/21/00	mg/L																		
MW-41	01/10/01	mg/L	0.84	<0.1	219	27.2	112	11.2	4.96	3.76	0.003	0.018	0.04		49	59.5	1.18	40.3		0.891
MW-41	04/23/01	mg/L																		
MW-41	07/25/01	mg/L	0.45	0.34	225	15.2	104	21	4.21	1.47	0.04	<0.001	0.039		11	212	0.878	42		0.459
MW-41	10/11/01	mg/L																		
MW-41	01/15/02	mg/L	0.1	<0.1	236	20.8	99.6	16.4	4.29	1.12	0.002	<0.001	0.024		11	115	0.974	41.8		0.551
MW-41	04/11/02	mg/L																		
MW-41	07/16/02	mg/L	0.05	<0.1	238	26.9	96.7	11.4	4.31	0.32	<0.001	<0.001	0.025		40	153	0.981	59.1	0.082	0.689
MW-41	10/11/02	mg/L																		
MW-41	01/13/03	mg/L	0.18	<0.1	286	35.9	117	14.4	4.45	<0.2	<0.001	<0.001	<0.01		7	82.1	1.51	35.4		0.092
MW-41	04/15/03	mg/L	<0.1	0.24	289	37.1	112	17.8	4.93						11.4		0.019	21	0.005	
MW-41	07/09/03	mg/L	<0.1	0.08	286	36.9	109	15.3	5.07	<0.0002	<0.001	<0.001	0.06		23	120	1.59	58	0.123	0.456
MW-41	07/09/03	mg/L	<0.1	0.14	292	37.8	114	18.6	4.34	<0.0002	<0.001	<0.001	0.051		19		1.49	32.1	0.089	0.211
MW-41	10/15/03	mg/L	<0.1	0.12	311	43.5	132	43.3	6.19						100		1.12	54.5	0.16	
MW-41	01/15/04	mg/L	<0.05	0.025	500	37	120	21	4.8	<0.0002	0.0074	<0.001	0.054		31	150	1.5	54	0.18	0.29
MW-41	04/15/04	mg/L	0.097	<0.023	460	28	110	19	5.1						30		1.6	50	0.16	
MW-41	07/15/04	mg/L	0.1	<0.023	420	17	110	12	4	<0.0002	0.0014	<0.001	0.08		37	130	1.5	42	0.16	0.61
MW-41	10/15/04	mg/L	<0.05	0.055	490	24	130								37					
MW-41	01/15/05	mg/L	<0.05	<0.023	410	20	130	12		<0.0002	0.0026	<0.001	<0.05		23	140	1.5	46	0.17	1.1
MW-41	04/15/05	mg/L	<0.05	<0.023	350	14	100	9.4	3.4		0.0045				8		1.4	43	0.16	
MW-41	07/15/05	mg/L	<0.05	<0.023	420	15	120	9.8	3.4	<0.0002	0.0072	<0.001	0.036		8	140	1.6	45	0.19	0.15
MW-41	10/15/05	mg/L	<0.05	<0.023	410	19	110	12	3.6						44		1.7	41	0.22	
MW-41	01/20/06	mg/L	<0.05	<0.023	450	21	110	13	3.8	<0.0002	0.001	<0.001	<0.05	0.0025	29		1.7	43	0.22	0.37
MW-41	04/28/06	mg/L	<0.05	<0.023	400	18	110	13	3.8				<20		12		1.7	42	0.21	
MW-41	07/21/06	mg/L	<0.05		380	18		13	3.8	<0.0002	<0.001	<0.001	<0.05	0.0024	26		1.8		0.21	0.17
MW-41R	04/28/06	mg/L	<0.05	<0.023	360	13	110	10	2				<20		43		1.6	39	0.1	
MW-41R	07/21/06	mg/L	<0.05	<0.023	340	15	100	10	2.3	<0.0002	<0.001	<0.001	0.022	0.0029	24	150	2.3	48	0.081	0.018
MW-41R	10/20/06	mg/L	<0.05	<0.023	360	14	120	8.8	2				0.025		<5		1.9	42	0.072	
MW-41R	01/12/07	mg/L	<0.05	<0.023	300	15	130	8	1.9	<0.0002	<0.001	<0.001	0.023	0.0028	19	130	1.7	43	0.078	0.015
MW-41R	04/13/07	mg/L	<0.05	<0.023	390	16	120	17	4.4				0.024		12		3.2	81	0.084	
MW-41R	07/12/07	mg/L	<0.05	<0.023	420	16	130	8.7	1.7	<0.0002	<0.001	<0.001	<0.02	0.0028	7	120	1.5	39	0.079	0.019
MW-41R	10/19/07	mg/L	<0.05	<0.023	430	14	130	8.3	1.6				<0.05		6		1.6	41	0.087	
MW-41R	02/04/08	mg/L	<0.05	0.024	700	14	130	10	2.4	<0.0002	0.0012	<0.001	0.028	0.0027	15	120	1.6	41	0.083	0.017
MW-41R	04/25/08	mg/L		0.035	310	15	100	10	2				<0.05				1.5	40	0.073	
MW-41R	04/28/08	mg/L	<0.05												12					
MW-41R	07/10/08	mg/L	<0.05	<0.023	340	14	100	8.8	2	<0.0002	0.0011	<0.001	0.026	0.0028	<5	130	1.5	41	0.089	0.011

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-41R	10/17/08	mg/L	<0.05	0.027	330	15	110	9	2		<0.001		<0.05		7		1.5	39	0.073	
MW-41R	01/29/09	mg/L	<0.05	<0.023	300	15	88	11	3.4	<0.0002	0.002	<0.001	0.031	0.0029	<5	120	1.5	39	0.088	0.014
MW-41R	02/27/09	mg/L							1.9		0.0039			0.003						
MW-41R	04/14/09	mg/L	<0.05	<0.023	360	13	100	8.5	1.9		<0.001		<0.05	0.0031	6		1.4	37	0.09	0.011
MW-41R	07/22/09	mg/L	<0.05	0.069	300	15	99	9	1.9	<0.0002	<0.001	<0.001	0.023	0.0028	36	120	1.5	38	0.083	0.012
MW-41R	10/16/09	mg/L	<0.05	<0.023	340	14	96	9	2				<0.05		6		1.5	38	0.081	
MW-41R	01/21/10	mg/L	<0.05	<0.023	320	15	95	10	2.1	<0.0002	<0.001	<0.001	0.028	0.003	<5	120	1.5	38	0.094	0.0085
MW-41R	04/13/10	mg/L	<0.05	<0.023	330	19	88	10	2.1				<0.05		<5		1.5	40	0.11	
MW-41R	07/08/10	mg/L	<0.05	<0.023	300	12	85	9.9	2.2	<0.0002	0.0016	<0.001	0.026	0.0032	9	120	1.5	38	0.095	0.022
MW-41R	10/15/10	mg/L	0.05	<0.023	420	17	86	9.3	2.1				<0.05		<5		1.4	38	0.098	
MW-41R	01/20/11	mg/L	<0.05	0.23	350	18	94	10	2.2	<0.0002	<0.001	<0.001	0.02	0.0028	<5	120	1.5	37	0.097	0.023
MW-41R	04/12/11	mg/L	<0.05	0.18	360	13	88	9.2	2.1				<0.05		<5		3.1	36	0.087	
MW-41R	07/08/11	mg/L	0.06	0.13	350	13	92	18	4.6	<0.0002	0.0016	<0.001	0.021	0.0026	<5	220	3	76	0.075	0.0086
MW-41R	10/21/11	mg/L	0.05	<0.023	320	12	85	7.8	2				<0.05		<5		1.2	35	0.07	
MW-41R	01/12/12	mg/L	<0.05	<0.023	330	12	72	12	2.9	<0.0002	<0.001	<0.001	0.023	0.0033	<5	170	1.9	53	0.072	0.013
MW-41R	04/10/12	mg/L	<0.05	<0.023	330	12	78	8.8	2.1				<0.05		<5		1.4	35	0.079	
MW-41R	07/18/12	mg/L	0.068	<0.023	310	13	76	9	2	<0.0002	<0.001	<0.001	0.022	0.0029	6	120	1.3	37	0.073	0.02
MW-41R	10/05/12	mg/L	<0.05	<0.023	330	18	72	8.9	2				<0.05		9		1.3	35	0.069	
MW-41R	01/10/13	mg/L	0.053	<0.023	310	13	73	9	2.1	<0.0002	0.0012	<0.001	0.023	0.0033	<5	110	1.2	33	0.078	0.063
MW-41R	04/12/13	mg/L	0.08	<0.023	350	11	72	8.5	2				<0.05		<5		1.2	33	0.07	
MW-41R	07/12/13	mg/L	<0.1	<0.023	340	12	71	9.9	2.3	<0.0002	<0.001	<0.001	0.02	0.003	<5	120	1.5	38	0.071	0.035
MW-41R	10/15/13	mg/L	<0.1	<0.023	340	13	72	9.3	2.1	<0.0002	<0.001	<0.001	<0.05	0.0034	<5		1.2	33	0.07	0.014
MW-41R	01/16/14	mg/L	<0.05	<0.023	330	13	66	10	2.4	<0.0002	<0.001	<0.001	0.022	0.0032	<5	110	1.4	34	0.088	0.036
MW-41R	04/04/14	mg/L	<0.05	0.13	350	13	77	9	1.8				<0.05		<5		1.2	37	0.073	
MW-41R	07/11/14	mg/L	0.046	<0.02	330	27	58	7.9	1.7	<0.0002	<0.001	<0.001	<0.02	0.0031	<5	120	1.2	35	0.068	0.035
MW-41R	10/21/14	mg/L	0.039	0.011	320	13	69	7.5	1.7				<0.05		<5		1.2	32	0.071	
MW-41R	01/22/15	mg/L	0.053	<0.01	350	13	60	8.8	1.8	<0.0002	<0.001	<0.001	<0.02	0.0031	12	110	1.2	35	0.062	0.03
MW-41R	04/02/15	mg/L	0.072	0.014	340	12		8.2	1.9				<0.05				1.3			
MW-41R	07/30/15	mg/L	0.063	<0.01	370	12	62	8.7	1.9	<0.0002	<0.001	<0.001	0.022	0.0033	<5	100	1.2	34	0.072	0.006
MW-41R	10/13/15	mg/L	0.043		370	11		8.2	1.8				<0.05		<5		1.2		0.074	
MW-41R2	07/30/15	mg/L	0.12	<0.01	420	48	85	22	3.9	<0.0002	<0.001	<0.001	0.041	0.0034	<5	130	1.8	41	0.21	0.011
MW-41R2	10/13/15	mg/L	0.16		420	58		26	3.7				<0.05		5		1.9		0.22	
MW-41R2	01/07/16	mg/L	0.21	<0.01	390	63	79	33	4.8	<0.0002	<0.001	<0.001	0.047	0.0033	<5	130	1.9	43	0.21	0.014
MW-41R2	04/12/16	mg/L	0.1						4				<0.05	0.0032			1.8			
MW-41R2	07/29/16	mg/L	0.1	0.023	400	54	77	27	4	<0.0002	<0.001	<0.001	0.042	0.0035		150	1.9	48	0.22	0.051
MW-41R2	10/07/16	mg/L	0.16						4				<0.05	0.0033			1.9			
MW-41R2	01/06/17	mg/L	0.13	<0.01	430	73	85	26	4.1	<0.0002	<0.001	<0.001	<0.05	0.0036	<5	140	2.1	52	0.21	0.037
MW-41R2	04/04/17	mg/L	0.11						3.8				<0.05	0.0037			2.1			
MW-41R2	07/14/17	mg/L	0.14	<0.01	380	36	83	28	3.7	<0.0002	<0.001	<0.001	0.038	0.0035		150	2	46	0.21	0.038
MW-41R2	10/06/17	mg/L	0.11						3.6				<0.05	0.0036			2			
MW-41R2	01/25/18	mg/L	0.096	0.063	430	77	93	33	3.5	<0.0002	0.0052	<0.001	0.044	0.0034	10	150	2.2	53	0.23	0.048
MW-41R2	04/06/18	mg/L	0.094						1.6		0.0092		<0.05	0.004			3.4			
MW-41R2	06/19/18	mg/L									<0.002						2			
MW-41R2	07/11/18	mg/L	0.070	<0.01	430	67	82	27	3.2	<0.0002	<0.001	<0.001	0.038	0.0034		140	2.1	46	0.22	0.045
MW-41R2	10/09/18	mg/L	0.047						3.7		<0.001		0.046	0.0039			2.1			
MW-41R2	01/10/19	mg/L	0.055	<0.01	410	93	85	33	3.8	<0.0002	<0.001	<0.001	0.046	0.0036	<5	150	2.1	51	0.23	0.034
MW-41R2	04/23/19	mg/L	0.049						3.7		<0.002		0.046	0.0035			1.9			
MW-41R2	07/11/19	mg/L	0.037	<0.01	430	53	76	27	3.2	<0.0002	<0.001	<0.001	0.042	0.0038		120	1.7	41	0.20	0.050
MW-41R2	10/14/19	mg/L	0.039						3.6				0.047				1.6			
MW-41R2	01/09/20	mg/L	0.054	<0.01	440	66	76	28	3.4	<0.0002	<0.001	<0.001	0.049	0.0033	<5	140	1.7	47	0.2	0.047
MW-41R2	07/09/20	mg/L	0.045	<0.01	420	58	84	24	3.2	<0.0002	<0.001	<0.001	0.045	0.0036		130	1.7	46	0.19	0.0053
MW-41R2	01/14/21	mg/L	0.06	<0.01	460	88	70	35	3.9	<0.0002	<0.001	<0.001	0.055	0.0038	18	160	2.2	55	0.23	0.015
MW-41R2	07/19/21	mg/L	0.065	<0.01	460	85	69	39	4.4	<0.0002	<0.001	<0.001	0.057	0.0042		170	2.3	58	0.24	0.015
MW-43D	03/07/95	mg/L																		
MW-43D	06/07/95	mg/L																		
MW-43D	09/08/95	mg/L																		
MW-43D	10/23/95	mg/L																		
MW-43D	11/27/95	mg/L																		
MW-43D	01/22/96	mg/L																		
MW-43D	03/06/96	mg/L																		
MW-43D	04/24/96	mg/L																		
MW-43D	06/04/96	mg/L																		

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-43D	07/15/96	mg/L																		
MW-43D	09/01/96	mg/L																		
MW-43D	12/01/96	mg/L																		
MW-43D	01/01/97	mg/L																		
MW-43D	04/01/97	mg/L																		
MW-43D	07/01/97	mg/L																		
MW-43D	10/01/97	mg/L																		
MW-43D	01/05/98	mg/L																		
MW-43D	04/06/98	mg/L																		
MW-43D	07/01/98	mg/L																		
MW-43D	10/05/98	mg/L																		
MW-43D	01/05/99	mg/L																		
MW-43D	04/05/99	mg/L																		
MW-43D	07/06/99	mg/L																		
MW-43D	10/01/99	mg/L																		
MW-43D	01/05/00	mg/L	0.08	<0.01	360	13	49	5.2	1.5	<0.0002	<0.001	<0.001	<0.05	0.006	<5	97	1	36		4.1
MW-43D	04/05/00	mg/L																		
MW-43D	07/06/00	mg/L	0.02	<0.01	130	14	49	5.2	4.2	<0.0002	<0.001	<0.001	<0.05	<0.001	38	32	<0.02	34	<0.02	0.82
MW-43D	10/21/00	mg/L																		
MW-43D	01/10/01	mg/L	0.35	<0.1	186	12.4	51.4	3.76	1.41	<0.2	<0.001	<0.001	0.03		<5	89.1	0.887	31.6		0.468
MW-43D	04/23/01	mg/L																		
MW-43D	07/25/01	mg/L	0.24	<0.1	213	13.3	48.7	15.1	1.57	1.26	0.002	<0.001	0.01		<5	102	0.831	35.1		1.17
MW-43D	10/11/01	mg/L																		
MW-43D	01/15/02	mg/L	0.05	<0.1	220	13.7	51.8	13.2	1.95	0.22	<0.001	0.001	<0.01		23	87.4	0.834	33.5		0.398
MW-43D	04/11/02	mg/L																		
MW-43D	07/16/02	mg/L	0.1	<0.1	170	13.2	95.4	4.84	1.58	<0.2	<0.001	<0.001	0.016		<5	93.6	1.09	38.3	0.024	0.19
MW-43D	10/11/02	mg/L																		
MW-43D	01/13/03	mg/L	0.15	<0.1	207	13.8	52.5	24.2	1.52	<0.2	<0.001	<0.001	<0.01		7	49.4	0.804	21.2		0.889
MW-43D	07/08/03	mg/L	<0.1	0.08	190	13.7	50.7	14.7	8.93	<0.0002	<0.001	<0.001	0.053		9	62.9	0.138	32.6	0.023	0.525
MW-43D	01/15/04	mg/L	<0.05	0.023	320	11	30	11	2.8	0.00045	0.0073	<0.001	0.028		12	85	0.56	34	0.037	2.5
MW-43D	07/15/04	mg/L	<0.05	<0.023	330	12	50	9.9	1.9	<0.0002	0.0014	<0.001	0.057		18	99	1.1	33	0.024	0.31
MW-43D	01/15/05	mg/L	<0.05	0.023	350	14	58	7.9	2.2	0.00037	0.0013	<0.001	<0.05		23	120	1.2	37	0.045	0.85
MW-43D	07/15/05	mg/L	0.052	<0.023	340	13	58	6	1.8	<0.0002	0.0027	<0.001	0.032		19	110	1.1	37	0.031	0.46
MW-43D	01/19/06	mg/L	<0.05	<0.023	350	13	53	5.9	1.6	<0.0002	0.002	<0.001	0.029	0.0056	6	94	1.3	33	0.03	0.43
MW-43D	07/19/06	mg/L	<0.05	<0.023	350	14	49	11	3	<0.0002	<0.001	<0.001	0.027	0.0052	13	110	1.2	37	0.029	0.42
MW-43D	01/10/07	mg/L	<0.05	<0.023	370	13	60	5.2	1.5	<0.0002	0.001	<0.001	0.045	0.0069	<5	110	1.3	36	0.036	0.37
MW-43D	07/11/07	mg/L	<0.05	<0.023	360	13	59	5.5	1.9	<0.0002	<0.001	<0.001	<0.02	0.0053	<5	110	1.6	36	0.032	0.3
MW-43D	02/01/08	mg/L	<0.05	0.043	640	13	60	5.1	1.6	<0.0002	0.0012	<0.001	<0.02	0.0062	8	120	1.5	38	0.018	0.28
MW-43D	07/10/08	mg/L	<0.05	<0.023	340	13	56	5.7	1.8	<0.0002	<0.001	<0.001	0.042	0.0053	9	110	1.3	38	0.028	0.54
MW-43D	01/29/09	mg/L	<0.05	<0.023	330	15	73	7.2	2.5	<0.0002	0.0022	<0.001	0.021	0.0052	<5	110	1.3	36	0.025	1.3
MW-43D	07/23/09	mg/L	0.065	<0.023	340	14	60	5.7	1.8	<0.0002	0.0012	<0.001	0.023	0.008	8	110	1.5	36	0.034	0.55
MW-43D	01/20/10	mg/L	<0.05	<0.023	310	12	59	6.3	1.8	<0.0002	0.0042	<0.001	0.022	0.0043	11	100	1.1	34	0.025	1.7
MW-43D	07/08/10	mg/L	0.086	<0.023	310	11	54	16	2.5	<0.0002	<0.001	<0.001	0.04	0.0035	<5	110	0.86	36	0.028	1.5
MW-43D	01/18/11	mg/L	<0.05	0.19	330	11	56	6.3	1.9	<0.0002	<0.001	<0.001	<0.02	0.0048	<5	110	1.5	36	0.027	0.5
MW-43D	07/07/11	mg/L	0.093	<0.023	350	12	65	14	4.9	<0.0002	0.0051	<0.001	<0.02	0.0031	<5	210	2.2	74	0.022	1.9
MW-43D	01/10/12	mg/L	<0.05	<0.023	350	12	53	6	1.7	<0.0002	<0.001	<0.001	<0.02	0.0047	<5	110	0.96	35	0.022	0.61
MW-43D	07/17/12	mg/L	<0.05	<0.023	330	11	51	6.1	1.9	<0.0002	<0.001	<0.001	0.02	0.0087	8	110	1.6	35	0.02	0.046
MW-43D	01/09/13	mg/L	<0.05	<0.023	300	10	53	6	1.9	<0.0002	<0.001	<0.001	0.021	0.0041	<5	110	1.1	35	0.027	1.4
MW-43D	07/11/13	mg/L	0.27	<0.023	320	10	49	7.5	1.8	<0.0002	<0.001	<0.001	<0.02	0.0035	<5	98	0.68	32	0.027	2.3
MW-43D	01/15/14	mg/L	0.07	<0.023	320	9.9	55	6.3	2	<0.0002	<0.001	<0.001	0.021	0.005	<5	110	1.4	34	0.025	0.8
MW-43D	07/10/14	mg/L	0.025	<0.01	340	9.4	48	4.8	1.4	<0.0002	<0.001	<0.001	<0.02	0.0024	<5	100	0.59	36	0.021	1
MW-43D	01/20/15	mg/L	0.018	<0.01	360	9.4	46	5.3	1.5	<0.0002	<0.001	<0.001	<0.02	0.0036	15	100	1.1	36	0.018	0.94
MW-43D	07/29/15	mg/L	0.12	<0.01	370	8.7	45	4.8	1.5	<0.0002	<0.001	<0.001	<0.02	0.0056		100	1.3	33	0.022	0.74
MW-43D	01/06/16	mg/L	0.12	<0.01	350	8.2	49	4.5	1.6	<0.0002	<0.001	<0.001	0.021	0.0046	<5	100	1.1	33	0.022	0.67
MW-43D	07/28/16	mg/L	0.052	<0.01	340	8.2	47	4.6	1.5	<0.0002	<0.001	<0.001	<0.02	0.0042		100	1.2	35	0.023	0.98
MW-43D	01/05/17	mg/L	0.062	<0.01	330	8.2	47	5.2	1.6	<0.0002	<0.001	<0.001	<0.02	0.0047	<5	100	1.2	32	0.029	3.2
MW-43DR	07/13/17	mg/L	0.037	<0.01	350	7.9	49	6.7	1.9	<0.0002	0.0012	<0.001	<0.02	0.0055		120	1.8	35	0.029	0.041
MW-43DR	01/24/18	mg/L	0.074	<0.01	360	7.8	52	5.7	1.5	<0.0002	<0.001	<0.001	<0.02	0.0049	<5	110	1.9	33	0.03	0.014
MW-43DR	07/10/18	mg/L	0.018	<0.01	360	7.8	49	5.8	1.7	<0.0002	<0.001	<0.001	<0.02	0.0048		100	1.7	32	0.035	0.069
MW-43DR	01/09/19	mg/L	0.038	<0.01	340	7.6	49	8.3	1.9	<0.0002	<0.001	<0.001	0.023	0.0053	<5	98	1.5	33	0.032	0.074
MW-43DR	07/10/19	mg/L	0.024	<0.01	360	7.6	43	5.5	1.6	<0.0002	<0.001	<0.001	<0.02	0.0047		100	1.6	33	0.027	0.015
MW-43DR	01/08/20	mg/L	0.031	<0.01	400	7.3	47	5	1.6	<0.0002	<0.001	<0.001	<0.02	0.0045	<5	99	1.6	32	0.026	0.016

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-43DR	07/08/20	mg/L	0.037	<0.01	360	7.6	51	5.3	1.7	<0.0002	0.0011	<0.001	<0.02	0.0053		110	1.8	35	0.027	0.0087
MW-43DR	01/14/21	mg/L	0.032	<0.01	350	6.6	49	5.4	1.6	<0.0002	<0.001	<0.001	0.02	0.0047	10	100	1.8	35	0.025	0.0063
MW-43DR	07/16/21	mg/L	0.036	<0.01	350	6.8	49	5	1.7	<0.0002	<0.001	<0.001	<0.02	0.0051		120	1.9	40	0.026	0.0088
MW-43S	03/07/95	mg/L																		
MW-43S	06/07/95	mg/L																		
MW-43S	09/08/95	mg/L																		
MW-43S	10/23/95	mg/L																		
MW-43S	11/27/95	mg/L																		
MW-43S	01/22/96	mg/L																		
MW-43S	03/06/96	mg/L																		
MW-43S	04/24/96	mg/L																		
MW-43S	06/04/96	mg/L																		
MW-43S	07/15/96	mg/L																		
MW-43S	09/01/96	mg/L																		
MW-43S	12/01/96	mg/L																		
MW-43S	01/01/97	mg/L																		
MW-43S	04/01/97	mg/L																		
MW-43S	07/01/97	mg/L																		
MW-43S	10/01/97	mg/L																		
MW-43S	01/05/98	mg/L																		
MW-43S	04/06/98	mg/L																		
MW-43S	07/01/98	mg/L																		
MW-43S	10/05/98	mg/L																		
MW-43S	01/05/99	mg/L																		
MW-43S	04/05/99	mg/L																		
MW-43S	07/06/99	mg/L																		
MW-43S	10/01/99	mg/L																		
MW-43S	01/05/00	mg/L	0.05	0.79	350	2.2	11	2.9	2.7	0.0002	<0.001	<0.001	<0.05	<0.001	<5	87	<0.02	29		0.034
MW-43S	04/05/00	mg/L																		
MW-43S	07/06/00	mg/L	0.03	0.79	320	1.3	11	2.1	2	0.0005	<0.001	<0.001	<0.05	<0.001	<5	90	<0.02	29	<0.02	0.014
MW-43S	10/21/00	mg/L																		
MW-43S	01/10/01	mg/L	0.61	0.55	186	2.01	10.9	3.78	0.787	3.89	0.002	0.001	0.039		<5	87	0.047	24.4		0.22
MW-43S	04/23/01	mg/L																		
MW-43S	07/25/01	mg/L	0.12	1.04	281	2.33	20.8	16.8	4.41	1.28	0.003	0.001	0.06		<5	94.3	0.084	27.4		0.177
MW-43S	10/11/01	mg/L																		
MW-43S	01/15/02	mg/L	0.02	0.64	219	1.84	10.3	3.23	1.76	<0.2	0.001	<0.001	0.011		18	83.3	<0.008	28		0.01
MW-43S	04/11/02	mg/L																		
MW-43S	07/16/02	mg/L	0.05	0.46	183	1.89	13.9	2.29	2.14	0.2	0.003	<0.001	0.017		11	63.8	0.107	26.8	0.005	0.093
MW-43S	10/11/02	mg/L																		
MW-43S	01/13/03	mg/L	0.08	0.29	237	2.03	13.4	14.6	1.4	<0.2	<0.001	<0.001	<0.01		<5	53.1	0.035	21.7		0.048
MW-43S	07/08/03	mg/L	0.27	0.06	217	1.31	8.41	12.6	2.41	<0.0002	<0.001	0.004	0.054		20	92.4	0.033	31.1	0.004	0.157
MW-43S	01/15/04	mg/L	<0.05	0.2	330	1.5	9.1	7.5	1.5	0.00022	0.0073	<0.001	0.037		49	93	0.06	27	<0.005	0.058
MW-43S	07/15/04	mg/L	<0.05	0.13	320	1.5	8.1	8.5	2.3	<0.0002	0.002	<0.001	0.053		5	81	<0.02	27	<0.005	0.08
MW-43S	01/15/05	mg/L	<0.05	0.27	310	1.3	13	4.6	2.1	<0.0002	0.01	<0.001	<0.05		26	89	<0.02	29	<0.005	0.028
MW-43S	07/15/05	mg/L	<0.05	<0.023	370	1.5	8.2	2.5	1.4	<0.0002	0.0044	<0.001	0.036		25	97	0.02	30	<0.005	0.02
MW-43S	01/18/06	mg/L	<0.05	0.13	340	1.8	8.3	3.5	1.1	<0.0002	0.001	<0.001	0.039	<0.001	12	80	<0.02	26	<0.005	0.036
MW-43S	07/18/06	mg/L	<0.05	<0.023	330	1.4	11	2.7	0.89	<0.0002	0.005	<0.001	0.026	<0.001	10	88	0.06	25	<0.005	0.013
MW-43S	01/09/07	mg/L	<0.05	0.12	340	<1	9.7	2.1	0.68	<0.0002	0.002	<0.001	<0.02	<0.001	<5	96	0.09	28	0.02	0.054
MW-43S	07/11/07	mg/L	<0.05	0.029	290	2.1	7.9	2.3	0.66	<0.0002	<0.001	<0.001	<0.02	<0.001	19	87	<0.02	26	<0.005	0.018
MW-43S	02/01/08	mg/L	<0.05	0.18	610	1.9	12	2.1	0.85	<0.0002	0.0014	<0.001	0.04	0.0021	5	94	<0.02	28	0.01	0.11
MW-43S	07/08/08	mg/L	<0.05	0.037	340	2.5	8	2.3	1	<0.0002	<0.001	<0.001	0.022	<0.001	15	97	0.03	29	<0.005	0.03
MW-43S	01/29/09	mg/L	<0.05		370	1.8	10	3	0.92	<0.0002	0.0023	<0.001	<0.02	<0.001	<5	100	<0.02	28	<0.005	0.019
MW-43S	07/23/09	mg/L	0.073	0.078	330	2.1	9.1	3.7	3.3	<0.0002	<0.001	<0.001	<0.02	<0.001	20	100	0.16	29	<0.005	0.25
MW-43S	01/19/10	mg/L	<0.05	0.098	340	2.2	12	4.1	1.7	0.00033	0.0062	<0.001	<0.02	<0.001	32	100	0.076	33	0.0094	0.07
MW-43S	07/08/10	mg/L	<0.05	<0.023	360	1.5	4.1	5.6	2.7	<0.0002	0.001	<0.001	0.023	<0.001	<5	100	<0.05	32	0.0074	0.046
MW-43S	01/18/11	mg/L	<0.05	0.28	350	1.5	6.6	3.1	0.84	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	97	<0.02	28	0.012	0.079
MW-43S	07/06/11	mg/L	<0.05	0.036	340	2.2	5.8	3.2	2.6	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	93	0.023	29	<0.005	0.14
MW-43S	01/10/12	mg/L	<0.05	<0.023	370	1.8	6.3	2.9	1.2	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	100	<0.02	32	<0.005	0.094
MW-43S	07/17/12	mg/L	<0.05	0.099	340	1.8	5.1	3.6	1.1	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	96	<0.05	30	0.0054	0.033
MW-43S	01/10/13	mg/L	<0.05	<0.023	340	1.8	6.9	2.3	0.89	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	95	<0.02	31	<0.005	0.09
MW-43S	07/10/13	mg/L	<0.1	<0.023	370	1.7	4.8	3.2	1.1	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	92	0.42	29	<0.005	0.22
MW-43S	01/14/14	mg/L	0.058	0.05	380	2.1	4.9	2.8	0.87	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	110	<0.02	34	<0.005	0.076

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-43S	07/11/14	mg/L	0.02	0.029	350	2	5.7	2.2	0.82	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	96	<0.02	31	<0.005	0.065
MW-43S	01/20/15	mg/L	0.013	0.031	390	2.2	4.8	1.9	0.48	<0.0002	<0.001	<0.001	<0.02	<0.001	<5.0	97	0.048	29	<0.005	0.052
MW-43S	07/29/15	mg/L	0.046	0.03	430	1.9	5.8	2.8	0.88	<0.0002	<0.001	<0.001	<0.02	<0.001		96	<0.025	28	<0.005	0.42
MW-43S	01/06/16	mg/L	0.1	0.027	410	1.8	4.8	1.9	0.49	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	98	0.088	28	<0.005	0.097
MW-43S	07/28/16	mg/L	0.013	0.012	380	1.5	4.3	2.2	0.58	<0.0002	<0.001	<0.001	<0.02	<0.001		110	<0.02	32	<0.005	0.18
MW-43S	01/05/17	mg/L	0.033	<0.01	390	2	5.7	2.1	0.44	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	110	0.061	30	0.0057	0.13
MW-43S	07/11/17	mg/L	0.019	0.024	410	2.3	4.2	3.5	0.69	<0.0002	<0.001	<0.001	<0.02	<0.001		110	<0.02	32	<0.005	0.2
MW-43S	01/23/18	mg/L	0.056	0.28	390	2.5	10	7.4	0.72	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	110	0.35	34	0.028	0.096
MW-43S	07/10/18	mg/L	0.023	0.047	410	2.2	3.4	2.8	0.86	<0.0002	<0.001	<0.001	<0.02	<0.001		100	0.034	33	<0.005	0.2
MW-43S	01/08/19	mg/L	<0.01	0.12	340	2.2	5.0	2.8	0.71	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	100	0.052	34	<0.005	0.14
MW-43SR	07/10/19	mg/L	<0.01	<0.01	370	2.3	4.4	2.3	0.77	<0.0002	<0.001	<0.001	<0.02	<0.001		97	0.100	28	0.0065	0.013
MW-43SR	01/08/20	mg/L	<0.01	0.025	380	2.5	4.5	<1	<0.1	<0.0002	<0.001	0.001	<0.02	<0.001	<5	<1	<0.02	<1	<0.005	0.013
MW-43SR	07/08/20	mg/L	<0.01	0.016	380	2	2.7	2.6	1	<0.0002	<0.001	<0.001	<0.02	<0.001		100	<0.02	34	<0.005	0.011
MW-43SR	01/14/21	mg/L	<0.01	0.016	380	1.4	2.6	1.9	0.72	<0.0002	<0.001	<0.001	<0.02	<0.001	11	96	0.068	31	<0.005	0.012
MW-43SR	07/16/21	mg/L	0.014	<0.01	350	1.5	3.2	2.3	0.5	<0.0002	<0.001	<0.001	<0.02	<0.001		100	0.054	32	0.0087	0.032
MW-44	03/07/95	mg/L																		
MW-44	06/07/95	mg/L																		
MW-44	09/08/95	mg/L																		
MW-44	10/23/95	mg/L																		
MW-44	11/27/95	mg/L																		
MW-44	01/22/96	mg/L																		
MW-44	03/06/96	mg/L																		
MW-44	04/24/96	mg/L																		
MW-44	06/04/96	mg/L																		
MW-44	07/15/96	mg/L																		
MW-44	09/01/96	mg/L																		
MW-44	12/01/96	mg/L																		
MW-44	01/01/97	mg/L																		
MW-44	04/01/97	mg/L																		
MW-44	07/01/97	mg/L																		
MW-44	10/01/97	mg/L																		
MW-44	01/05/98	mg/L																		
MW-44	04/06/98	mg/L																		
MW-44	07/01/98	mg/L		2.6	430	8.8	52	5.4	7.7	<0.0002		<0.001				140	<0.02	48		
MW-44	10/05/98	mg/L																		
MW-44	01/05/99	mg/L		2.5	410	11	76	5.3	7.1	<0.0002	<0.001	<0.001				130	<0.02	42		
MW-44	04/05/99	mg/L																		
MW-44	07/06/99	mg/L		1.1	430	9.1	42	4.3	7.5	0.0003	<0.001	<0.001				130	<0.02	40		
MW-44	10/01/99	mg/L																		
MW-44	01/05/00	mg/L	0.05	1.3	660	4.4	39	4.2	8.1	<0.0002	<0.001	<0.001	<0.05	<0.001	<5	120	<0.02	39		3.9
MW-44	04/05/00	mg/L																		
MW-44	07/06/00	mg/L	0.02	1.2	370	4.7	35	4.1	8.2	0.0004	<0.001	<0.001	<0.05	<0.001	<5	120	<0.02	38	<0.02	3.8
MW-44	10/21/00	mg/L																		
MW-44	01/10/01	mg/L	0.56	1.08	237	3.57	44.6	5.88	6.94	2.59	0.001	0.002	0.044		43	112	0.058	34.8		2.97
MW-44	04/23/01	mg/L																		
MW-44	07/25/01	mg/L	0.17	0.9	281	3.72	41.7	17.4	7.01	1.07	0.003	0.001	0.029		7	95.5	0.031	30.2		1.37
MW-44	10/11/01	mg/L																		
MW-44	01/15/02	mg/L	0.01	1.04	229	3.51	46.1	8.56	7.32	0.545	<0.001	<0.001	<0.01		7	95.7	<0.008	33.9		1.65
MW-44	04/11/02	mg/L																		
MW-44	07/16/02	mg/L	0.04	0.85	213	2.42	32.2	4.87	7.18	<0.2	<0.001	<0.001	0.02		7	77.6	0.014	35.1	0.003	1.9
MW-44	10/11/02	mg/L																		
MW-44	01/13/03	mg/L	0.1	0.79	225	2.64	29.2	3.18	6.88	<0.2	<0.001	<0.001	<0.01		7.5	42.2	0.064	17.6		1.3
MW-44	01/15/04	mg/L	<0.05	0.7	360	2.1	23	5.5	6.7	<0.0002	0.0062	<0.001	0.027		34	97	<0.02	30	0.0075	1.6
MW-44	07/15/04	mg/L	<0.05	0.66	340	2.4	22	8	7.1	<0.0002	0.0021	<0.001	0.057		11	93	<0.02	29	<0.005	1.8
MW-44	01/15/05	mg/L	<0.05	0.83	370	2.2	37	5.4	6.8	<0.0002	0.0022	<0.001	<0.05		17	100	0.02	33	0.006	1.6
MW-44	07/15/05	mg/L	<0.05	0.6	380	2.3	39	4.4	6.3	0.00026	0.0043	<0.001	0.045		36	110	0.065	34	0.024	0.54
MW-44	01/18/06	mg/L	<0.05	0.64		2.5	32	5.1	6	<0.0002	0.002	<0.001	0.043	<0.001	34	95	<0.02	33	<0.005	0.73
MW-44	07/18/06	mg/L	<0.05	1		2.5	31	5.6	5.5	0.00021	0.004	<0.001	0.026	<0.001	10	110	0.02	33	<0.005	2.5
MW-44	01/09/07	mg/L	<0.05	0.48	410	1.4	31	3.7	5.1	<0.0002	0.002	<0.001	0.024	<0.001	<5	110	<0.02	34	0.0075	3
MW-44	07/10/07	mg/L	<0.05	0.56	380	3.3	30	3.5	4.7	<0.0002	0.001	<0.001	<0.02	<0.001	16	110	<0.02	32	<0.005	3.1
MW-44	01/31/08	mg/L	<0.05	0.6	820	2.6	27	4.2	5.6	<0.0002	<0.001	<0.001	0.023	<0.001	<5	110	0.03	33	<0.005	2.4
MW-44	07/08/08	mg/L	<0.05	0.49	380	3	28	3.6	5.4	<0.0002	0.0011	<0.001	0.029	<0.001	5	110	<0.02	34	<0.005	2.7

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-44	01/27/09	mg/L	<0.05		360	2.8	26	4.2	5.6	<0.0002	0.0025	<0.001	0.024	<0.001	<5	110	<0.02	33	<0.005	2.7
MW-44	07/21/09	mg/L	<0.05	0.5	350	3.1	32	3.7	4.9	<0.0002	0.0011	<0.001	<0.02	<0.001	9	110	<0.02	33	<0.005	18
MW-44	01/18/10	mg/L	<0.05	0.51	330	3.1	52	4.4	4.7	0.00024	0.0014	<0.001	<0.02	<0.001	22	110	<0.05	35	<0.005	3.1
MW-44	07/07/10	mg/L	<0.05	0.53	400	2.4	47	6.3	5	<0.0002	0.0019	<0.001	0.027	<0.001	<5	110	<0.05	34	<0.005	3.4
MW-44	01/18/11	mg/L	<0.05	0.77	380	2.3	41	4.6	4.5	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	110	<0.02	34	<0.005	3
MW-44	07/08/11	mg/L	<0.05	0.54	320	3	35	9.4	11	<0.0002	<0.001	<0.001	<0.02	<0.001	58	230	0.023	74	<0.005	2.4
MW-44	01/09/12	mg/L	<0.05	0.43	400	2.6	29	3.6	4	0.00021	<0.001	<0.001	0.021	<0.001	6	110	<0.02	32	0.0076	2.3
MW-44	07/23/12	mg/L	<0.05	0.39	370	3.5	32	4.7	5.1	0.0034	<0.001	<0.001	<0.02	<0.001	<5	120	<0.02	37	<0.005	3.4
MW-44	01/10/13	mg/L	<0.05	0.089	360	2.7	44	3.8	4.3	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	110	0.02	34	<0.005	1.8
MW-44	07/10/13	mg/L	<0.1	0.86	410	2.9	38	4.2	4.6	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	110	0.084	34	0.012	2.2
MW-44	01/14/14	mg/L	0.12	0.54	430	7	37	4.8	5	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	130	0.046	38	0.0058	2.6
MW-44	07/10/14	mg/L	<0.01	0.35	440	4.6	38	3.2	4	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	120	<0.02	37	<0.005	2.2
MW-44	01/20/15	mg/L	0.012	0.43	440	5.3	32	3	3.9	<0.0002	<0.001	<0.001	<0.02	<0.001	6	110	<0.02	37	<0.005	2.3
MW-44	07/28/15	mg/L	0.011	0.39	460	4.9	29	3.8	4.4	<0.0002	<0.001	<0.001	<0.02	<0.001		120	<0.025	37	<0.005	2.6
MW-44	01/05/16	mg/L	0.019	0.41	450	5.5	29	3.5	3.9	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	120	<0.02	36	<0.005	2.5
MW-44	07/26/16	mg/L	0.035	0.32	450	5.2	27	3.3	3.6	<0.0002	<0.001	<0.001	<0.02	<0.001		130	<0.02	40	<0.005	2.6
MW-44	01/04/17	mg/L	0.05	0.34	440	5.1	33	5	3.4	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	130	<0.02	39	0.011	2.9
MW-44	07/11/17	mg/L	0.02	0.32	440	5.2	31	5	3.9	<0.0002	<0.001	<0.001	<0.02	<0.001		130	<0.02	39	<0.005	2.7
MW-44D	01/23/18	mg/L	0.19	0.47	460	5.1	36	4.9	3.7	<0.0002	<0.001	<0.001	<0.02	<0.001	9	130	<0.02	42	<0.005	2.6
MW-44D	07/10/18	mg/L	<0.01	0.39	460	5.3	28	6.9	4	<0.0002	<0.001	<0.001	<0.02	<0.001		120	0.032	39	<0.005	2.8
MW-44D	01/08/19	mg/L	<0.01	0.37	490	4.7	30	4.1	4.1	<0.0002	<0.001	<0.001	<0.02	<0.001	9.0	120	<0.02	39	<0.005	2.8
MW-44D	07/09/19	mg/L	<0.01	0.11	460	4.3	30	4.6	4.1	<0.0002	<0.001	<0.001	0.020	<0.001		130	<0.02	42	<0.005	3.0
MW-44D	01/06/20	mg/L	<0.01	0.36	480	4.4	30	4.5	3.7	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	130	<0.02	43	<0.005	2.5
MW-44DR	07/07/20	mg/L	<0.01	0.28	410	3.5	25	5	1.3	<0.0002	0.0013	<0.001	<0.02	<0.001		120	0.029	40	<0.005	0.018
MW-44DR	01/13/21	mg/L	<0.01	0.55	440	4.4	45	8.6	1.7	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	130	<0.02	46	<0.005	0.0061
MW-44DR	07/15/21	mg/L	<0.01	0.55	490	6.3	29	7.6	1.6	<0.0002	<0.001	<0.001	<0.02	<0.001		120	<0.02	44	0.0054	0.021
MW-45	03/07/95	mg/L																		
MW-45	06/07/95	mg/L																		
MW-45	09/08/95	mg/L																		
MW-45	10/23/95	mg/L																		
MW-45	11/27/95	mg/L																		
MW-45	01/22/96	mg/L																		
MW-45	03/06/96	mg/L																		
MW-45	04/24/96	mg/L																		
MW-45	06/04/96	mg/L																		
MW-45	07/15/96	mg/L																		
MW-45	09/01/96	mg/L																		
MW-45	12/01/96	mg/L																		
MW-45	01/01/97	mg/L																		
MW-45	04/01/97	mg/L																		
MW-45	07/01/97	mg/L																		
MW-45	10/01/97	mg/L																		
MW-45	01/05/98	mg/L																		
MW-45	04/06/98	mg/L																		
MW-45	07/01/98	mg/L																		
MW-45	10/05/98	mg/L																		
MW-45	01/05/99	mg/L																		
MW-45	04/05/99	mg/L																		
MW-45	07/06/99	mg/L																		
MW-45	10/01/99	mg/L																		
MW-45	01/05/00	mg/L	0.07	<0.01	370	5.9	42	4.8	1.6	<0.0002	<0.001	<0.001	<0.05	0.002	<5	98	1	36		0.11
MW-45	04/05/00	mg/L																		
MW-45	07/06/00	mg/L	0.01	<0.01	320	7.1	44	4.6	1.6	<0.0002	<0.001	<0.001	<0.05	0.003	<5	100	1	37	0.04	0.033
MW-45	10/21/00	mg/L																		
MW-45	01/10/01	mg/L	0.51	<0.1	186	6.02	44.1	6.07	1.18	0.93	0.002	0.001	0.036		<5	93	0.866	31		0.272
MW-45	04/23/01	mg/L																		
MW-45	07/25/01	mg/L	0.14	<0.1	335	6.74	50.5	18.3	1.49	7.5	0.002	<0.001	0.041		11	88.8	1.09	32.1		0.147
MW-45	10/11/01	mg/L																		
MW-45	01/15/02	mg/L	0.13	<0.1	213	6.27	46.2	10.3	1.92	1.16	0.002	<0.001	<0.01		7	89.4	1.01	31.8		0.169
MW-45	04/11/02	mg/L																		
MW-45	07/16/02	mg/L																		
MW-45	10/11/02	mg/L																		

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
MW-45	01/13/03	mg/L	0.12	<0.1	213	6.12	43.2	16.9	1.6	<0.2	<0.001	<0.001	<0.01		<5	42.8	0.445	19.3		0.678
MW-45	07/09/03	mg/L	<0.1	0.08	213	6.7	43.2	16.1	2.4	<0.0002	<0.001	<0.001	0.052		7	119	0.703	36.4	0.036	0.414
MW-45	01/15/04	mg/L	<0.05	<0.023	350	<1	40	4.1	1.5	<0.0002	0.0045	<0.001	0.021		12	92	0.87	33	0.042	0.66
MW-45	07/15/04	mg/L	<0.05	<0.023	340	8.2	42	11	2	<0.0002	0.0017	<0.001	0.055		12	99	0.91	34	0.043	0.76
MW-45	01/15/05	mg/L	<0.05	<0.023	330	7.8	49	7.3	2.1	<0.0002	0.0016	<0.001	<0.05		<5	120	1.7	37	0.065	0.21
MW-45	07/15/05	mg/L	<0.05	<0.023	350	7.7	47	5.3	1.6	<0.0002	0.0038	<0.001	<0.02		33	100	1.7	33	0.057	0.17
MW-45	01/19/06	mg/L	<0.05	0.027	370	9.3	43	5.6	1.6	<0.0002	0.001	<0.001	<0.02	0.003	11	94	1.7	30	0.053	0.11
MW-45	07/21/06	mg/L	<0.05	<0.023	330	9.6	39	1.6	56	<0.0002	<0.001	<0.001	<0.02	0.0035	40	120	1.9	36	0.056	0.13
MW-45	01/11/07	mg/L	<0.05	<0.023	360	9.7	44	5.1	1.6	<0.0002	<0.001	<0.001	0.024	0.0038	<5	110	1.8	34	0.057	0.13
MW-45	07/12/07	mg/L	<0.05	<0.023	330	12	36	4.5	1.4	<0.0002	0.001	<0.001	0.089	0.0033	6	100	1.8	32	0.053	0.11
MW-45	02/01/08	mg/L	0.052	0.087	730	11	23	4.7	1.4	<0.0002	<0.001	<0.001	0.046	0.0033	<5	110	1.9	34	0.047	0.12
MW-45	07/11/08	mg/L	0.061	<0.023	350	11	13	4.8	1.7	<0.0002	0.0011	0.0015	<0.02	0.0037	5	98	1.8	32	0.065	0.17
MW-45	01/30/09	mg/L	0.065	<0.023	360	13	12	11	3.2	<0.0002	<0.001	<0.001	<0.02	0.0028	<5	200	3.9	63	0.043	0.22
MW-45	07/22/09	mg/L	0.052	0.074	330	11	20	5.9	1.5	<0.0002	<0.001	<0.001	<0.02	0.0028	9	100	1.9	32	0.048	0.12
MW-45	01/20/10	mg/L	0.054	<0.023	340	11	20	5.3	1.5	<0.0002	0.0022	<0.001	<0.02	0.0033	8	95	1.9	31	0.046	0.21
MW-45	07/08/10	mg/L	0.065	<0.023	340	10	20	6.1	1.7	<0.0002	<0.001	<0.001	0.026	0.0028	54	100	2.1	32	0.049	0.23
MW-45	01/19/11	mg/L	0.062	0.2	330	12	27	5.4	1.8	<0.0002	<0.001	<0.001	<0.02	0.0025	74	100	1.8	33	0.047	0.2
MW-45	07/07/11	mg/L	0.098	<0.023	400	11	26	13	4.2	<0.0002	0.0091	<0.001	<0.02	0.0024	<5	210	4.5	71	0.039	0.16
MW-45	01/11/12	mg/L	0.086	<0.023	340	10	26	5.3	1.5	<0.0002	0.0011	<0.001	<0.02	0.002	<5	110	1.7	33	0.04	0.55
MW-45	07/18/12	mg/L	0.063	<0.023	320	10	27	5.3	1.6	<0.0002	<0.001	<0.001	<0.02	0.0023	5	100	1.9	31	0.039	0.16
MW-45	01/10/13	mg/L	0.087	<0.023	340	11	25	5.4	1.7	<0.0002	<0.001	<0.001	<0.02	0.0018	<5	100	1.7	30	0.038	0.22
MW-45	07/11/13	mg/L	0.19	<0.023	370	10	23	5.4	1.6	<0.0002	<0.001	<0.001	0.022	0.0019	<5	94	1.8	31	0.039	0.15
MW-45	01/15/14	mg/L	0.09	<0.023	350	10	22	6.2	1.9	<0.0002	<0.001	<0.001	<0.02	0.0018	<5	110	2.1	33	0.039	0.25
MW-45	07/11/14	mg/L	0.078	<0.02	360	10	20	4.5	1.3	<0.0002	<0.001	<0.001	<0.02	0.0019	<5	100	1.8	33	0.036	0.17
MW-45	01/21/15	mg/L	0.086	<0.01	360	10	21	4.1	1.3	<0.0002	<0.001	<0.001	<0.02	0.0019	7	97	1.7	33	0.032	0.22
MW-45	07/29/15	mg/L	0.095	<0.01	380	10	20	4.4	1.3	<0.0002	<0.001	<0.001	<0.02	0.0018		99	1.9	31	0.036	0.21
MW-45	01/07/16	mg/L	0.081	<0.01	340	<1	2.6	4.3	1.4	<0.0002	<0.001	<0.001	<0.02	0.0019	<5	96	1.9	32	0.035	0.26
MW-45	07/29/16	mg/L	0.095	<0.01	310	9.7	16	4.9	1.4	<0.0002	<0.001	<0.001	<0.02	0.0017		100	1.8	36	0.034	0.26
MW-45	01/06/17	mg/L	0.1	<0.01	380	10	17	4.9	1.3	<0.0002	<0.001	<0.001	<0.02	0.0017	<5	100	2	31	0.035	0.34
MW-45	07/12/17	mg/L	0.17	<0.01	350	11	25	5	1.3	<0.0002	<0.001	<0.001	<0.02	0.0018		100	1.9	33	0.034	0.16
MW-45	01/24/18	mg/L	0.074	<0.01	360	11	24	5.1	1.3	<0.0002	<0.001	<0.001	<0.02	0.0015	<5	100	1.9	33	0.033	0.2
MW-45	07/11/18	mg/L	0.039	<0.01	350	11	21	4.7	1.3	<0.0002	<0.001	<0.001	<0.02	0.0014		93	1.7	30	0.033	0.17
MW-45	01/09/19	mg/L	0.066	<0.01	340	11	23	4.9	1.4	<0.0002	<0.001	<0.001	<0.02	0.0017	5.0	97	1.6	32	0.031	0.18
MW-45R	07/10/19	mg/L	0.11	<0.01	390	11	<2	7.8	1.8	<0.0002	<0.001	<0.001	0.021	0.0014		99	3.5	33	0.044	0.13
MW-45R	01/08/20	mg/L	0.072	<0.01	390	11	<2	6	1.4	<0.0002	<0.001	<0.001	<0.02	0.0013	<5	93	3.4	32	0.035	0.014
MW-45R	07/08/20	mg/L	0.047	<0.01	380	12	<2	5.7	1.2	<0.0002	<0.001	<0.001	<0.02	0.0013		99	3.4	34	0.03	<0.004
MW-45R	01/14/21	mg/L	0.055	<0.01	380	10	<2	5.9	1.3	<0.0002	<0.001	<0.001	<0.02	0.0012	<5	98	3.9	36	0.031	0.0046
MW-45R	07/16/21	mg/L	0.062	0.036	370	10	<2	5.6	1.3	<0.0002	<0.001	<0.001	0.021	0.0011		110	3.7	38	0.03	0.0059
P-28	03/07/95	mg/L																		
P-28	06/07/95	mg/L																		
P-28	09/08/95	mg/L																		
P-28	10/23/95	mg/L																		
P-28	11/27/95	mg/L																		
P-28	01/22/96	mg/L																		
P-28	03/06/96	mg/L																		
P-28	04/24/96	mg/L																		
P-28	06/04/96	mg/L																		
P-28	07/15/96	mg/L																		
P-28	09/01/96	mg/L																		
P-28	12/01/96	mg/L																		
P-28	01/01/97	mg/L																		
P-28	04/01/97	mg/L																		
P-28	07/01/97	mg/L																		
P-28	10/01/97	mg/L																		
P-28	01/05/98	mg/L																		
P-28	04/06/98	mg/L																		
P-28	07/01/98	mg/L		2.4	360	3.4	30	3.6	1.8	<0.0002	<0.001	<0.001				130	<0.02	35		
P-28	10/05/98	mg/L																		
P-28	01/05/99	mg/L		3.7	380	4.8	50	3.4	1.8	<0.0002	0.001	<0.001				130	<0.02	33		
P-28	04/05/99	mg/L																		
P-28	07/06/99	mg/L		3.5	400	6.8	42	3.2	1.7	<0.0002	<0.001	<0.001				140	<0.02	35		
P-28	10/01/99	mg/L																		

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
P-28	01/05/00	mg/L	0.08	5.1	480	7.9	67	4	1.6	0.0002	<0.001	<0.001	<0.05	<0.001	<5	160	0.07	40		2
P-28	04/05/00	mg/L																		
P-28	07/06/00	mg/L	0.03	4.1	400	5.3	11	3.2	1.7	0.0003	<0.001	0.004	<0.05	<0.001	9.9	140	<0.02	37	<0.02	1.6
P-28	10/21/00	mg/L																		
P-28	01/10/01	mg/L	0.45	3.66	250	4.64	36.3	5.88	1.33	5.07	0.008	0.013	0.054		11	115	5.35	32.1		2.3
P-28	04/23/01	mg/L																		
P-28	07/25/01	mg/L	0.42	4.63	244	5.6	48.4	15.8	1.66	1.36	0.004	<0.001	0.039		9	218	0.057	35.9		1.18
P-28	10/11/01	mg/L																		
P-28	01/15/02	mg/L	0.01	5.18	256	5.27	51.1	9.83	2.57	1.03	<0.001	0.001	0.022		11	120	0.011	36		0.597
P-28	04/11/02	mg/L																		
P-28	07/16/02	mg/L	0.03	3.25	256	4.03	33.4	5.57	1.95	0.48	0.001	0.001	0.027		9	121	0.043	39.4	0.003	1.08
P-28	10/11/02	mg/L																		
P-28	01/13/03	mg/L	0.21	2.52	274	3.63	31.5	16.3	1.67	0.26	<0.001	0.001	0.037		16	68.3	0.019	23.1		0.701
P-28	07/10/03	mg/L	2.08	0.1	268	4.01	29.1	17.5	2.74	0.000284	<0.001	<0.001	<0.01		6	157	0.043	40.3	0.007	0.621
P-28	01/15/04	mg/L	<0.05	2.5	450	4.7	38	9.3	1.9	0.00054	0.0092	0.0042	0.04		27	130	0.15	37	0.0081	1.4
P-28	07/15/04	mg/L	<0.05	1.3	420	3.9	27	9.3	1.9	0.00023	0.0023	<0.001	0.064		25	130	<0.02	34	<0.005	0.71
P-28	01/15/05	mg/L	<0.05	0.93	410	3.7	33	6.5	2.1	0.00069	0.0026	<0.001	<0.05		10	130	0.025	32	0.005	0.58
P-28	07/15/05	mg/L	<0.05	0.88	440	4.6	37	4.7	1.7	<0.0002	0.0058	<0.001	0.035		49	140	<0.02	37	<0.005	0.58
P-28	01/18/06	mg/L	<0.05	0.77	540	8.9	44	6.5	1.8	0.00037	0.003	<0.001	0.052	<0.001	31	150	<0.02	41	<0.005	0.6
P-28	07/18/06	mg/L	<0.05	<0.023	550	8.5	44	6.3	2	0.00057	0.006	<0.001	0.046	<0.001	17	170	0.03	46	<0.005	0.79
P-28	01/10/07	mg/L	<0.05	1	540	9	57	7.2	1.7	0.0005	0.001	0.0027	0.041	<0.001	10	180	<0.02	48	<0.005	0.91
P-28	07/11/07	mg/L	<0.05	2.8	530	8.9	43	5.3	1.9	0.00033	<0.001	0.0018	<0.02	<0.001	12	170	<0.02	46	<0.005	1
P-28	01/31/08	mg/L	<0.05	3.9	1000	11	48	8.7	1.8	0.00054	0.003	0.0019	0.041	<0.001	<5	150	0.07	39	0.017	1
P-28	07/09/08	mg/L	<0.05	3.8	580	5.9	38	6.6	1.9	0.00045	<0.001	0.0019	0.052	<0.001	23	160	<0.02	43	<0.005	1.4
P-28	01/29/09	mg/L	<0.05		470	6.7	41	8.5	3	0.00073	0.0042	0.0018	0.04	<0.001	<5	150	<0.02	40	<0.005	1
P-28	07/21/09	mg/L	<0.05	3.1	380	5	38	5.4	1.7	0.00066	0.0019	0.0033	0.032	<0.001	20	150	<0.02	39	<0.005	1.3
P-28	01/19/10	mg/L	<0.05	3.6	120	4.9	36	5.5	1.8	0.00075	0.0072	0.0013	0.032	<0.001	13	140	<0.02	38	0.0064	0.85
P-28	07/07/10	mg/L	<0.05	2.8	470	3.7	31	8.4	2	0.00038	0.0016	<0.001	0.034	<0.001	5	140	<0.05	37	<0.005	0.89
P-28	01/18/11	mg/L	<0.05	2.2	450	4.3	40	6.2	2.5	0.00045	<0.001	0.0011	0.022	<0.001	13	150	<0.02	41	<0.005	0.91
P-28	07/06/11	mg/L	<0.05	1.8	440	3.8	24	5.3	2.1	0.00022	<0.001	<0.001	<0.02	<0.001	<5	140	0.026	37	<0.005	0.9
P-28	01/10/12	mg/L	<0.05	0.94	420	3.3	19	4.6	1.6	0.00028	<0.001	0.0014	0.021	<0.001	<5	130	<0.02	35	0.0065	0.69
P-28	07/17/12	mg/L	<0.05	0.77	390	3.2	19	4.6	1.8	0.00022	<0.001	<0.001	<0.02	<0.001	9	120	<0.02	32	<0.005	0.49
P-28	01/09/13	mg/L	<0.05	0.95	370	3.5	20	5.5	1.7	0.00033	<0.001	<0.001	0.022	<0.001	<5	120	<0.02	32	<0.005	0.62
P-28	07/10/13	mg/L	<0.1	0.98	430	2.3	14	4.1	1.7	0.00022	<0.001	<0.001	<0.02	<0.001	<5	110	0.03	30	<0.005	0.54
P-28	01/14/14	mg/L	0.073	0.71	420	3.1	16	4.7	1.8	0.00053	<0.001	0.0016	<0.02	<0.001	<5	130	<0.02	34	<0.005	0.78
P-28	07/10/14	mg/L	0.015	0.77	430	5.5	28	7.7	1.5	0.0003	<0.001	0.001	0.086	<0.001	13	130	0.055	37	<0.005	0.77
P-28	01/20/15	mg/L	<0.01	0.47	460	4.6	21	3.6	1.3	0.00039	<0.001	<0.001	0.027	<0.001	22	120	0.02	34	<0.005	0.87
P-28	07/28/15	mg/L	0.017	0.31	440	4.8	29	4.5	1.5	0.00049	<0.001	0.0016	0.025	<0.001		120	0.047	33	<0.005	0.89
P-28	01/05/16	mg/L	0.016	0.29	480	3.2	21	4.2	1.3	0.00031	<0.001	<0.001	0.025	<0.001	13	120	<0.02	33	<0.005	0.86
P-28	07/26/16	mg/L	0.012	0.24	430	3.4	19	4.3	1.4	<0.0002	<0.001	<0.001	0.026	<0.001		120	<0.02	35	<0.005	0.54
P-28	01/04/17	mg/L	0.029	0.14	440	3.6	19	4.6	1.1	0.00031	0.13	<0.001	0.033	<0.001	<5	130	1.5	33	0.011	0.69
P-28	07/11/17	mg/L	0.023	0.2	430	3.8	16	3.8	1.3	<0.0002	<0.001	<0.001	0.023	<0.001		120	<0.02	33	<0.005	0.83
P-28	01/23/18	mg/L	0.054	0.79	430	5.7	34	6.7	1.3	<0.0002	<0.001	0.0011	0.046	<0.001	5	130	<0.02	36	<0.005	0.65
P-28	07/10/18	mg/L	0.019	0.28	450	3.4	14	3.7	1.2	<0.0002	<0.001	<0.001	0.025	<0.001		120	0.022	31	<0.005	0.79
P-28	01/08/19	mg/L	<0.01	0.42	370	4.2	23	8.0	1.4	0.00027	<0.001	<0.001	0.055	<0.001	<5	130	<0.02	36	<0.005	0.63
P-28	07/09/19	mg/L	<0.01	0.13	570	3.4	18	5.5	1.4	<0.0002	<0.001	<0.001	0.042	<0.001		140	0.027	39	<0.005	0.53
P-28	01/06/20	mg/L	<0.01	0.47	570	4.1	22	7.6	1.6	0.00026	<0.001	0.0013	0.066	<0.001	6	160	<0.02	46	<0.005	0.68
P-28R	07/07/20	mg/L	<0.01	0.35	440	3.4	20	11	1.4	<0.0002	0.0015	<0.001	0.065	<0.001		130	0.06	37	0.0062	0.022
P-28R	01/13/21	mg/L	<0.01	2.7	530	<10	52	12	1.4	<0.0002	<0.001	<0.001	0.1	<0.001	<5	180	0.068	48	<0.005	0.0072
P-28R	07/15/21	mg/L	<0.01	0.56	670	6.3	54	10	1.4	<0.0002	<0.001	<0.001	0.084	<0.001		180	0.029	52	<0.005	0.0064
P-29	03/07/95	mg/L																		
P-29	03/07/95	mg/L																		
P-29	06/07/95	mg/L																		
P-29	06/07/95	mg/L																		
P-29	09/08/95	mg/L																		
P-29	09/08/95	mg/L																		
P-29	10/23/95	mg/L																		
P-29	10/23/95	mg/L																		
P-29	11/27/95	mg/L																		
P-29	11/27/95	mg/L																		
P-29	01/22/96	mg/L																		
P-29	01/22/96	mg/L																		

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
P-29	03/06/96	mg/L																		
P-29	03/06/96	mg/L																		
P-29	04/24/96	mg/L																		
P-29	04/24/96	mg/L																		
P-29	06/04/96	mg/L																		
P-29	06/04/96	mg/L																		
P-29	07/15/96	mg/L																		
P-29	07/15/96	mg/L																		
P-29	09/01/96	mg/L																		
P-29	09/01/96	mg/L																		
P-29	12/01/96	mg/L																		
P-29	12/01/96	mg/L																		
P-29	01/01/97	mg/L																		
P-29	01/01/97	mg/L																		
P-29	04/01/97	mg/L																		
P-29	04/01/97	mg/L																		
P-29	07/01/97	mg/L																		
P-29	07/01/97	mg/L																		
P-29	10/01/97	mg/L																		
P-29	10/01/97	mg/L																		
P-29	01/05/98	mg/L																		
P-29	01/05/98	mg/L																		
P-29	04/06/98	mg/L																		
P-29	04/06/98	mg/L																		
P-29	07/01/98	mg/L			700															
P-29	07/01/98	mg/L		0.28		59	95		3.7		<0.001	<0.001					1.9	57	15	
P-29	10/05/98	mg/L																		
P-29	10/05/98	mg/L																		
P-29	01/05/99	mg/L																		
P-29	01/05/99	mg/L																		
P-29	04/05/99	mg/L																		
P-29	04/05/99	mg/L																		
P-29	07/06/99	mg/L		0.12		77	140	18	4.4		<0.001	<0.001								
P-29	07/06/99	mg/L			730												0.44	110		
P-29	10/01/99	mg/L								<0.0002						190				
P-29	10/01/99	mg/L																		
P-29	01/05/00	mg/L			820															
P-29	01/05/00	mg/L	0.08	1		110	160	19	4.2		<0.001	<0.001			22		1.4	110		0.029
P-29	04/05/00	mg/L								<0.0002						190				
P-29	04/05/00	mg/L																		
P-29	07/06/00	mg/L			700					<0.0002			<0.05	<0.001		260				
P-29	07/06/00	mg/L	0.42	2.1		65	140	26	4		<0.001	<0.001			22		1.3	89	0.44	0.05
P-29	10/21/00	mg/L								<0.0002			<0.05	<0.001		230				
P-29	10/21/00	mg/L																		
P-29	01/10/01	mg/L	0.55	2.02	402	52.3	145	20.2	4.36	2	0.003	0.001	0.016		34	136	5.89	64.1		0.326
P-29	04/23/01	mg/L																		
P-29	07/25/01	mg/L	0.55	3.98	329	32.7	114	32.3	3.52	3.04	0.005	0.001	0.03		23	259	0.932	56.9		0.776
P-29	10/11/01	mg/L																		
P-29	01/15/02	mg/L																		
P-29	04/11/02	mg/L																		
P-29	07/16/02	mg/L																		
P-29	10/11/02	mg/L																		
P-29	01/13/03	mg/L																		
P-29	07/15/04	mg/L	<0.05	0.03	430	12	52	13	2.3	<0.0002	0.0015	<0.001	0.067		110	97	0.4	32	0.058	0.05
P-29	01/15/05	mg/L	<0.05	<0.023	720	12	58	7.8	2.2	<0.0002	0.0013	<0.001	<0.05		180	120	0.35	36	0.07	0.11
P-29R	07/15/05	mg/L	<0.05	<0.023	470	11	56	8.3	1.6	<0.0002	0.0054	<0.001	<0.02		170	100	0.1	32	0.046	0.18
P-29R	01/20/06	mg/L	<0.05	<0.023	530	13	49	8.2	1.5	<0.0002	0.001	<0.001	0.026	0.0043	130	90	0.56	31	0.036	0.033
P-29R	07/18/06	mg/L	<0.05	<0.023	390	13	46	13	2	0.00025	0.004	<0.001	0.059	0.0038	22	110	0.17	34	0.038	0.013
P-29R	01/10/07	mg/L	<0.05	<0.023	310	12	56	6	1.4	<0.0002	<0.001	<0.001	0.021	0.0037	<5	100	0.33	34	0.052	0.017
P-29R	07/10/07	mg/L	<0.05	<0.023	290	14	53	7.5	1.2	<0.0002	<0.001	<0.001	<0.02	0.0023	110	99	0.05	32	0.037	0.13
P-29R	01/31/08	mg/L	<0.05	0.084	630	12	50	6.6	1.8	<0.0002	<0.001	<0.001	<0.02	0.0053	5	100	0.58	33	0.033	0.0071
P-29R	07/09/08	mg/L	<0.05	<0.023	360	12	50	6	1.6	<0.0002	<0.001	<0.001	<0.02	0.0049	<5	100	1.1	34	0.03	0.013

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
P-29R	01/27/09	mg/L	<0.05		280	13	50	6.5	1.8	<0.0002	0.0019	<0.001	<0.02	0.0051	<5	100	1.1	32	0.037	0.025
P-29R	07/20/09	mg/L	<0.05	0.033	250	12	55	5.6	1.7	0.00032	<0.001	<0.001	<0.02	0.0054	25	100	1.1	33	0.032	0.0093
P-29R	01/19/10	mg/L	<0.05	<0.023	270	12	51	6.1	1.6	<0.0002	0.0047	<0.001	<0.02	0.0051	74	97	0.93	33	0.03	0.016
P-29R	07/07/10	mg/L	<0.05	<0.023	310	10	54	7.6	1.9	<0.0002	<0.001	<0.001	0.023	0.0048	<5	100	1.1	33	0.031	0.023
P-29R	01/18/11	mg/L	<0.05	<0.023	320	11	52	6.5	1.7	<0.0002	<0.001	<0.001	<0.02	0.0046	<5	100	1.2	32	0.031	0.033
P-29R	07/06/11	mg/L	0.057	<0.023	320	11	52	7.3	2.2	<0.0002	<0.001	<0.001	<0.02	0.0044	<5	110	1.2	34	0.037	0.0077
P-29R	01/10/12	mg/L	0.054	<0.023	330	9.7	50	6.5	1.6	<0.0002	<0.001	<0.001	0.021	0.0055	<5	110	1	34	0.072	0.014
P-29R	07/16/12	mg/L	<0.05	<0.023	310	9.9	49	6.7	1.8	0.00026	<0.001	<0.001	<0.02	0.0044	<5	100	1.1	31	0.03	0.0092
P-29R	01/09/13	mg/L	<0.05	<0.023	300	10	51	8.4	1.8	<0.0002	<0.001	<0.001	<0.02	0.0045	<5	110	1.1	34	0.043	<0.005
P-29R	07/11/13	mg/L	<0.1	<0.023	330	9.4	48	8.5	1.8	<0.0002	<0.001	<0.001	<0.02	0.005	6	95	1.5	30	0.027	0.022
P-29R	01/14/14	mg/L	0.092	<0.023	340	9.5	55	6.7	1.8	<0.0002	<0.001	<0.001	<0.02	0.005	<5	110	1.3	35	0.032	0.0079
P-29R	07/10/14	mg/L	0.031	0.013	190	9.1	50	6.2	1.5	<0.0002	<0.001	<0.001	<0.02	0.0046	<5	110	0.96	35	0.027	0.0042
P-29R	01/20/15	mg/L	0.027	<0.01	360	9.2	50	4.8	1.4	<0.0002	<0.001	<0.001	<0.02	0.0048	17	100	1.2	34	0.022	<0.004
P-29R	07/28/15	mg/L	0.034	<0.01	350	8.9	50	5.8	1.5	<0.0002	<0.001	<0.001	<0.02	0.0051		99	1.2	33	0.031	0.0044
P-29R	01/06/16	mg/L	0.056	0.018	330	8.6	47	5.4	1.5	<0.0002	<0.001	<0.001	<0.02	0.005	<5	97	1.2	32	0.024	0.007
P-29R	07/26/16	mg/L	0.058	<0.01	360	7.9	48	5.1	1.5	<0.0002	<0.001	<0.001	<0.02	0.0055		100	1.3	34	0.024	0.017
P-29R	01/04/17	mg/L	0.06	0.053	330	8.1	48	6	1.3	<0.0002	<0.001	<0.001	<0.02	0.0052	<5	100	1.1	31	0.024	0.015
P-29R2	07/12/17	mg/L	0.47	<0.01	570	75	170	27	2.1	<0.0002	<0.001	<0.001	0.066	0.022		240	27	70	0.91	0.092
P-29R2	01/24/18	mg/L	0.21	0.083	650	42	150	24	1.9	<0.0002	<0.001	<0.001	0.14	0.019	<5	220	32	69	0.86	0.067
P-29R2	07/11/18	mg/L	0.18	0.019	650	47	140	22	2	<0.0002	<0.001	<0.001	0.11	0.018		210	29	60	0.83	0.22
P-29R2	01/09/19	mg/L	0.17	<0.01	570	57	140	23	2.2	<0.0002	<0.001	<0.001	0.10	0.019	9.0	210	30	64	0.69	0.11
P-29R2	01/08/20	mg/L	0.55	0.22	670	120	170	38	2.4	<0.0002	<0.001	<0.001	0.058	0.012	<5	240	25	76	0.42	0.12
P-29R2	07/08/20	mg/L	1.5	<0.01	660	150	200	28	3.2	<0.0002	<0.001	<0.001	0.043	0.04		260	28	86	1.7	0.0096
P-29R2	01/13/21	mg/L	0.67	<0.01	650	43	120	22	1.7	<0.0002	<0.001	<0.001	0.045	0.011	16	200	52	71	0.28	0.023
P-29R2	07/15/21	mg/L	0.27	<0.01	700	77	150	29	1.8	<0.0002	<0.001	<0.001	0.057	0.026		230	55	84	0.19	0.013
PW-38	03/07/95	mg/L																		
PW-38	06/07/95	mg/L																		
PW-38	09/08/95	mg/L																		
PW-38	10/23/95	mg/L																		
PW-38	11/27/95	mg/L																		
PW-38	01/22/96	mg/L																		
PW-38	03/06/96	mg/L																		
PW-38	04/24/96	mg/L																		
PW-38	06/04/96	mg/L																		
PW-38	07/15/96	mg/L																		
PW-38	09/01/96	mg/L																		
PW-38	12/01/96	mg/L																		
PW-38	01/01/97	mg/L																		
PW-38	04/01/97	mg/L																		
PW-38	07/01/97	mg/L																		
PW-38	10/01/97	mg/L																		
PW-38	01/05/98	mg/L																		
PW-38	04/06/98	mg/L																		
PW-38	07/01/98	mg/L		2.5	680	9.2	110	18	1.9	0.0006	<0.001	<0.001				210	<0.02	53		
PW-38	10/05/98	mg/L																		
PW-38	01/05/99	mg/L		3.3	710	21	130	17	1.7	<0.0002	<0.001	<0.001				260	0.09	71		
PW-38	04/05/99	mg/L																		
PW-38	07/06/99	mg/L		2.9	790	25	120	16	1.6	0.0014	<0.001	<0.001				210	0.07	73		
PW-38	10/01/99	mg/L																		
PW-38	01/05/00	mg/L	0.08	3.6	790	26	160	39	1.9	0.0041	<0.001	<0.001	<0.05	<0.001	10	250	0.09	76		0.018
PW-38	04/05/00	mg/L																		
PW-38	07/06/00	mg/L	0.06	4.8	690	22	180	34	1.7	0.0003	<0.001	<0.001	<0.05	<0.001	5.8	240	0.17	74	1.7	0.017
PW-38	10/21/00	mg/L																		
PW-38	01/10/01	mg/L	0.3	3.15	414	39.7	209	50.1	2.43	19.8	0.006	0.003	0.048		19	233	2.92	69.7		0.428
PW-38	04/23/01	mg/L																		
PW-38	07/25/01	mg/L																		
PW-38	10/11/01	mg/L																		
PW-38	01/15/02	mg/L																		
PW-38	04/11/02	mg/L																		
PW-38	07/16/02	mg/L	0.05	5.65	360	17.9	153	28.2	2	0.24	0.001	<0.001	0.032		9	275	0.194	73.2	0.438	0.025
PW-38	10/11/02	mg/L																		
PW-38	01/13/03	mg/L	0.16	5.96	384	22.5	165	37.2	2.54	0.33	<0.001	<0.001	0.04		20	121	0.224	42		0.085

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
PW-38	07/15/04	mg/L	<0.05	5.7	560	17	170	36	2.2	0.00036	0.0018	<0.001	0.13		11	180	0.21	51	0.51	0.063
PW-38	01/21/05	mg/L	<0.05	5.5	560	25	160	36	2.9	0.0002	0.0022	<0.001	0.07	<0.001	11	210	0.17	55	0.62	0.053
PW-39	03/07/95	mg/L																		
PW-39	06/07/95	mg/L																		
PW-39	09/08/95	mg/L																		
PW-39	10/23/95	mg/L																		
PW-39	11/27/95	mg/L																		
PW-39	01/22/96	mg/L																		
PW-39	03/06/96	mg/L																		
PW-39	04/24/96	mg/L																		
PW-39	06/04/96	mg/L																		
PW-39	07/15/96	mg/L																		
PW-39	09/01/96	mg/L																		
PW-39	12/01/96	mg/L																		
PW-39	01/01/97	mg/L																		
PW-39	04/01/97	mg/L																		
PW-39	07/01/97	mg/L																		
PW-39	10/01/97	mg/L																		
PW-39	01/05/98	mg/L																		
PW-39	04/06/98	mg/L																		
PW-39	07/01/98	mg/L		7.3	630		80	5	1.9		<0.001	0.001				210	0.05	42		
PW-39	10/05/98	mg/L																		
PW-39	01/05/99	mg/L		3.9	600	130	88	15	2.8	<0.0002	<0.001	<0.001				240	0.03	58		
PW-39	04/05/99	mg/L																		
PW-39	07/06/99	mg/L		5.5	640		97	8.8	2.1	0.0003	<0.001	<0.001				180	<0.02	51		
PW-39	10/01/99	mg/L																		
PW-39	01/05/00	mg/L	0.09	2.8	710		110	24	2.8	<0.0002	<0.001	<0.001	0.05	<0.001	<5	230	0.08	68		0.021
PW-39	04/05/00	mg/L																		
PW-39	07/06/00	mg/L	0.03	5.3	580		96	19	2.4	<0.0002	<0.001	<0.001	<0.05	<0.001	<5	200	0.05	57	0.75	0.02
PW-39	10/21/00	mg/L																		
PW-39	01/10/01	mg/L	0.21	3.35	351	26.6	107	24.3	3.06	15.6	<0.001	0.002	0.029		13	194	0.304	52.6		0.424
PW-39	04/23/01	mg/L																		
PW-39	07/25/01	mg/L	0.32	4.59	280	15.5	71.2	20.2	2.35	0.845	0.005	0.001	0.059		<5	245	0.089	41.8		0.124
PW-39	10/11/01	mg/L																		
PW-39	01/15/02	mg/L	0.01	4.64	300	16.7	78	20.8	2.92	0.845	<0.001	<0.001	0.039		8	149	0.009	44.5		0.005
PW-39	04/11/02	mg/L																		
PW-39	07/16/02	mg/L	0.05	4.07	274	15	65.9	11.2	2.53	0.64	0.001	<0.001	0.08		<5	158	0.081	52.1	0.235	0.081
PW-39	10/11/02	mg/L																		
PW-39	01/13/03	mg/L	0.09	3.82	317	19.6	86.5	23.3	2.84	0.6	0.001	<0.001	0.033		11	91.1	0.147	30.1		0.054
PW-39	07/10/03	mg/L	3.05	0.09	213	138	116	114	4.03	0.000301	0.007	<0.001	0.067		20	124	1.59	58.6	2.42	0.139
PW-39	01/15/04	mg/L	<0.05	2.7	630	30	150	40	2.9	0.00025	0.013	<0.001	0.087		18	200	0.17	57	1.1	0.083
PW-46	01/15/05	mg/L	<0.05	0.93	300	2.5	30	5.2	3.4	0.00061	0.0021	<0.001	<0.05		<5	92	0.02	27	<0.005	0.017
PW-46	07/15/05	mg/L	<0.05	0.71	310	2.6	26	3.6	2.9	0.00089	0.0061	<0.001	0.034		8	95	<0.02	28	<0.005	0.091
PW-46	01/17/06	mg/L	<0.05	1.1	370	3.3	30	5.9	3.1	0.00037	0.001	<0.001	0.066	<0.001	110	97	<0.02	30	<0.005	0.015
PW-46	07/20/06	mg/L	<0.05	<0.023	360	3.3	30	3.6	3.4	<0.0002	0.001	0.0034	0.027	<0.001	10	120	<0.02	34	<0.005	0.04
PW-46	01/10/07	mg/L	<0.05	1.2	400	2.7	38	3.1	3	<0.0002	0.001	0.0013	0.022	<0.001	<5	120	<0.02	33	<0.005	0.014
PW-46	07/10/07	mg/L	<0.05	0.84	350	3.8	28	3	2.3	<0.0002	0.001	<0.001	<0.02	<0.001	<5	100	<0.02	29	<0.005	0.019
PW-46	01/30/08	mg/L	<0.05	1.3	640	3.9	33	3.9	3.5	<0.0002	<0.001	<0.001	0.07	<0.001	6	110	0.03	32	<0.005	0.014
PW-46	07/08/08	mg/L	0.057	0.73	350	6.2	26	3	2.9	<0.0002	<0.001	<0.001	0.028	<0.001	<5	110	<0.02	33	<0.005	0.014
PW-46	01/28/09	mg/L	<0.05		320	5.1	29	4.4	3.6	<0.0002	0.002	0.0011	<0.02	<0.001	<5	100	<0.02	28	<0.005	0.012
PW-46	07/21/09	mg/L	<0.05	0.51	300	5.4	19	3.2	2.1	<0.0002	0.0012	<0.001	<0.02	<0.001	11	93	<0.02	27	<0.005	0.022
PW-46	01/19/10	mg/L	<0.05	0.5	270	4.9	25	3.7	2.4	<0.0002	0.0051	<0.001	<0.02	<0.001	9	90	<0.02	26	<0.005	0.0069
PW-46	07/07/10	mg/L	<0.05	0.44	330	2.8	23	4.2	2.6	<0.0002	0.0015	<0.001	<0.02	<0.001	<5	100	<0.05	29	<0.005	0.0086
PW-46	01/26/11	mg/L	<0.05	0.59	340	2.9	25	4	3.1	<0.0002	0.0011	<0.001	0.035	<0.001	6	98	<0.02	26	<0.005	0.0065
PW-46	07/06/11	mg/L	<0.05	0.34	360	4.6	18	4.6	2.7	<0.0002	<0.001	<0.001	<0.02	<0.001	<5	100	<0.02	30	<0.005	0.011
PW-46	01/10/12	mg/L	<0.05	0.31	330	5.6	18	4.1	2.5	<0.0002	<0.001	<0.001	0.029	<0.001	<5	100	<0.02	28	<0.005	0.0084
PW-46	07/17/12	mg/L	<0.05	0.33	330	5.7	15	4.6	2.2	<0.0002	<0.001	<0.001	<0.02	<0.001	10	100	<0.02	29	<0.005	0.0074
PW-46	01/11/13	mg/L	<0.05	0.35	330	8.3	21	5.2	3.8	<0.0002	<0.001	<0.001	0.023	<0.001	<5	110	<0.02	29	<0.005	0.062
PW-46	07/09/13	mg/L	0.19	0.2	340	5.8	13	5.7	2.3	<0.0002	<0.001	<0.001	0.09	<0.001	<5	98	0.083	28	<0.005	0.076
PW-46	01/13/14	mg/L	0.32	0.37	380	7	20	5.6	3.2	<0.0002	<0.001	<0.001	0.033	<0.001	<5	110	<0.02	29	<0.005	0.028
PW-46	07/10/14	mg/L	<0.01	0.25	250	5.5	16	4.8	2.1	<0.0002	<0.001	<0.001	0.021	<0.001	<5	110	<0.02	29	<0.005	0.018
PW-46	01/19/15	mg/L	0.012	0.27	390	6.2	19	5.6	2.2	<0.0002	<0.001	<0.001	0.028	<0.001	19	100	<0.02	29	<0.005	0.015

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
PW-46	07/27/15	mg/L	0.024	0.34	400	4.1	15	4.8	2	<0.0002	0.0013	<0.001	0.028	<0.001		100	<0.02	29	<0.005	0.013
PW-46	01/06/16	mg/L	0.04	0.3	350	3.6	15	4.6	2.3	<0.0002	<0.001	<0.001	0.031	<0.001	<5	100	<0.02	28	<0.005	0.0076
PW-46	07/28/16	mg/L	<0.01	0.33	350	3	13	4.5	1.9	<0.0002	<0.001	<0.001	0.027	<0.001		110	<0.02	32	<0.005	0.0073
PW-46	01/04/17	mg/L	0.053	0.22	370	4.4	17	5.4	2	<0.0002	<0.001	<0.001	0.034	<0.001	<5	120	<0.02	29	<0.005	0.0077
PW-46	07/11/17	mg/L	0.013	0.25	380	3.9	13	5	1.9	<0.0002	<0.001	<0.001	0.031	<0.001		110	<0.02	31	<0.005	0.021
PW-46	01/22/18	mg/L	0.34	0.26	390	4.1	16	5.4	2.1	<0.0002	0.003	<0.001	0.035	<0.001	<5	110	<0.02	28	<0.005	0.014
PW-46	07/09/18	mg/L	<0.01	0.28	380	3.3	8.8	4.2	1.8	<0.0002	<0.001	<0.001	0.026	<0.001		110	<0.02	30	<0.005	0.02
PW-46	01/07/19	mg/L	<0.01	0.26	360	3.6	12	5.1	2.5	<0.0002	<0.001	<0.001	0.032	<0.001	<5	120	<0.02	30	<0.005	0.0087
PW-46	07/08/19	mg/L	<0.01	0.10	<20	3.6	10	4.6	1.7	<0.0002	<0.001	<0.001	0.036	<0.001		110	<0.02	30	<0.005	0.018
PW-46	01/07/20	mg/L	<0.01	0.39	390	3.8	11	4.8	1.8	<0.0002	<0.001	<0.001	0.034	<0.001	8	110	<0.02	31	<0.005	0.0097
PW-46	07/06/20	mg/L	<0.01	0.37	340	3.4	9.2	4.4	1.6	<0.0002	<0.001	<0.001	0.029	<0.001		100	<0.02	30	<0.005	0.009
PW-46	01/12/21	mg/L	<0.01	0.26	380	2.8	12	5.4	2	<0.0002	<0.001	<0.001	0.044	<0.001	<5	110	<0.02	28	<0.005	0.0053
PW-46	07/15/21	mg/L	0.015	0.22	390	2	7.9	4.3	2	<0.0002	<0.001	<0.001	0.035	<0.001		110	0.061	32	0.0089	0.015
PW-48	07/15/05	mg/L	<0.05	3.5	540	17	130	29	2.7	0.00069	0.01	<0.001	0.075		9	180	0.22	49	0.41	0.1
PW-48	01/17/06	mg/L	<0.05	3.4	610	28	110	39	2.9	0.00087	0.003	<0.001	0.14	<0.001	8	190	0.13	52	0.7	0.035
PW-48	07/20/06	mg/L	<0.05	<0.023	600	21	22	30	3.3	0.00024	<0.001	<0.001	0.076	<0.001	10	210	0.19	57	0.76	0.029
PW-48	01/10/07	mg/L	<0.05	2.3	610	26	120	29	2.4	<0.0002	<0.001	0.0018	0.098	<0.001	5	190	0.13	52	1	0.044
PW-48	07/10/07	mg/L	<0.05	3.3	580	20	99	24	2.6	<0.0002	0.001	<0.001	0.073	<0.001	<5	190	1.2	50	0.8	0.028
PW-48	01/30/08	mg/L	<0.05	3.5	1200	28	120	28	0.34	<0.0002	<0.001	<0.001	0.12	<0.001	13	200	0.13	53	1	0.017
PW-48	07/08/08	mg/L	<0.05	2.8	570	21	90	24	3.1	<0.0002	<0.001	<0.001	0.088	<0.001	19	190	0.07	53	0.91	0.04
PW-48	01/28/09	mg/L	<0.05		500	29	91	29	3	<0.0002	0.0021	0.0013	0.09	<0.001	<5	180	0.05	48	1.1	0.033
PW-48	07/21/09	mg/L	<0.05	3.5	520	15	90	18	2.7	<0.0002	0.0012	<0.001	0.06	<0.001	8	170	0.049	45	0.53	0.02
PW-48	01/19/10	mg/L	<0.05	4.4	450	19	57	23	2.6	<0.0002	0.0084	<0.001	0.07	<0.001	9	170	0.034	46	0.67	0.012
PW-48	07/07/10	mg/L	<0.05	3.7	490	16	81	21	2.7	<0.0002	0.0013	<0.001	0.071	<0.001	6	160	<0.05	44	0.49	0.013
PW-48	01/18/11	mg/L	<0.05	4.1	490	25	87	21	2.6	<0.0002	<0.001	<0.001	0.082	<0.001	10	170	0.051	45	0.58	0.012
PW-48	07/06/11	mg/L	<0.05	2.9	450	12	69	14	3	<0.0002	<0.001	<0.001	0.035	<0.001	<5	150	0.058	42	0.09	0.0054
PW-48	01/10/12	mg/L	0.056	4.5	480	25	86	20	2.5	<0.0002	<0.001	<0.001	0.055	<0.001	<5	170	0.13	45	0.11	0.0075
PW-48	07/17/12	mg/L	<0.05	3.7	430	17	69	16	2.3	<0.0002	<0.001	<0.001	0.042	<0.001	<5	150	0.098	40	0.015	0.0067
PW-48	01/11/13	mg/L	<0.05	4	380	22	80	23	2.5	<0.0002	<0.001	<0.001	0.067	<0.001	<5	160	0.13	43	0.11	0.095
PW-48	07/09/13	mg/L	<0.1	3.3	460	16	62	17	2.3	<0.0002	<0.001	<0.001	0.055	<0.001	7	140	0.3	38	0.049	0.061
PW-48	01/13/14	mg/L	<0.05	4.1	460	21	66	21	2.4	<0.0002	<0.001	<0.001	0.061	<0.001	<5	150	0.1	40	0.05	0.045
PW-48	07/10/14	mg/L	<0.01	2.4	450	17	55	12	1.5	<0.0002	<0.001	<0.001	0.034	<0.001	<5	140	0.041	39	<0.005	0.055
PW-48	01/19/15	mg/L	<0.01	3.7	450	22	93	17	1.6	<0.0002	<0.001	<0.001	0.052	<0.001	10	140	0.13	42	<0.005	0.052
PW-48	07/27/15	mg/L	0.037	0.56	400	5.2	20	5.8	2	<0.0002	<0.001	<0.001	0.034	<0.001		110	<0.02	29	0.019	0.4
PW-48	01/06/16	mg/L	0.043	3.6	440	19	82	17	1.7	<0.0002	<0.001	<0.001	0.071	<0.001	<5	140	0.15	40	<0.005	0.031
PW-48	07/28/16	mg/L	0.011	1.9	440	14	65	12	1.5	<0.0002	<0.001	<0.001	0.061	<0.001		140	0.12	39	<0.005	0.022
PW-48	01/04/17	mg/L	0.057	2.9	430	24	99	18	1.5	<0.0002	<0.001	<0.001	0.095	<0.001	<5	140	0.35	42	<0.005	0.07
PW-48	07/11/17	mg/L	0.077	2.5	440	15	72	15	1.7	<0.0002	<0.001	<0.001	0.071	<0.001		150	0.14	39	<0.005	0.0099
PW-48	01/22/18	mg/L	0.47	3.2	440	19	88	17	1.7	<0.0002	<0.001	<0.001	0.071	<0.001	6	150	0.15	41	<0.005	0.011
PW-48	07/09/18	mg/L	0.013	1.7	450	12	49	11	1.8	<0.0002	<0.001	<0.001	0.05	<0.001		140	0.069	38	<0.005	0.019
PW-48	01/07/19	mg/L	<0.01	2.8	380	18	70	15	1.8	<0.0002	<0.001	<0.001	0.073	<0.001	5.0	150	0.19	42	0.0050	0.0076
PW-48	07/08/19	mg/L	<0.01	0.57	<20	11	50	13	1.8	<0.0002	<0.001	<0.001	0.055	<0.001		150	0.12	38	<0.005	0.0079
PW-48	01/07/20	mg/L	<0.01	3.4	490	17	67	17	1.8	<0.0002	0.0011	<0.001	0.075	<0.001	<5	160	0.18	46	<0.005	0.0061
PW-48	07/06/20	mg/L	<0.01	2	430	10	48	12	1.8	<0.0002	<0.001	<0.001	0.057	<0.001		140	0.089	39	<0.005	0.010
PW-48	01/12/21	mg/L	<0.01	3.5	460	18	57	18	1.6	<0.0002	0.001	<0.001	0.065	<0.001	<5	150	0.15	44	<0.005	0.0062
PW-48	07/15/21	mg/L	<0.01	4	490	25	62	28	1.8	<0.0002	<0.001	<0.001	0.075	<0.001		150	0.14	47	<0.005	0.0099
PW-49	10/19/06	mg/L											2.2							
PW-49	01/12/07	mg/L											2.1							
PW-49	01/12/07	mg/L											2.1							
PW-49	04/12/07	mg/L											2.9							
PW-49	07/10/07	mg/L											5							
PW-49	10/18/07	mg/L											3.9							
PW-49	01/30/08	mg/L											2.1							
PW-49	04/24/08	mg/L											1.2							
PW-49	07/09/08	mg/L											1.2							
PW-49	10/16/08	mg/L											1.2							
PW-49	01/28/09	mg/L											1.3							
PW-49	04/13/09	mg/L											0.78							
PW-49	07/21/09	mg/L											0.65							
PW-49	10/15/09	mg/L											0.6							
PW-49	01/19/10	mg/L											0.74							
PW-49	04/12/10	mg/L											0.67							

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
PW-49	07/07/10	mg/L											0.61							
PW-49	10/13/10	mg/L											0.48							
PW-49	01/18/11	mg/L											0.62							
PW-49	04/11/11	mg/L											0.42							
PW-49	07/06/11	mg/L											0.37							
PW-49	10/19/11	mg/L											0.41							
PW-49	01/10/12	mg/L											0.55							
PW-49	04/09/12	mg/L											0.53							
PW-49	07/17/12	mg/L											0.4							
PW-49	10/08/12	mg/L											0.32							
PW-49	01/11/13	mg/L											0.37							
PW-49	07/09/13	mg/L											0.3							
PW-49	10/14/13	mg/L											0.22							
PW-49	01/13/14	mg/L											0.37							
PW-49	04/03/14	mg/L											0.31							
PW-49	07/10/14	mg/L											0.25							
PW-49	10/20/14	mg/L											0.33							
PW-49	01/19/15	mg/L											0.24							
PW-49	04/01/15	mg/L											0.23							
PW-49	07/27/15	mg/L											0.24							
PW-49	10/12/15	mg/L											<0.3							
PW-49	01/06/16	mg/L											0.28							
PW-49	04/11/16	mg/L											0.24							
PW-49	07/28/16	mg/L											0.19							
PW-49	10/06/16	mg/L											0.26							
PW-49	01/04/17	mg/L											0.31							
PW-49	04/03/17	mg/L											0.20							
PW-49	07/11/17	mg/L											0.25							
PW-49	10/05/17	mg/L											0.15							
PW-49	01/22/18	mg/L											0.26							
PW-49	04/06/18	mg/L											0.24							
PW-49	07/09/18	mg/L											0.24							
PW-49	10/08/18	mg/L											0.33							
PW-49	10/22/18	mg/L											0.38							
PW-49	01/07/19	mg/L											0.38							
PW-49	04/22/19	mg/L											0.25							
PW-49	07/08/19	mg/L											0.32							
PW-49	10/10/19	mg/L											0.40							
PW-49	01/07/20	mg/L											0.36							
PW-49	04/15/20	mg/L											0.24							
PW-49	07/06/20	mg/L											0.31							
PW-49	10/08/20	mg/L											0.22							
PW-49	01/12/21	mg/L											0.33							
PW-49	04/07/21	mg/L											0.36							
PW-49	07/15/21	mg/L											0.38							
PW-49	10/05/21	mg/L											0.51							
PW-50	10/19/06	mg/L											0.54							
PW-50	01/12/07	mg/L											0.58							
PW-50	01/12/07	mg/L											0.58							
PW-50	04/12/07	mg/L											0.4							
PW-50	07/10/07	mg/L											0.32							
PW-50	10/18/07	mg/L											0.24							
PW-50	01/30/08	mg/L											0.23							
PW-50	04/24/08	mg/L											0.19							
PW-50	07/09/08	mg/L											0.29							
PW-50	10/16/08	mg/L											0.21							
PW-50	01/29/09	mg/L											0.19							
PW-50	04/13/09	mg/L											0.17							
PW-50	07/21/09	mg/L											0.2							
PW-50	10/15/09	mg/L											0.19							
PW-50	01/19/10	mg/L											0.17							
PW-50	04/12/10	mg/L											0.18							

Table 1
Granger Grand River Landfill
MID 082 771 700
Historical Secondary and Tertiary Inorganic Groundwater Analytical Data

Monitoring Well	Sample Date	Unit	Ammonia Nitrogen	Nitrate Nitrogen	Bicarbonate Alkalinity	Chloride	Sulfate	Dissolved Sodium	Dissolved Potassium	Dissolved Cadmium	Dissolved Chromium	Dissolved Lead	Dissolved Boron	Dissolved Arsenic	Dissolved COD	Dissolved Calcium	Dissolved Iron	Dissolved Magnesium	Dissolved Manganese	Dissolved Zinc
PW-50	07/07/10	mg/L											0.2							
PW-50	10/13/10	mg/L											0.21							
PW-50	01/18/11	mg/L											0.17							
PW-50	04/11/11	mg/L											0.14							
PW-50	07/06/11	mg/L											0.16							
PW-50	10/19/11	mg/L											0.18							
PW-50	01/10/12	mg/L											0.19							
PW-50	04/09/12	mg/L											0.17							
PW-50	07/17/12	mg/L											0.21							
PW-50	10/04/12	mg/L											<0.3							
PW-50	01/13/14	mg/L											0.14							
PW-50	04/03/14	mg/L											0.13							
PW-50	07/09/14	mg/L											0.14							
PW-50	10/20/14	mg/L											0.14							
PW-50	01/19/15	mg/L											0.11							
PW-50	04/01/15	mg/L											0.14							
PW-50	07/27/15	mg/L											0.14							
PW-50	10/12/15	mg/L											<0.3							
PW-50	01/06/16	mg/L											0.16							
PW-50	04/11/16	mg/L											0.11							
PW-50	07/28/16	mg/L	1.4										0.14							
PW-50	10/06/16	mg/L											<0.02							
PW-50	01/04/17	mg/L											0.16							
PW-50	04/03/17	mg/L											0.14							
PW-50	07/12/17	mg/L											0.16							
PW-50	10/05/17	mg/L											0.27							
PW-50	01/22/18	mg/L											0.2							
PW-50	04/06/18	mg/L											0.16							
PW-50	07/09/18	mg/L											0.16							
PW-50	10/08/18	mg/L											0.33							
PW-50	10/22/18	mg/L											0.31							
PW-50	01/07/19	mg/L											0.28							
PW-50	04/22/19	mg/L											0.23							
PW-50	07/08/19	mg/L											0.23							
PW-50	10/10/19	mg/L											0.44							
PW-50	01/07/20	mg/L											0.3							
PW-50	04/15/20	mg/L											0.22							
PW-50	07/06/20	mg/L											0.24							
PW-50	10/08/20	mg/L											0.53							
PW-50	01/12/21	mg/L											0.43							
PW-50	04/07/21	mg/L											0.32							
PW-50	07/15/21	mg/L											0.29							
PW-50	10/05/21	mg/L											0.23							

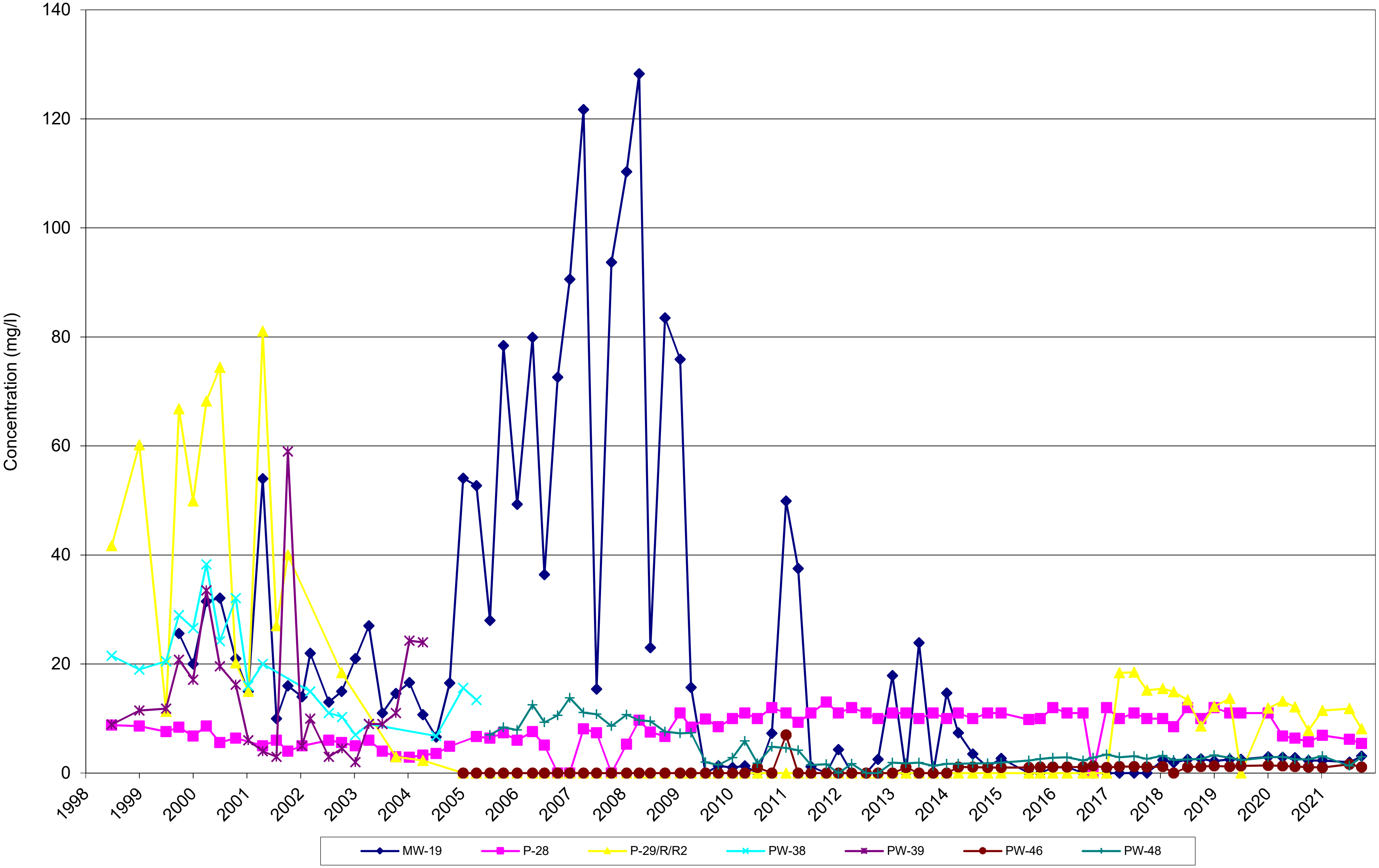
GRANGER GRAND RIVER MID 082 771 700 LANDFILL

2021 ANNUAL REPORT

ATTACHMENT B

GRAPHICAL TREND ANALYSES

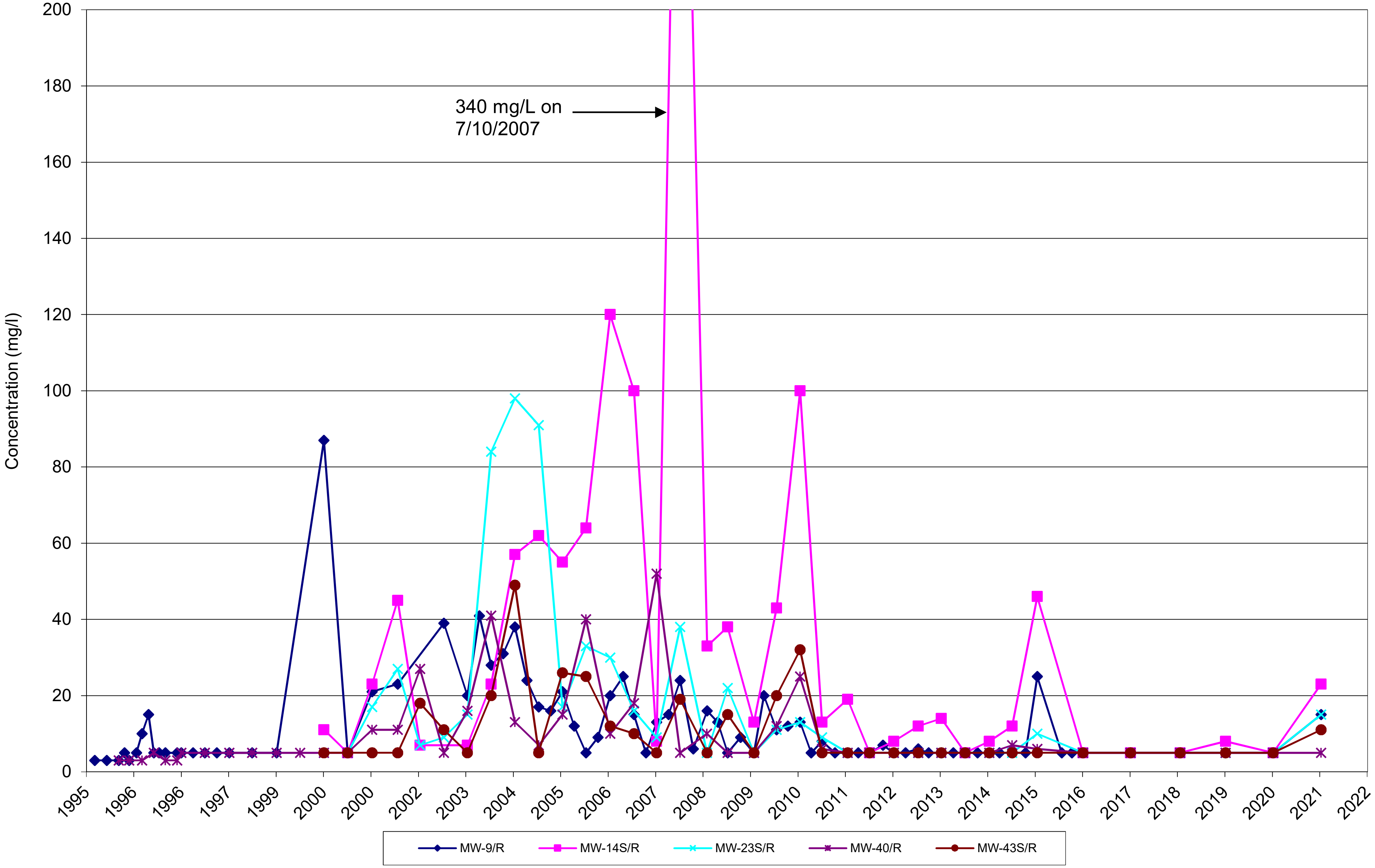
Figure 1
Granger Grand River MID Landfill
MID 082 771 700
Recovery System Effective Monitoring Wells Total Volatile Organic Constituents



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

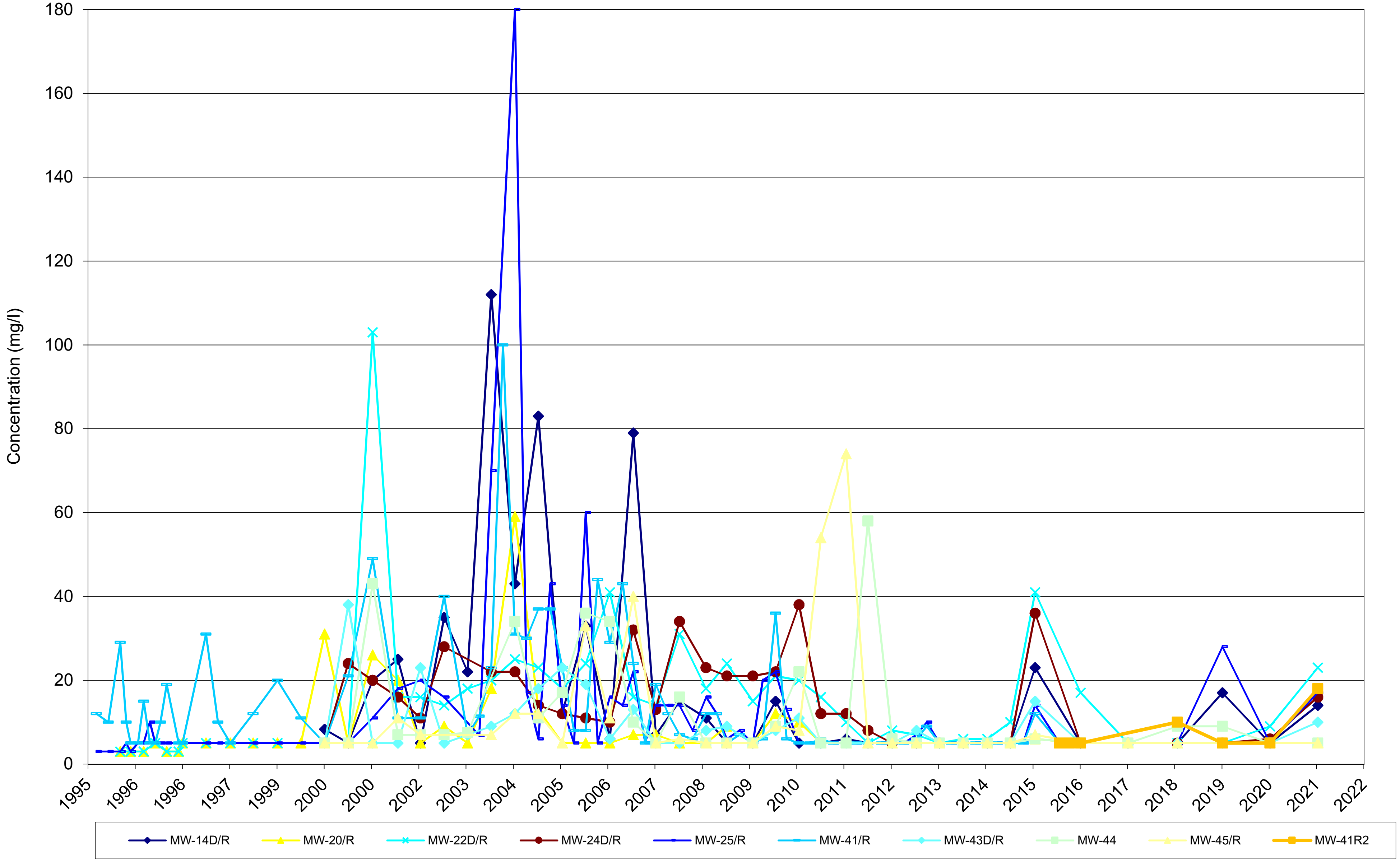
Figure 2
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Chemical Oxygen Demand



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

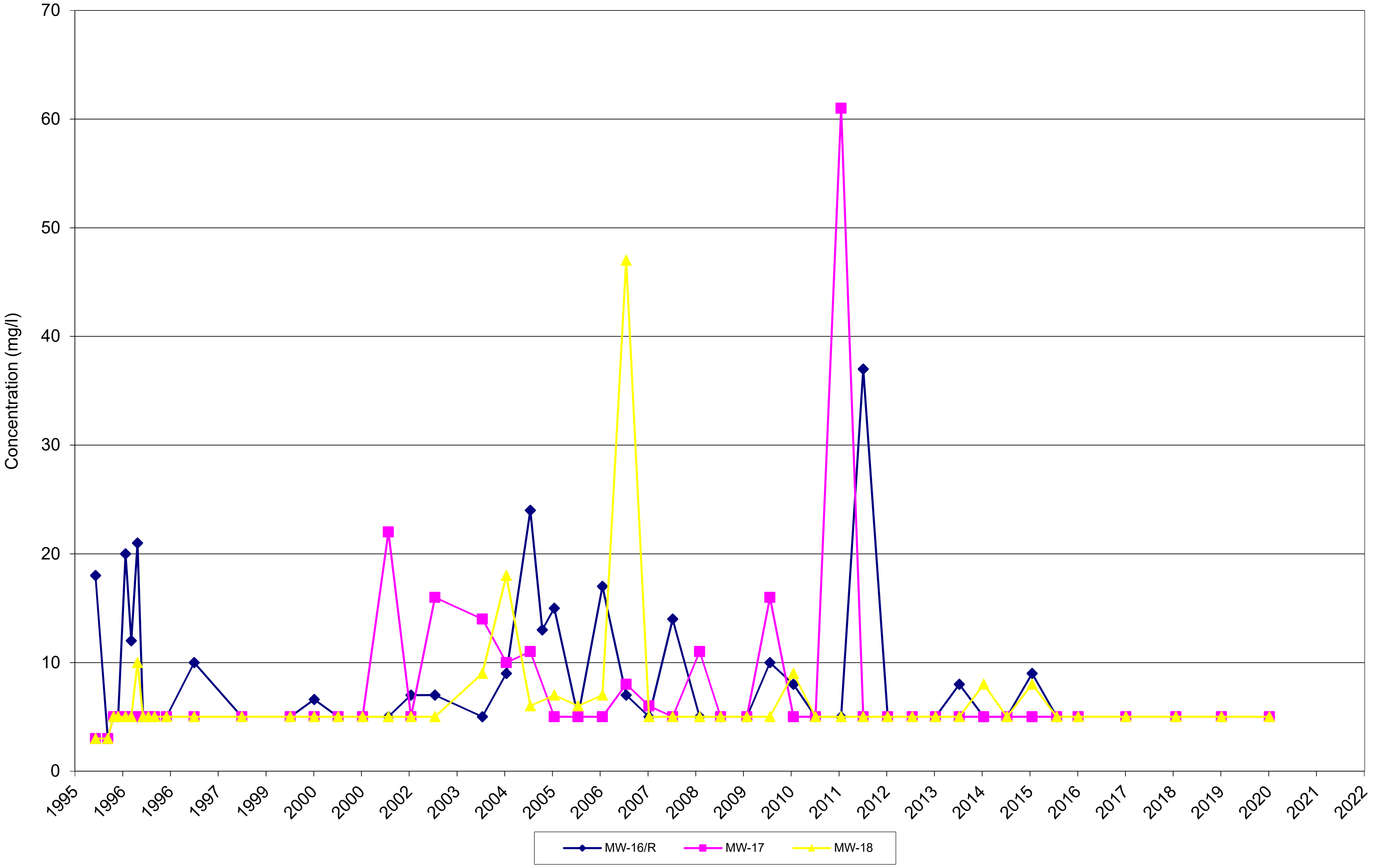
Figure 3
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Chemical Oxygen Demand



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

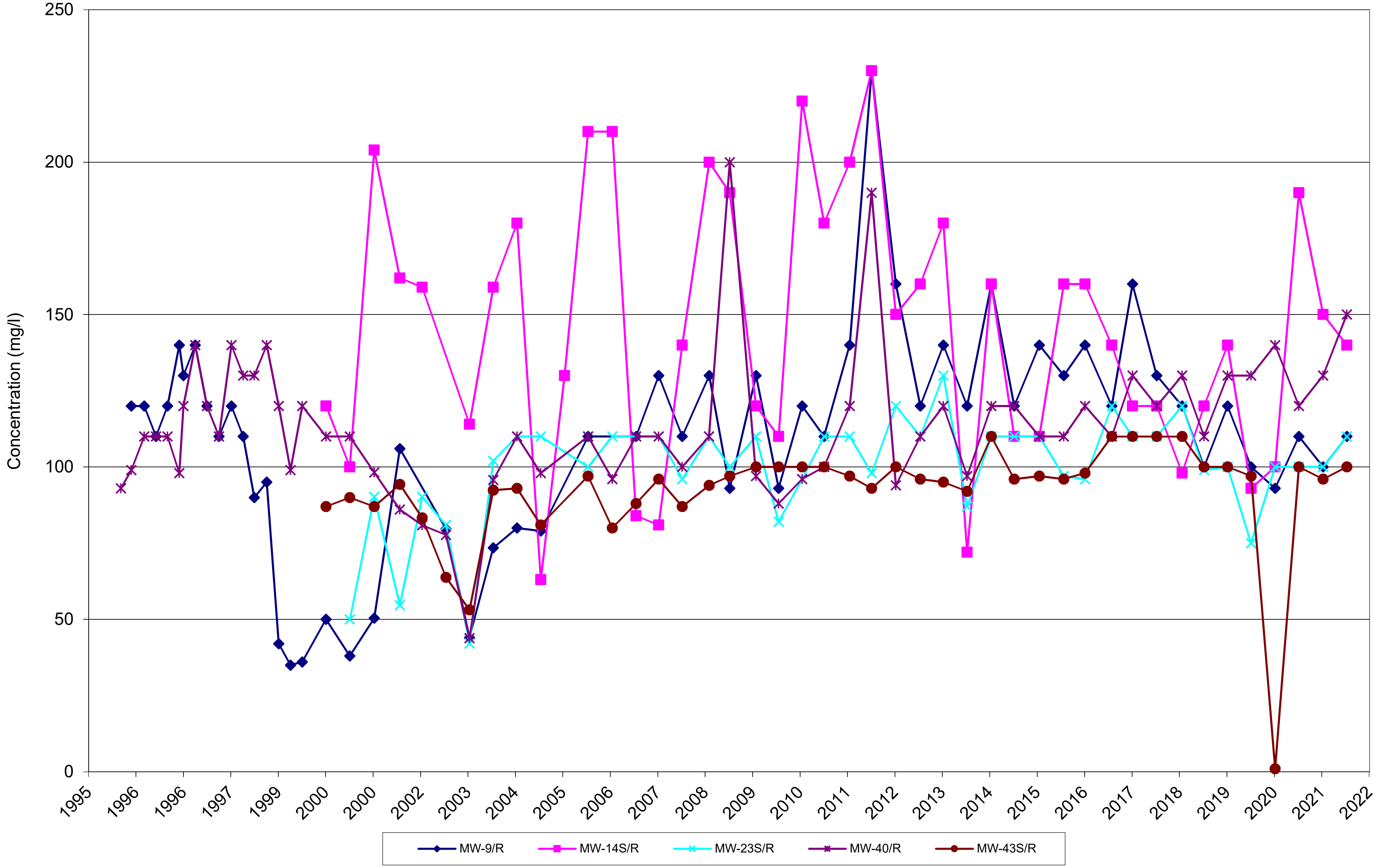
February 2022

Figure 4
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Chemical Oxygen Demand



February 2022

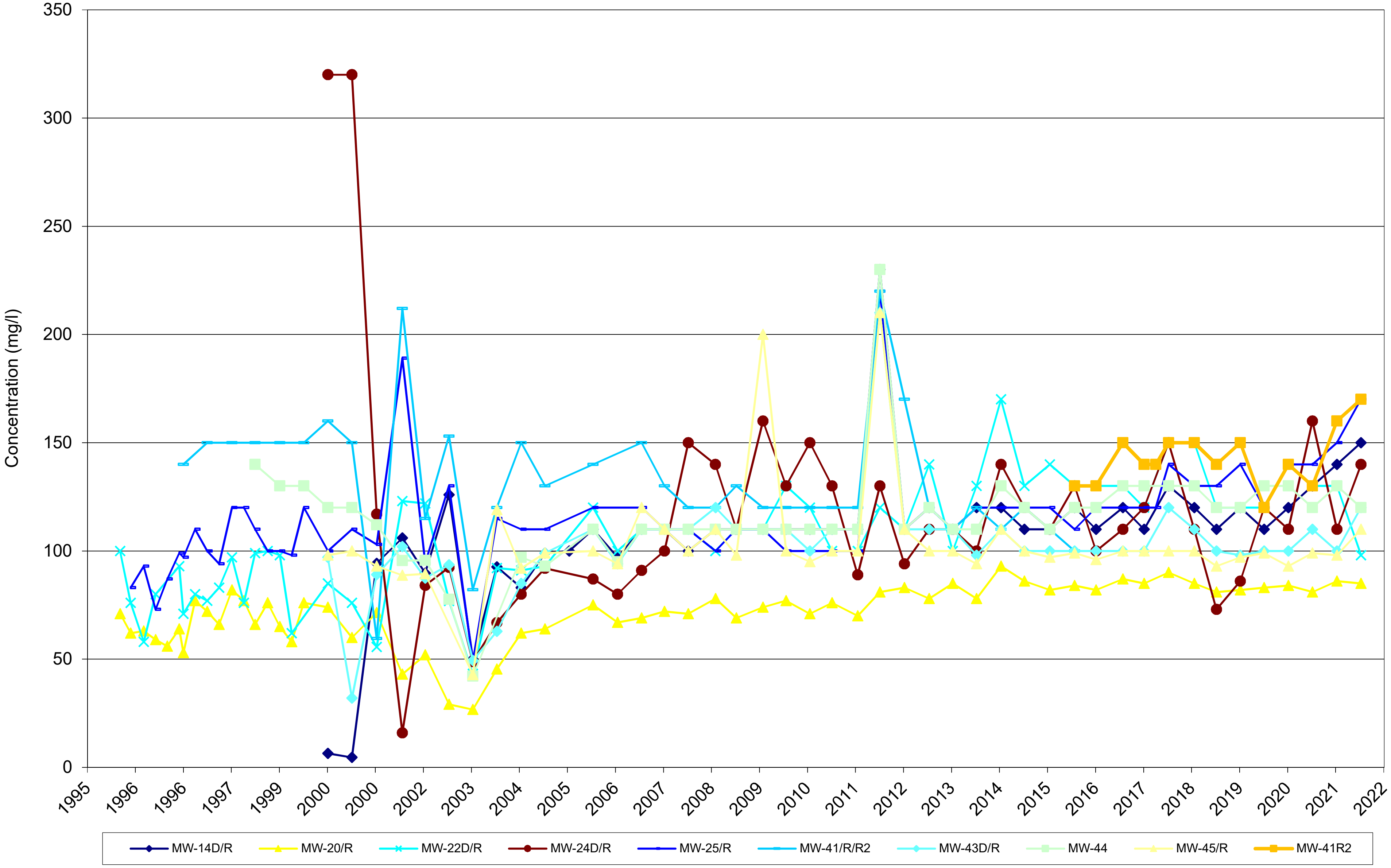
Figure 5
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Calcium



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

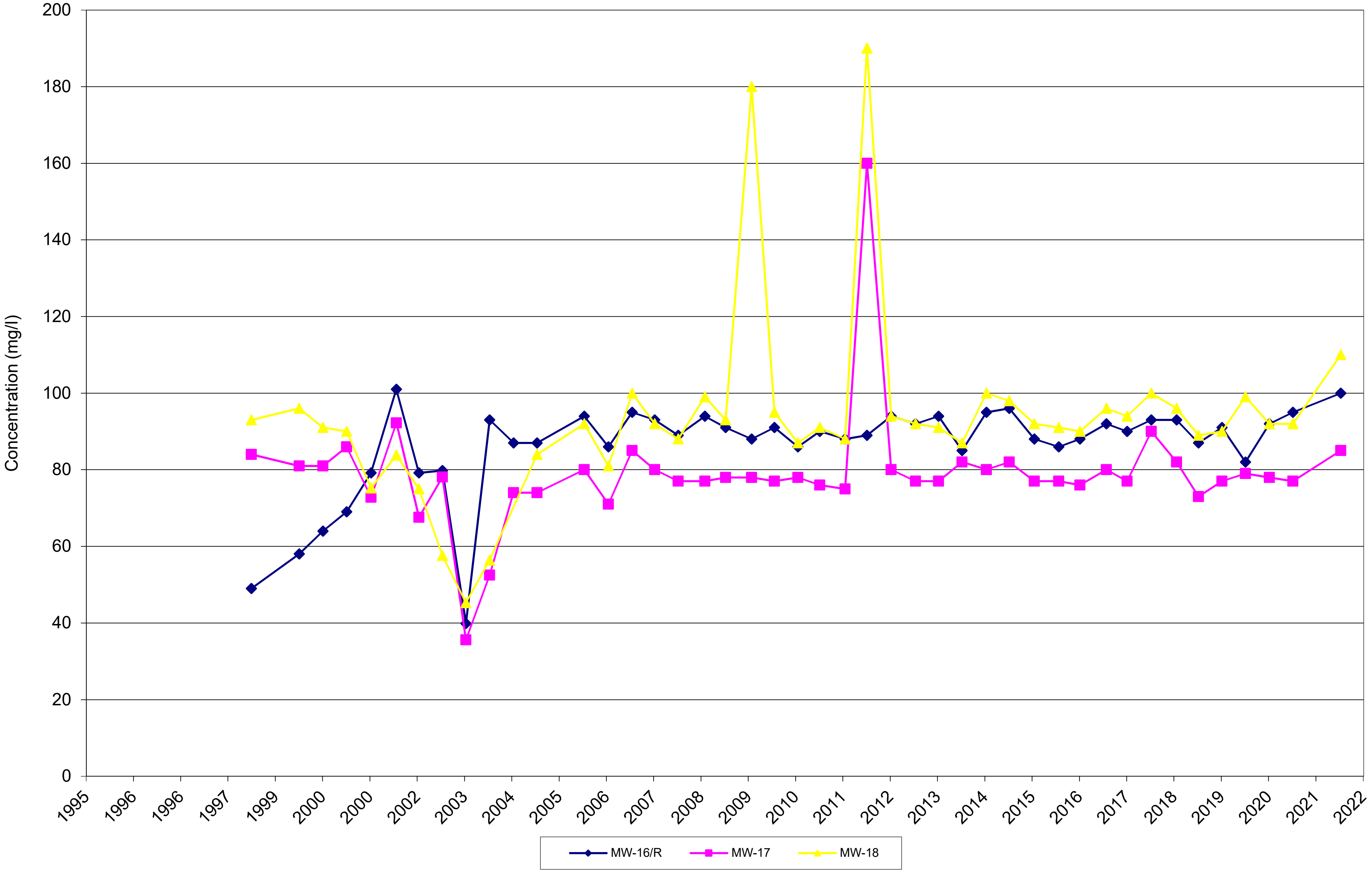
Figure 6
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Calcium



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

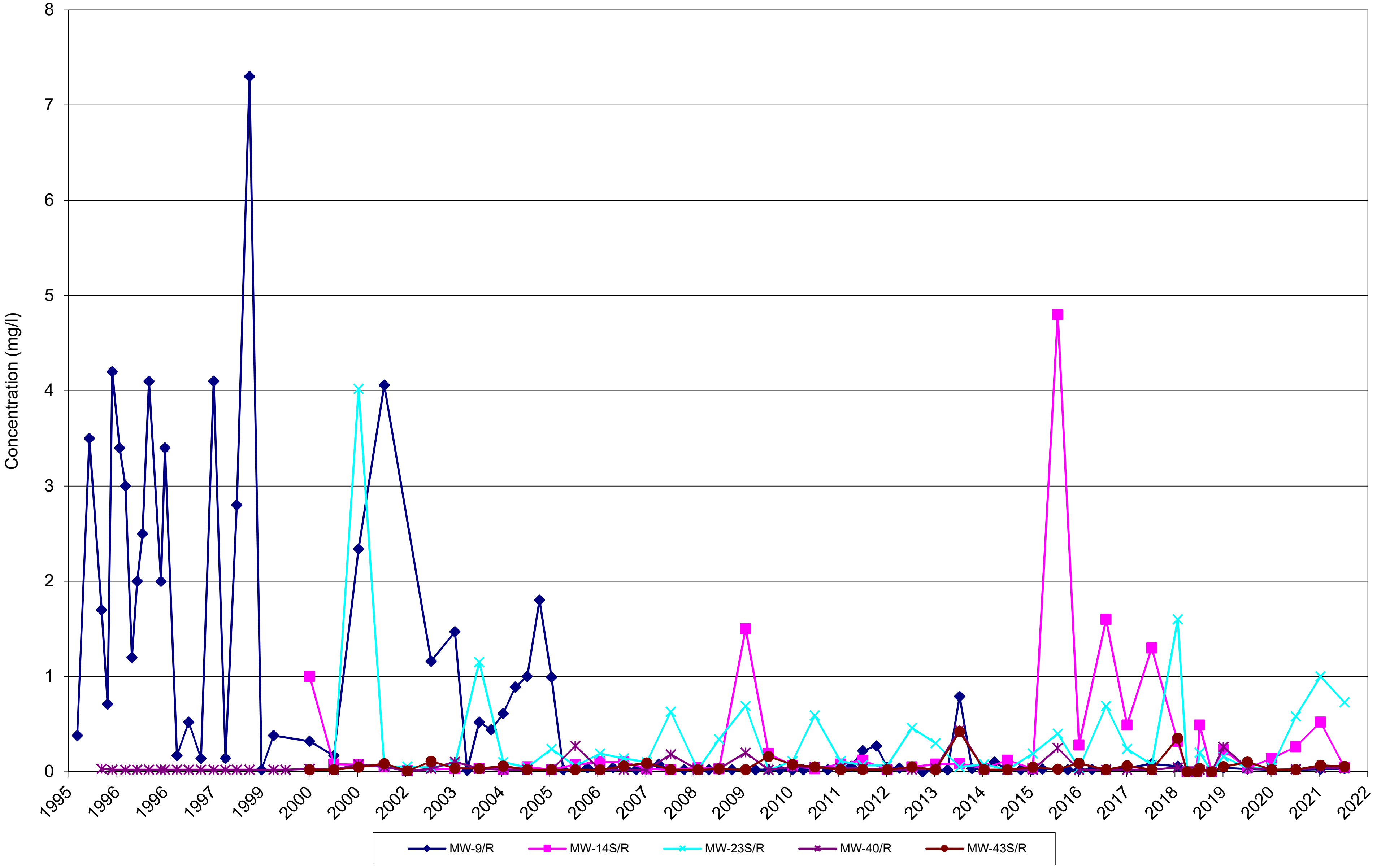
Figure 7
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Calcium



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

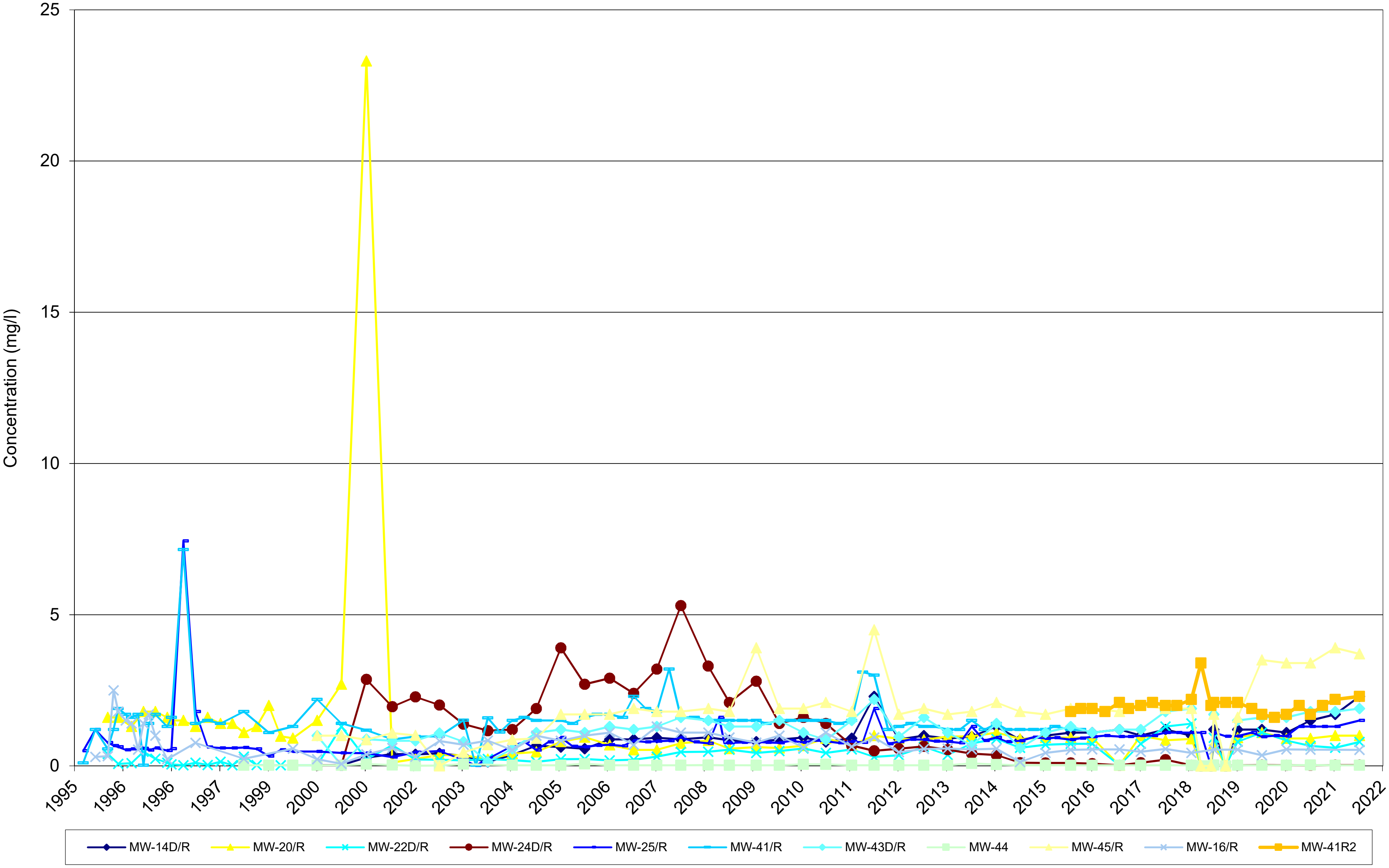
Figure 8
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Iron



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

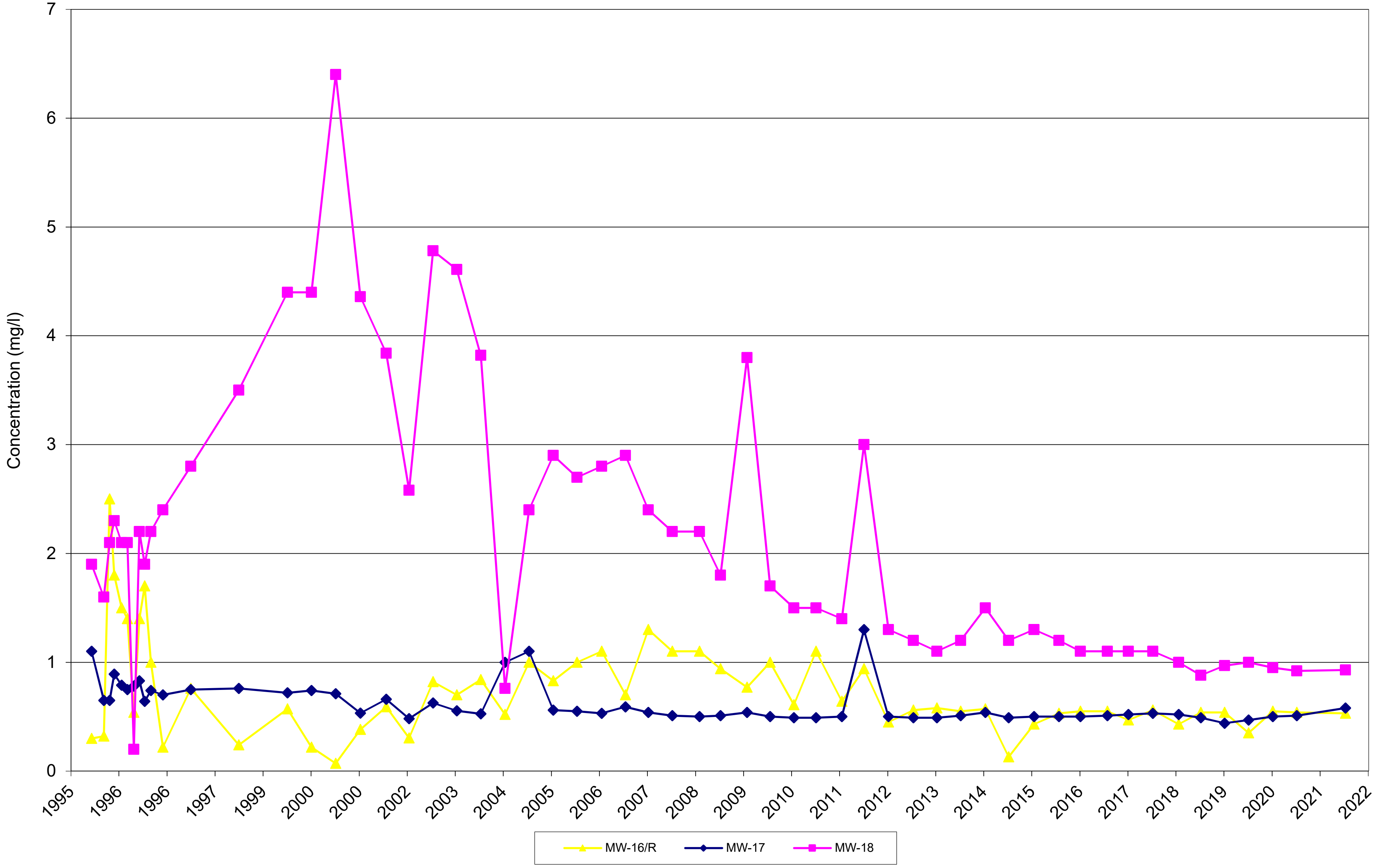
Figure 9
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Iron



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

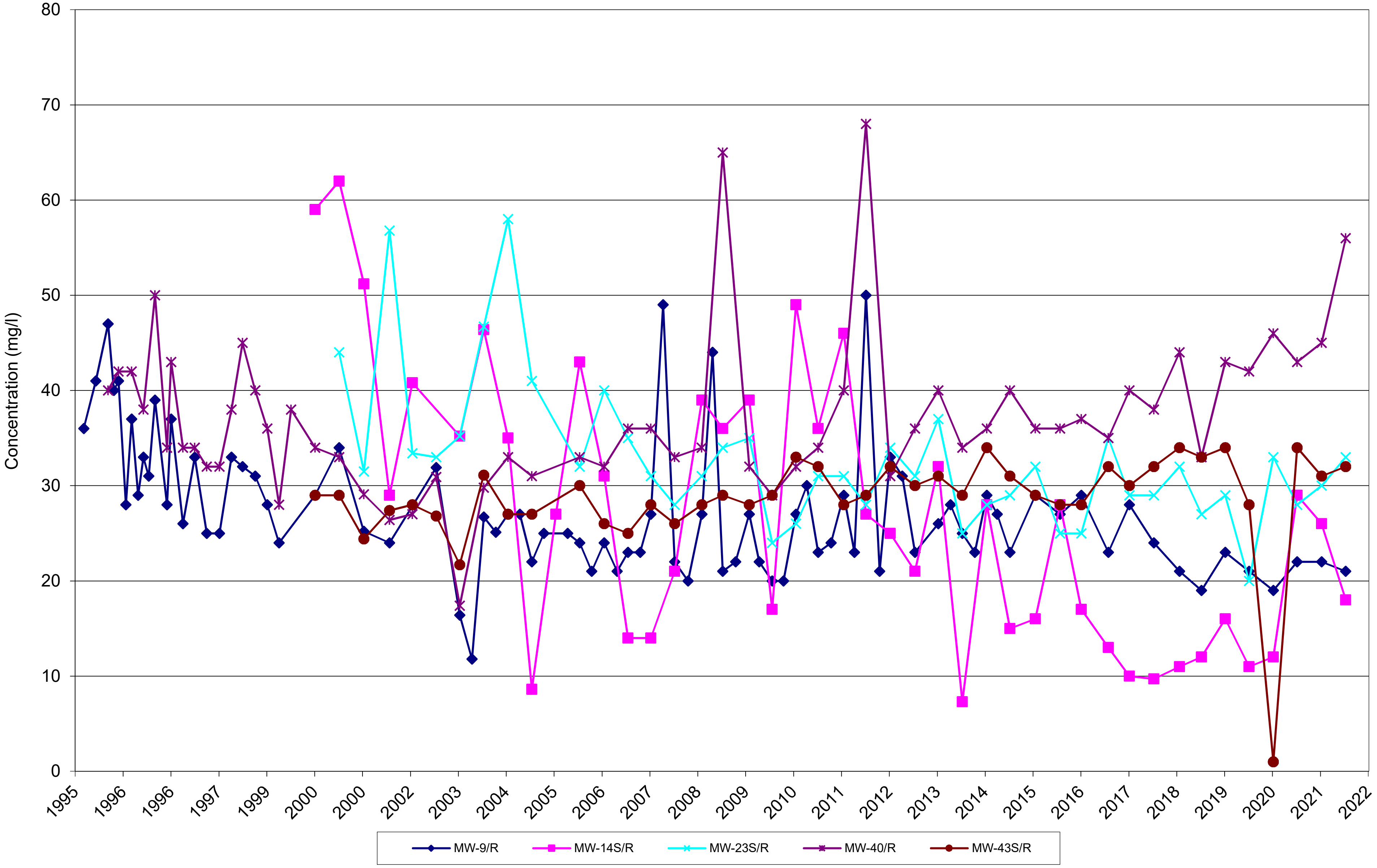
Figure 10
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Iron



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

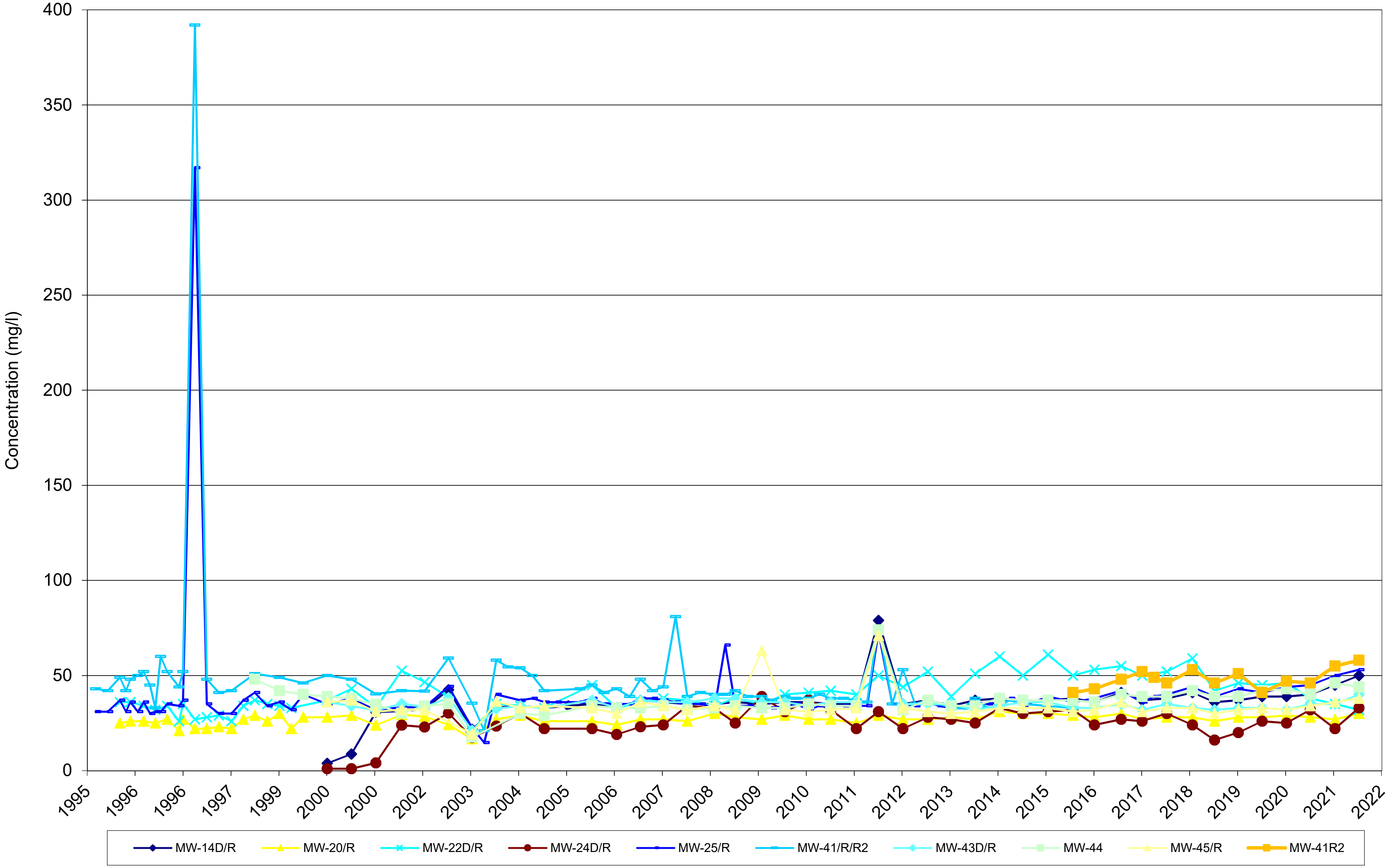
Figure 11
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Magnesium



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

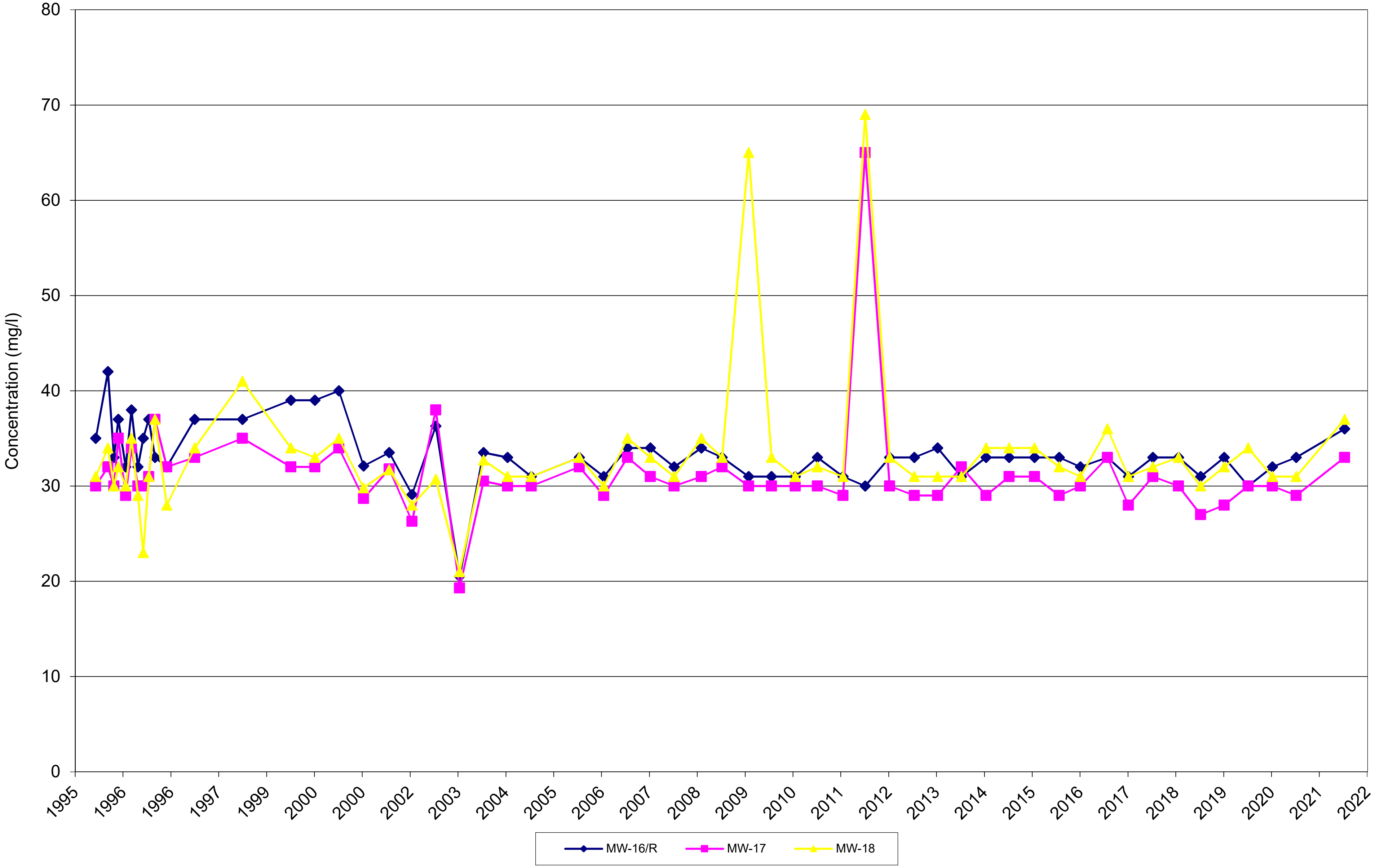
Figure 12
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Magnesium



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

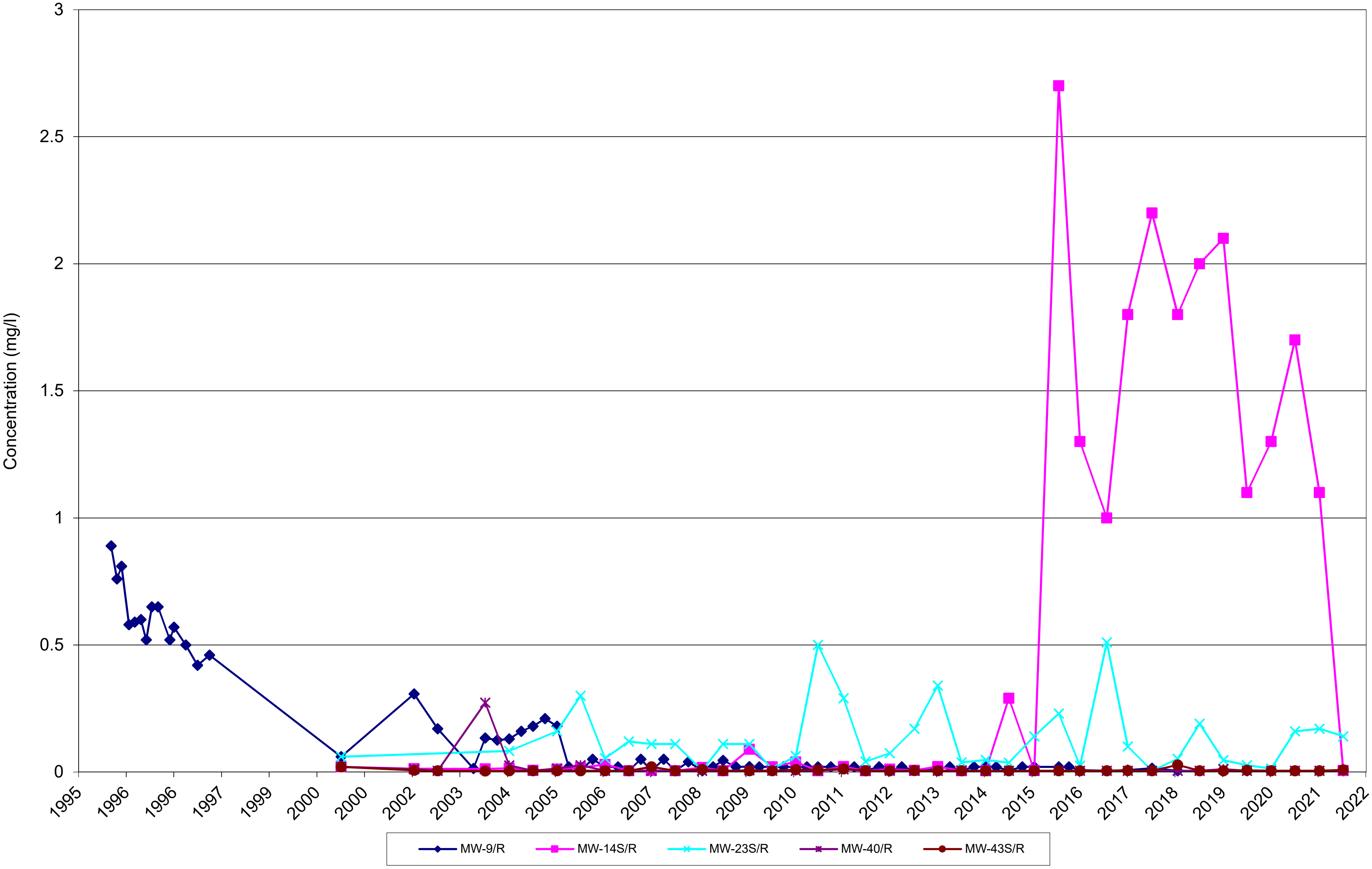
Figure 13
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Magnesium



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

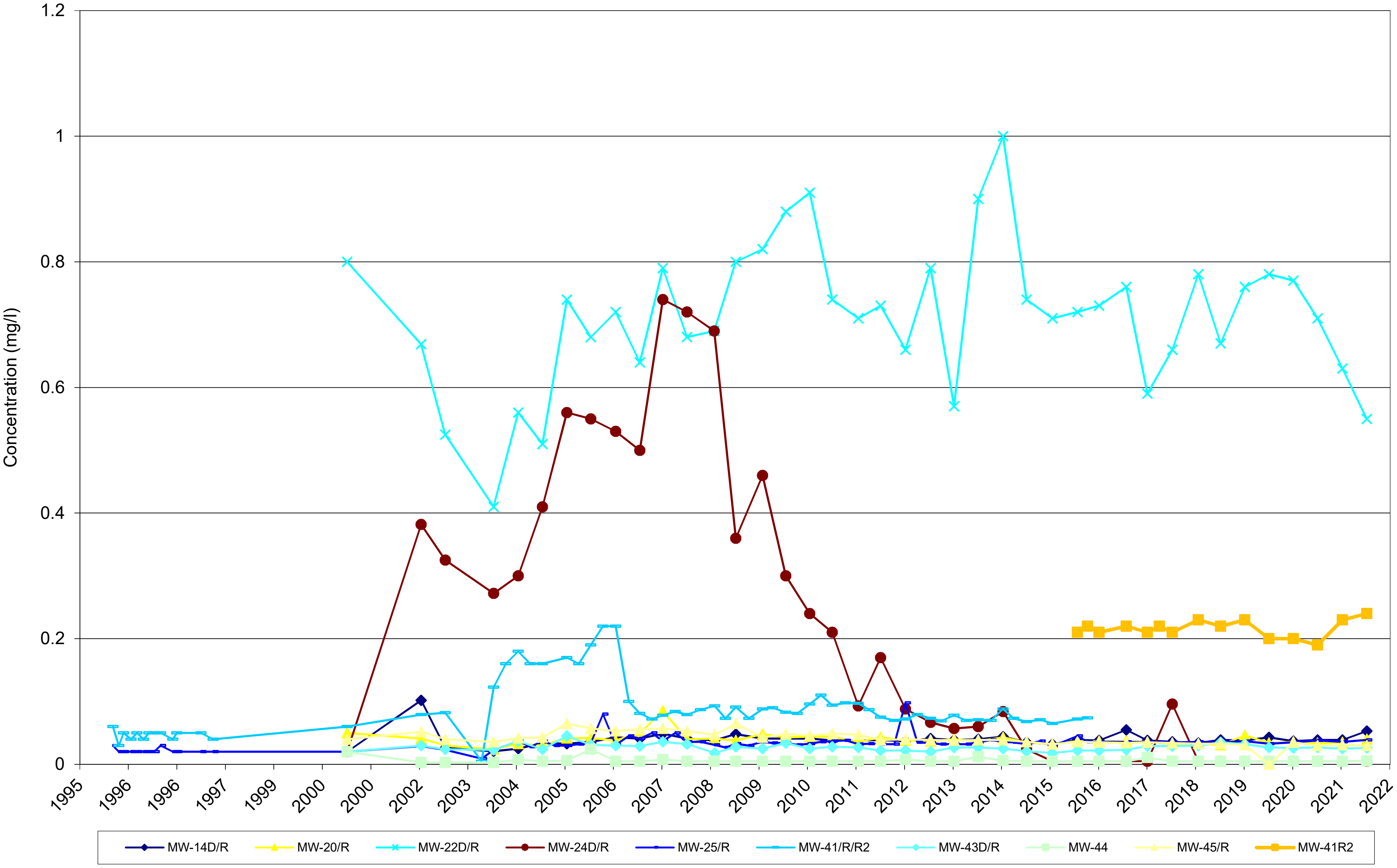
Figure 14
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Manganese



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

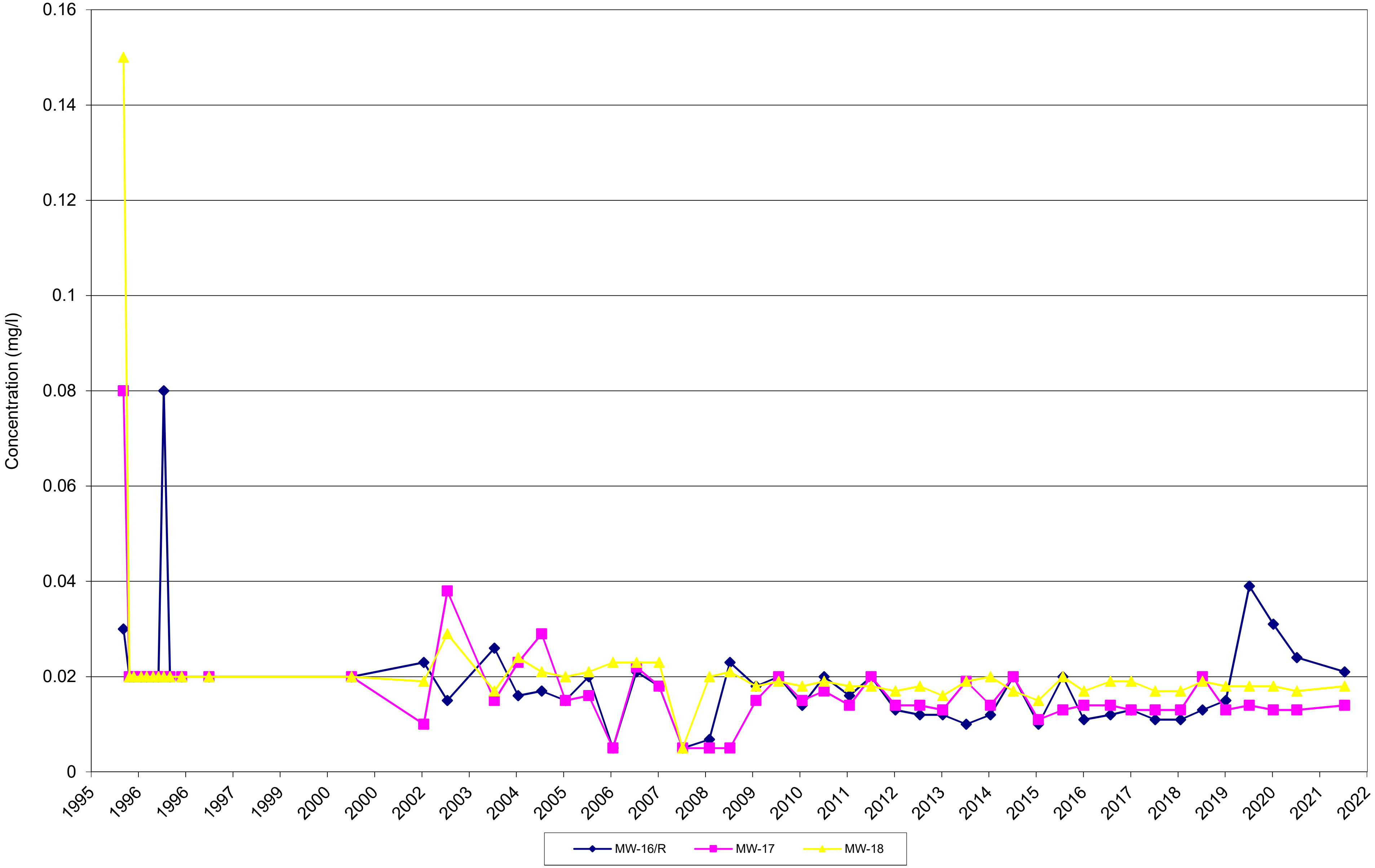
Figure 15
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Manganese



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

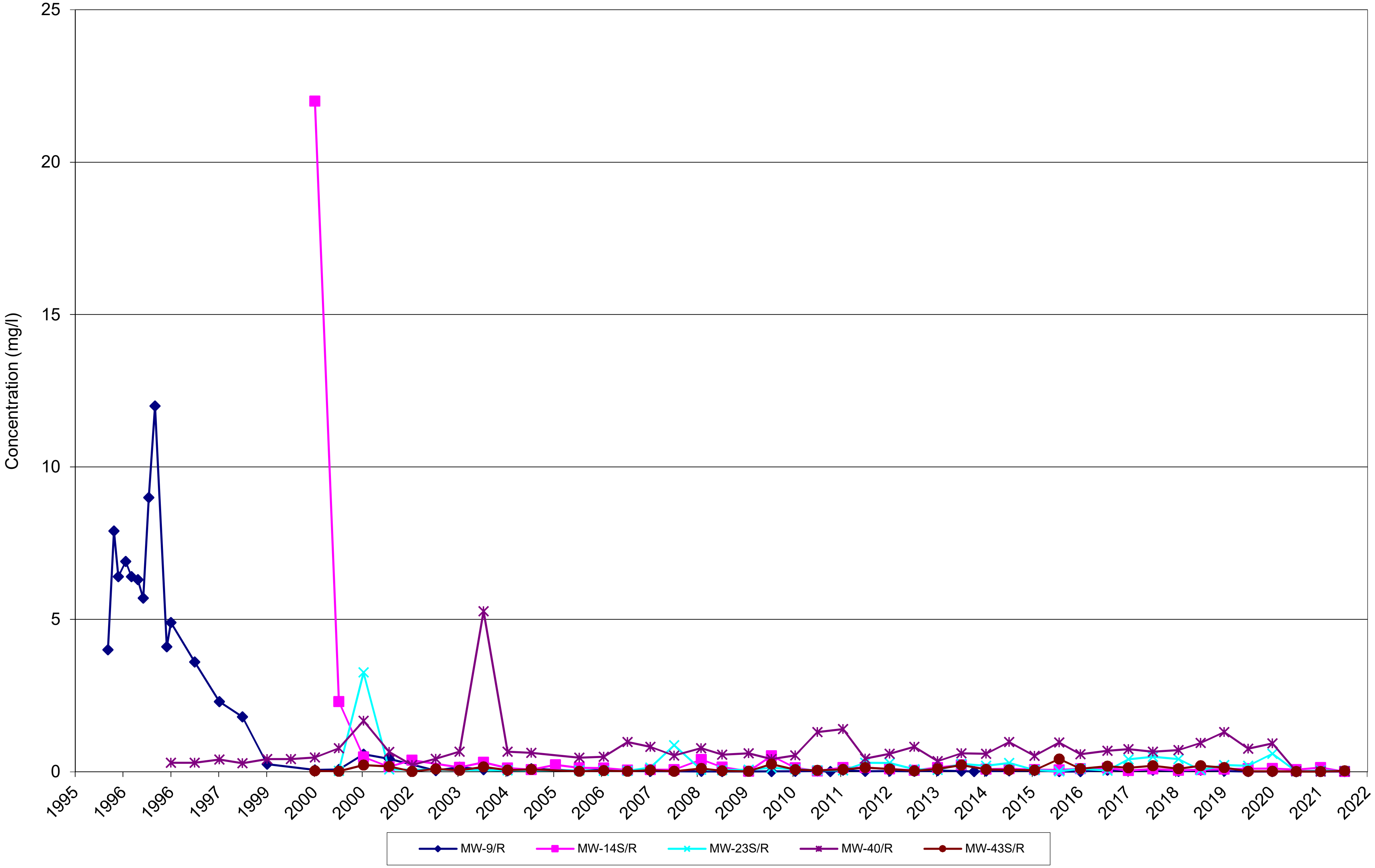
Figure 16
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Manganese



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

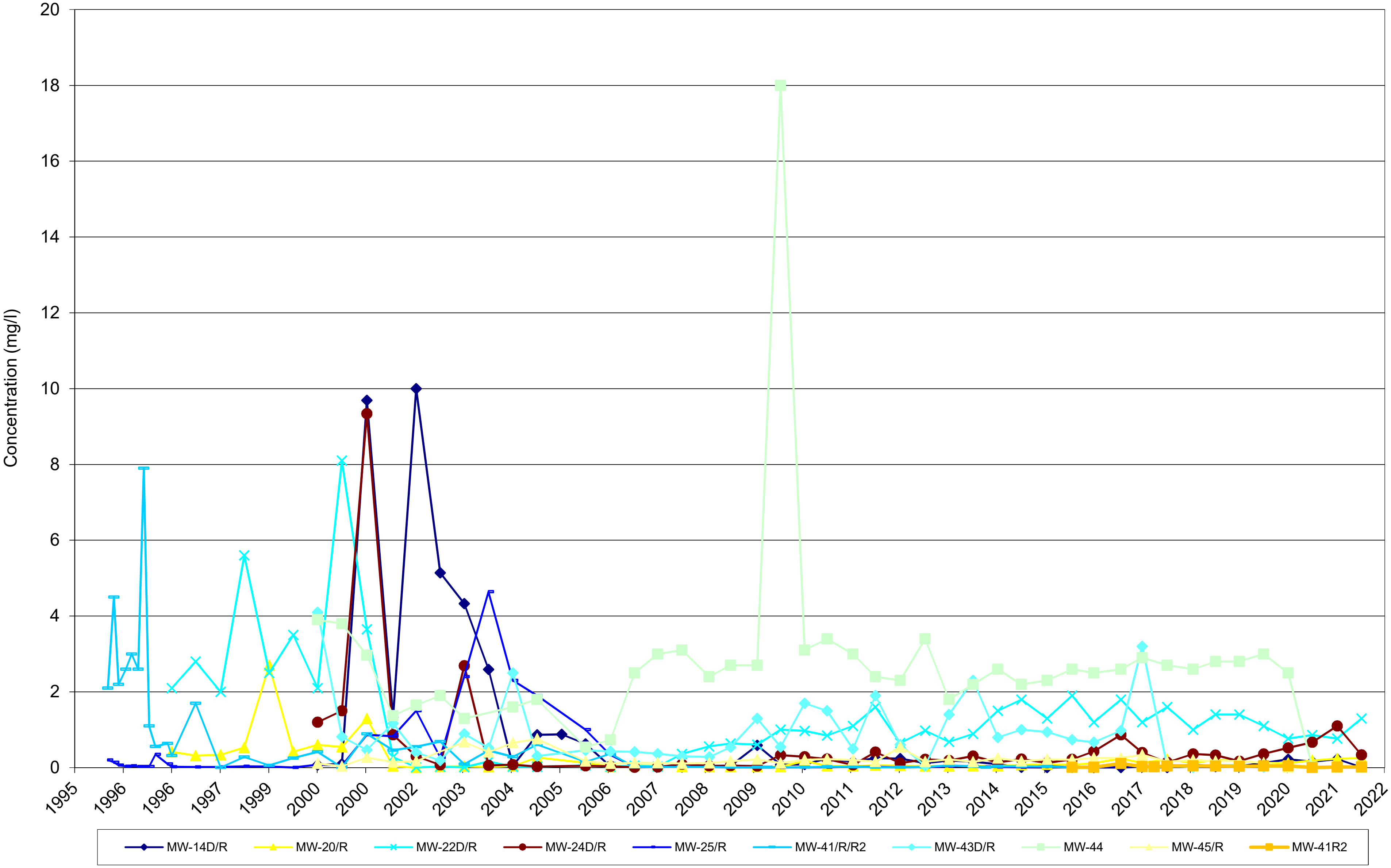
Figure 17
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Zinc



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

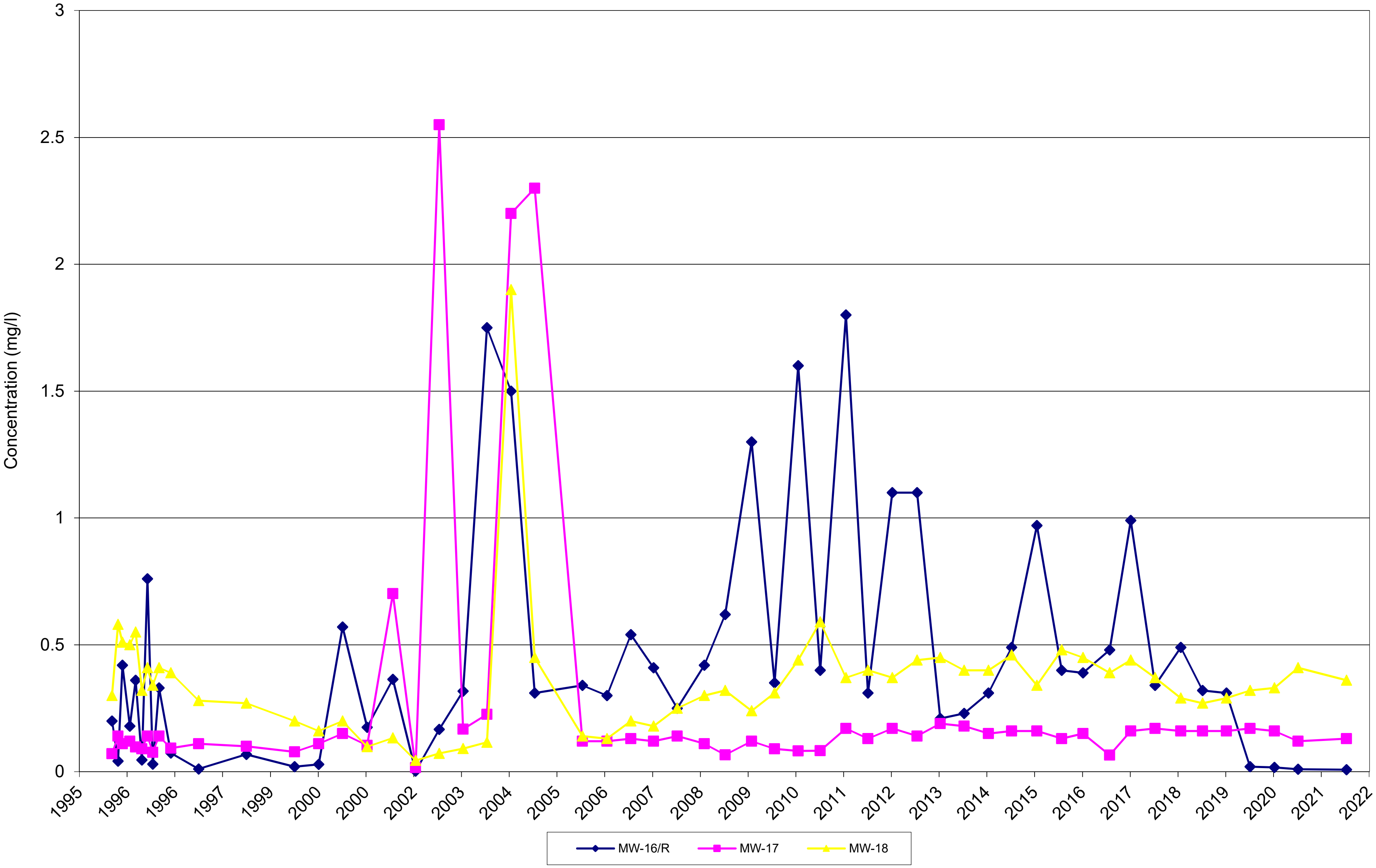
Figure 18
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Zinc



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

February 2022

Figure 19
Granger Grand River MID Landfill
MID 082 771 700
Tertiary Monitoring Parameter Dissolved Zinc



X:\WPAAM\PJT2\414508\0002\MID Annual\T414508.2-001

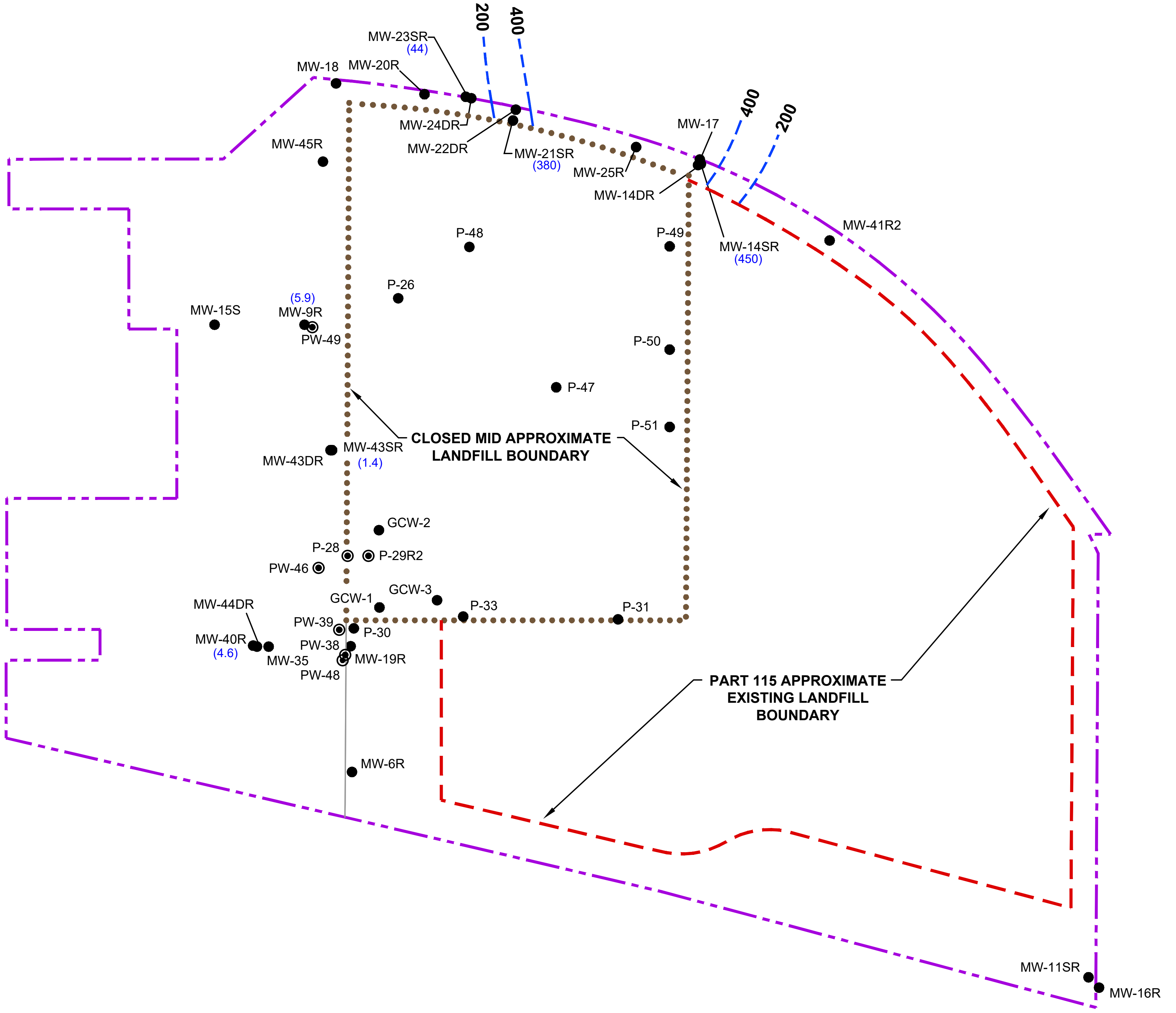
February 2022

GRANGER GRAND RIVER MID 082 771 700 LANDFILL

2021 ANNUAL REPORT

ATTACHMENT C

ISOCHEM PLOTS

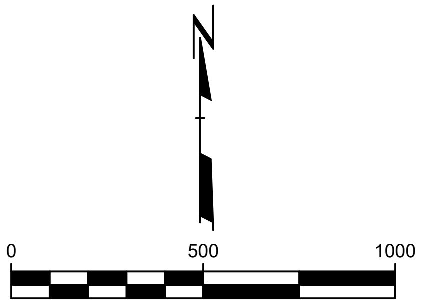


LEGEND

MW-1 ●	MONITORING WELL LOCATION AND NUMBER
P-1 ●	PIEZOMETER LOCATION AND NUMBER
PW-39 ◉	PURGE WELL LOCATION AND NUMBER
GCW-1 ●	GAS COLLECTION WELL LOCATION AND NUMBER
•••••••	CLOSED MID APPROXIMATE LANDFILL BOUNDARY
— —	PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
—·—·—	APPROXIMATE PROPERTY LINE
400 ——	LINE OF EQUAL CONCENTRATION
(95)	CONCENTRATION (mg/L)

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER, DATED FEBRUARY 7, 2001.
2. ISOCHEMS REPRESENT INTERPRETATIONS OF GROUNDWATER CHEMISTRY BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS. ACTUAL CONCENTRATIONS WILL VARY.



APPROXIMATE SCALE IN FEET

PROJECT:
GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:
SHALLOW GLACIAL AQUIFER
CHLORIDE ISOCHEMS
JANUARY 2021

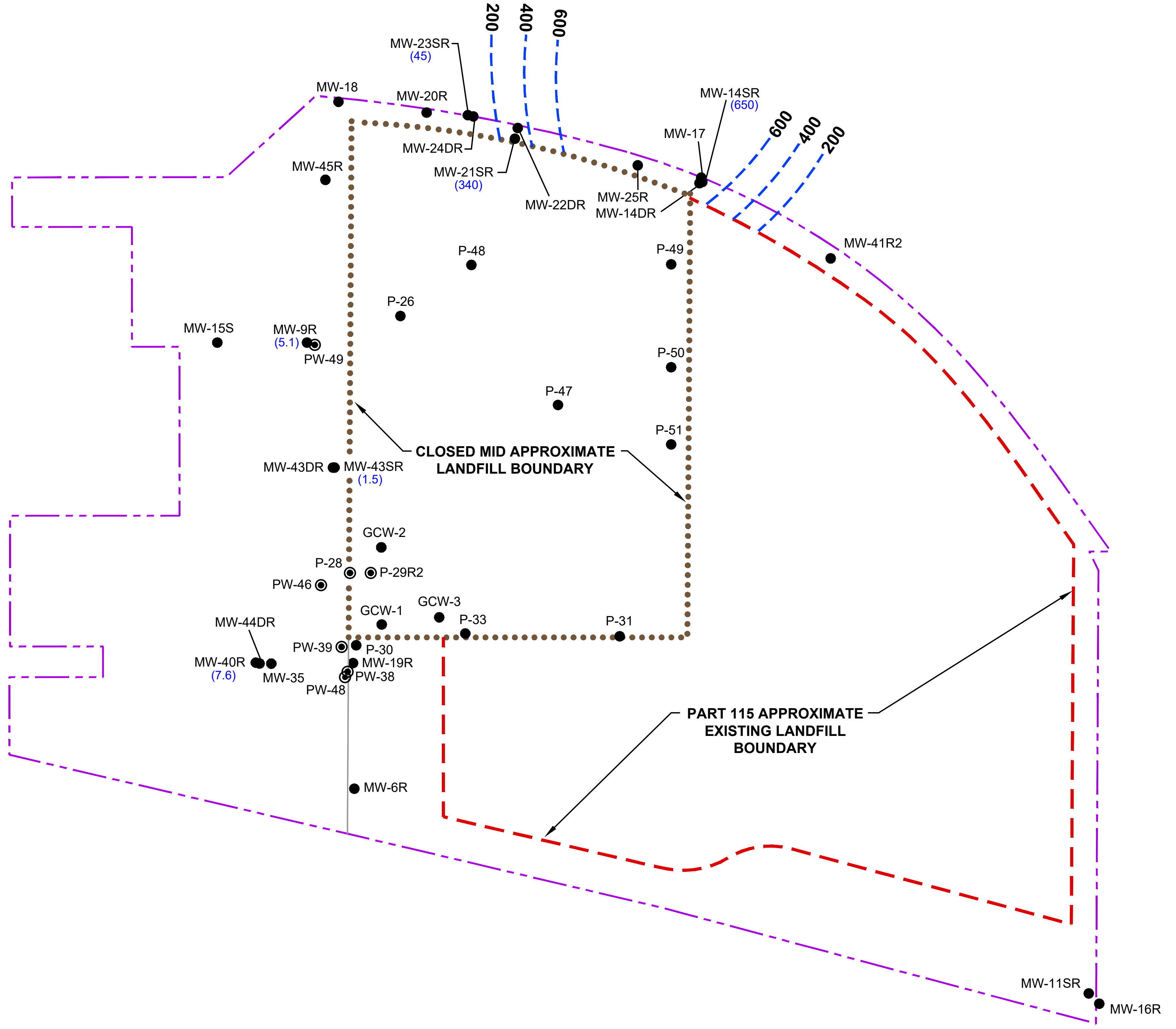
DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K.LOWERY		FIGURE 1
APPROVED BY:	S.HOLMSTROM		
DATE:	FEBRUARY 2022		

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.01 2021 AR.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES:
DRAWING NAME: J:_TRC\Granger LF\414508\0002\01_2021 Annual Rpt\414508.0002.01.01 2021 AR.dwg --- PLOT DATE: February 14, 2022 - 11:29AM --- LAYOUT: FIG01 Shallow Chloride 2021 Jan

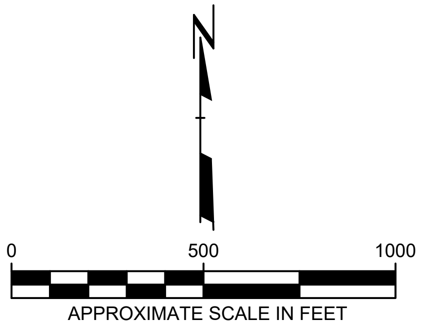


LEGEND

MW-1 ●	MONITORING WELL LOCATION AND NUMBER
P-1 ●	PIEZOMETER LOCATION AND NUMBER
PW-39 ◉	PURGE WELL LOCATION AND NUMBER
GCW-1 ●	GAS COLLECTION WELL LOCATION AND NUMBER
•••••••	CLOSED MID APPROXIMATE LANDFILL BOUNDARY
— — —	PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
— - —	APPROXIMATE PROPERTY LINE
400 ——	LINE OF EQUAL CONCENTRATION
(31)	CONCENTRATION (mg/L)

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER, DATED FEBRUARY 7, 2001.
2. ISOCHEMS REPRESENT INTERPRETATIONS OF GROUNDWATER CHEMISTRY BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS. ACTUAL CONCENTRATIONS WILL VARY.



APPROXIMATE SCALE IN FEET

PROJECT:
GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:
SHALLOW GLACIAL AQUIFER
CHLORIDE ISOCHEMS
JULY 2021

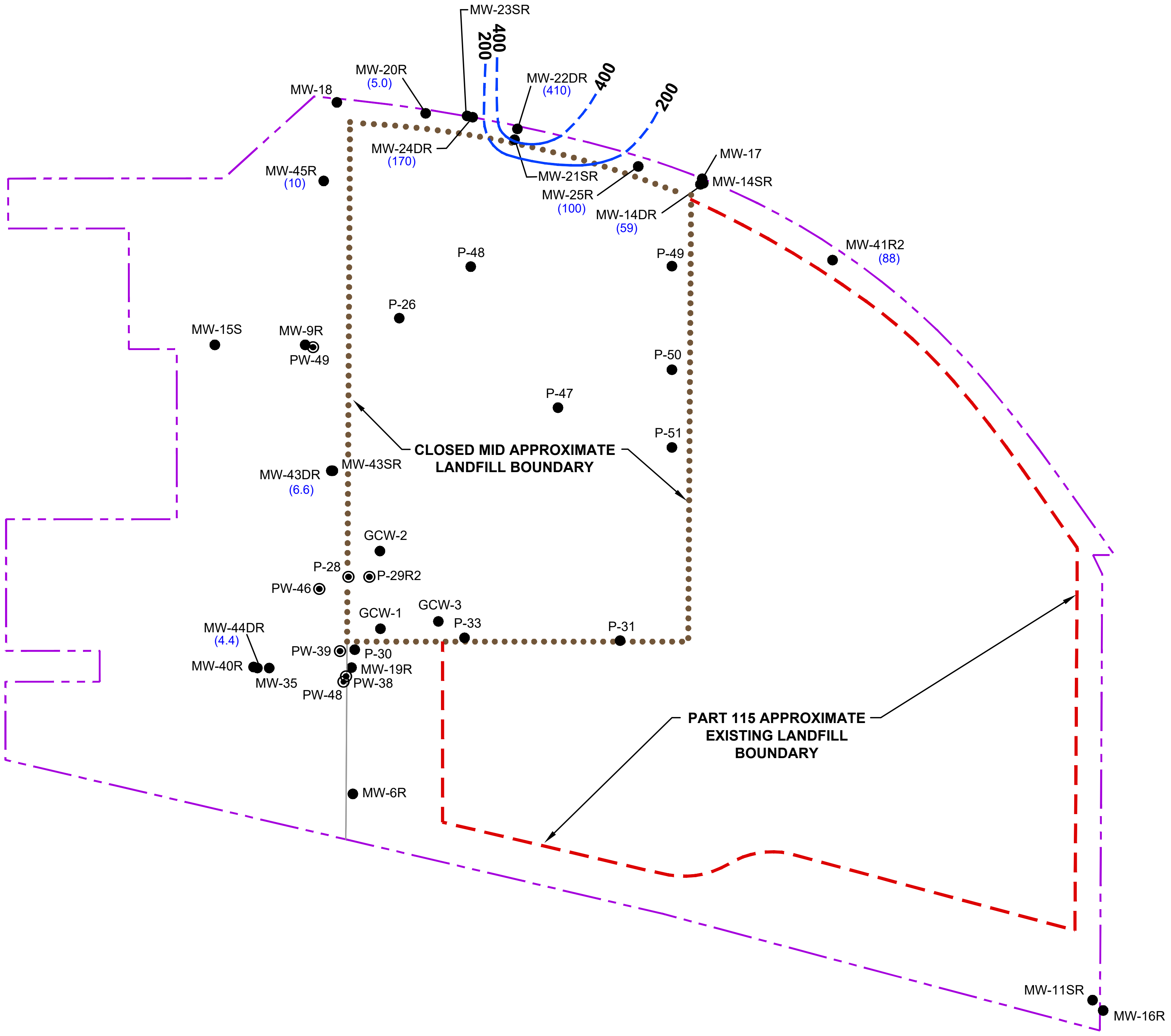
DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K.LOWERY		**FIGURE 2**
APPROVED BY:	S.HOLMSTROM		
DATE:	FEBRUARY 2022		

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.02 2021 AR.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES:
DRAWING NAME: \\annarbor-fp2\CADD\PJT\00_TRC\Granger LF\414508\0002\01_2021 Annual Rpt\414508.0002.01.02 2021 AR.dwg --- PLOT DATE: February 14, 2022 - 11:30AM --- LAYOUT: FIG02 Shallow Chloride 2021 Jul

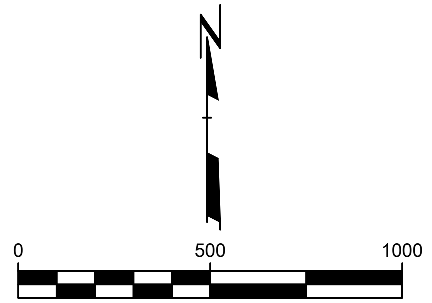


LEGEND

MW-1 ●	MONITORING WELL LOCATION AND NUMBER
P-1 ●	PIEZOMETER LOCATION AND NUMBER
PW-39 ◉	PURGE WELL LOCATION AND NUMBER
GCW-1 ●	GAS COLLECTION WELL LOCATION AND NUMBER
●●●●●●●●	CLOSED MID APPROXIMATE LANDFILL BOUNDARY
— — —	PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
— - —	APPROXIMATE PROPERTY LINE
200 ———	LINE OF EQUAL CONCENTRATION
(26)	CONCENTRATION (mg/L)

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER, DATED FEBRUARY 7, 2001.
2. ISOCHEMS REPRESENT INTERPRETATIONS OF GROUNDWATER CHEMISTRY BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS. ACTUAL CONCENTRATIONS WILL VARY.



APPROXIMATE SCALE IN FEET

PROJECT:
GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:
DEEP GLACIAL AQUIFER
CHLORIDE ISOCHEMS
JANUARY 2021

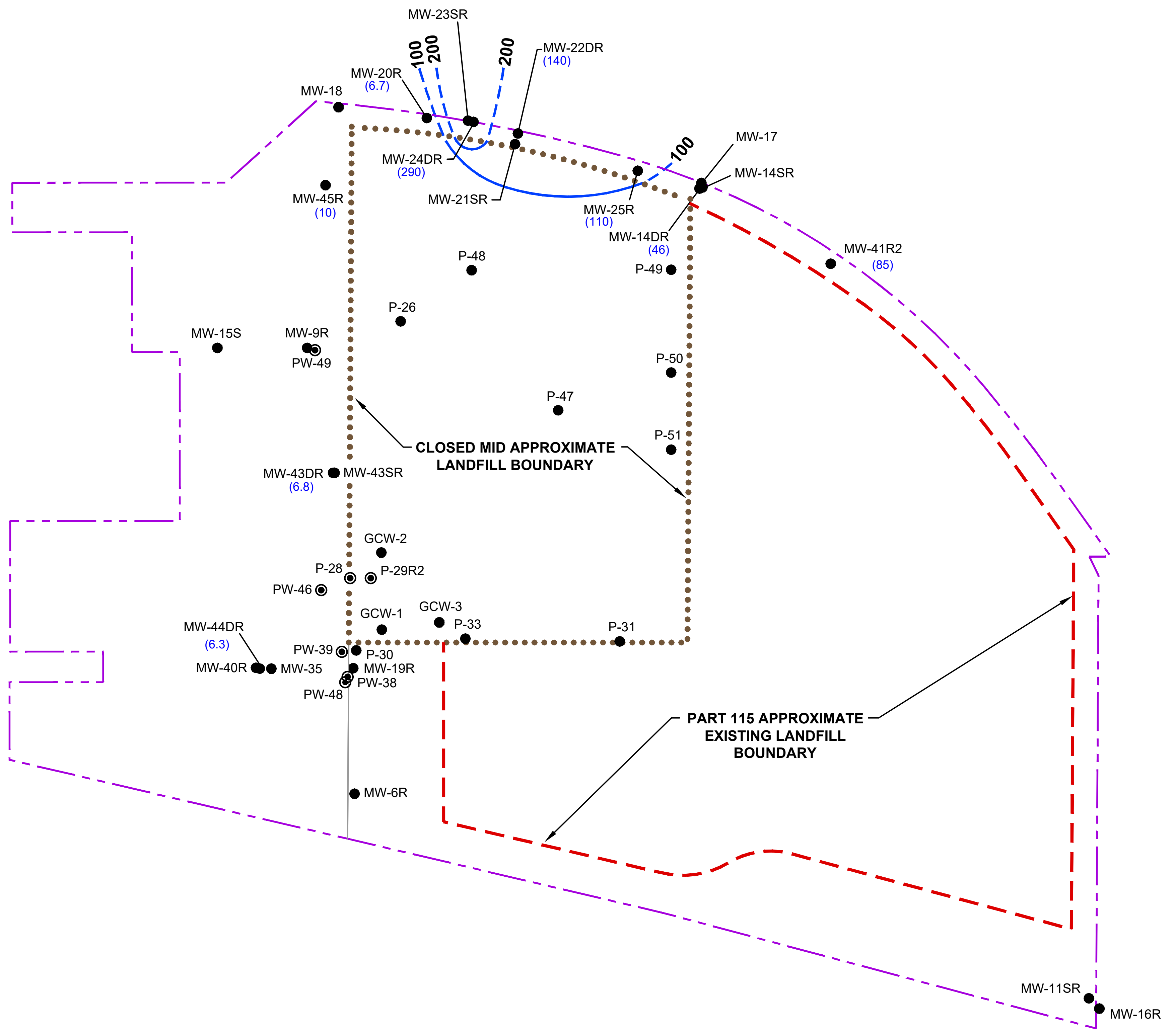
DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K.LOWERY		**FIGURE 3**
APPROVED BY:	S.HOLMSTROM		
DATE:	FEBRUARY 2022		

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.03 2021 AR.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES:
DRAWING NAME: \\annarbor-fp2\CADD\PJT\00_TRC\Granger LF\414508\0002\01_2021 Annual Rpt\414508.0002.01.03 2021 AR.dwg --- PLOT DATE: February 14, 2022 - 11:31AM --- LAYOUT: FIG03 Deep Chloride 2021 Jan

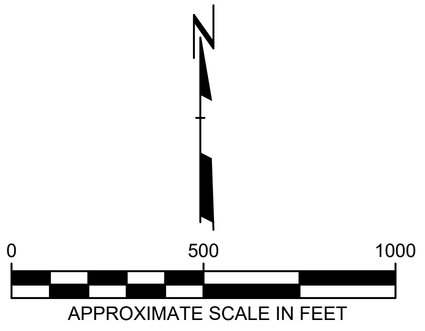


LEGEND

MW-1 ●	MONITORING WELL LOCATION AND NUMBER
P-1 ●	PIEZOMETER LOCATION AND NUMBER
PW-39 ◉	PURGE WELL LOCATION AND NUMBER
GCW-1 ●	GAS COLLECTION WELL LOCATION AND NUMBER
•••••••	CLOSED MID APPROXIMATE LANDFILL BOUNDARY
— —	PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
— - —	APPROXIMATE PROPERTY LINE
200 ——	LINE OF EQUAL CONCENTRATION
(42)	CONCENTRATION (mg/L)

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER, DATED FEBRUARY 7, 2001.
2. ISOCHEMS REPRESENT INTERPRETATIONS OF GROUNDWATER CHEMISTRY BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS. ACTUAL CONCENTRATIONS WILL VARY.



PROJECT:

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:

DEEP GLACIAL AQUIFER
CHLORIDE ISOCHEMS
JULY 2021

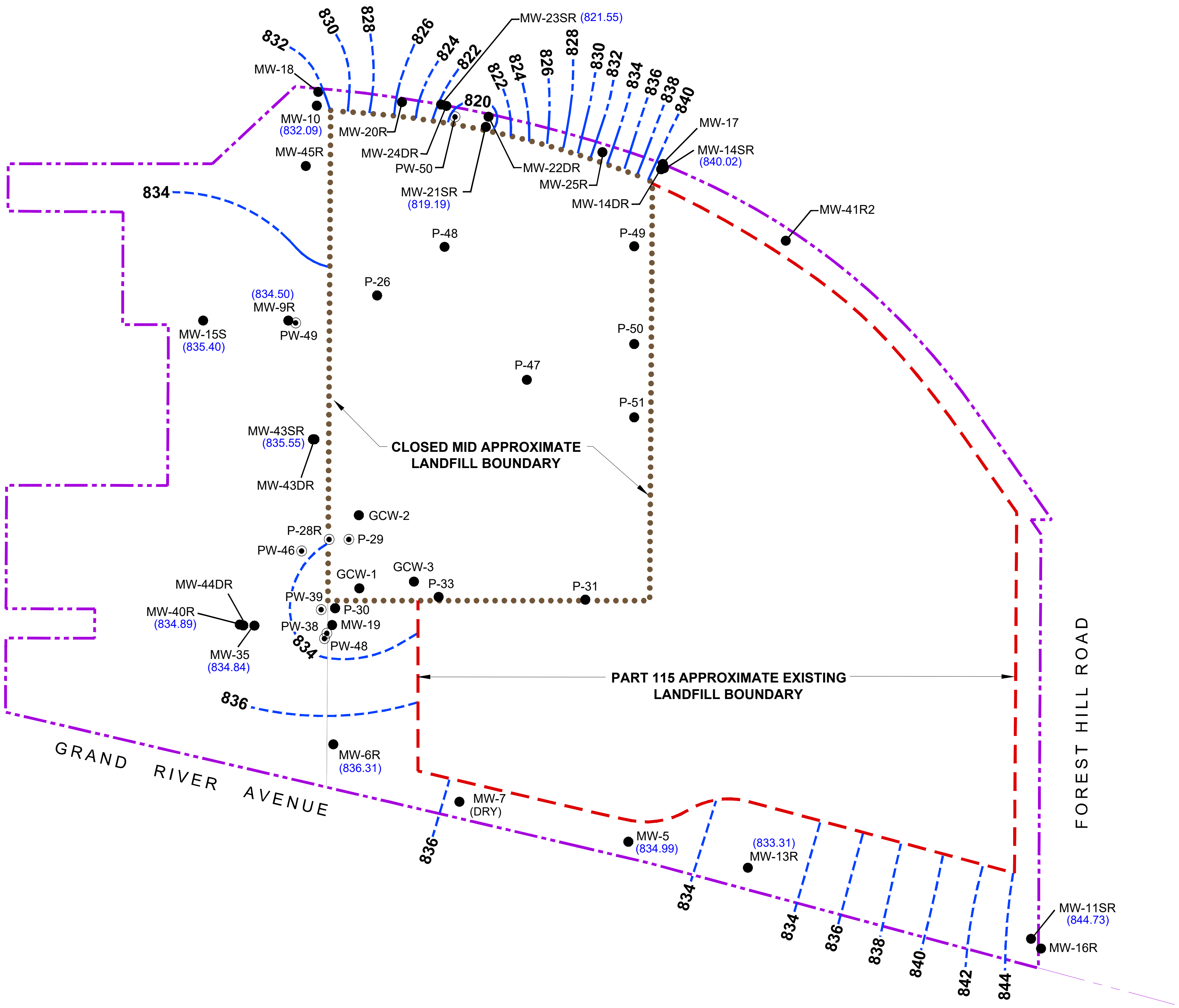
DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K.LOWERY		**FIGURE 4**
APPROVED BY:	S.HOLMSTROM		
DATE:	FEBRUARY 2022		

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.04 2021 AR.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES:
DRAWING NAME: \\annarbor-fp2\CADD\PJT\00_TRC\Granger LF\414508\0002\01_2021 Annual Rpt\414508.0002.01.04 2021 AR.dwg --- PLOT DATE: February 14, 2022 - 11:01AM --- LAYOUT: FIG04 Deep Chloride 2021Jul

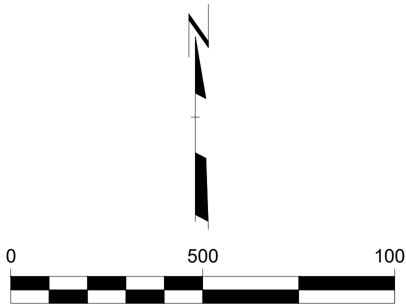


LEGEND

MW-1 ●	MONITORING WELL LOCATION AND NUMBER
P-1 ●	PIEZOMETER LOCATION AND NUMBER
PW-39 ◉	PURGE WELL LOCATION AND NUMBER
GCW-1 ●	GAS COLLECTION WELL LOCATION AND NUMBER
•••••••••	CLOSED MID APPROXIMATE LANDFILL BOUNDARY
— — —	PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
—·—·—	APPROXIMATE PROPERTY LINE
838 ——	LINE OF EQUAL ELEVATION
(840.34)	GROUNDWATER ELEVATION

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER CO., DATED 05-04-2007, FIGURE 1 GENERAL LOCATIONS.DWG.
2. CONTOURS REPRESENT INTERPRETATIONS OF GROUNDWATER ELEVATION BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS.



APPROXIMATE SCALE IN FEET

PROJECT:

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:

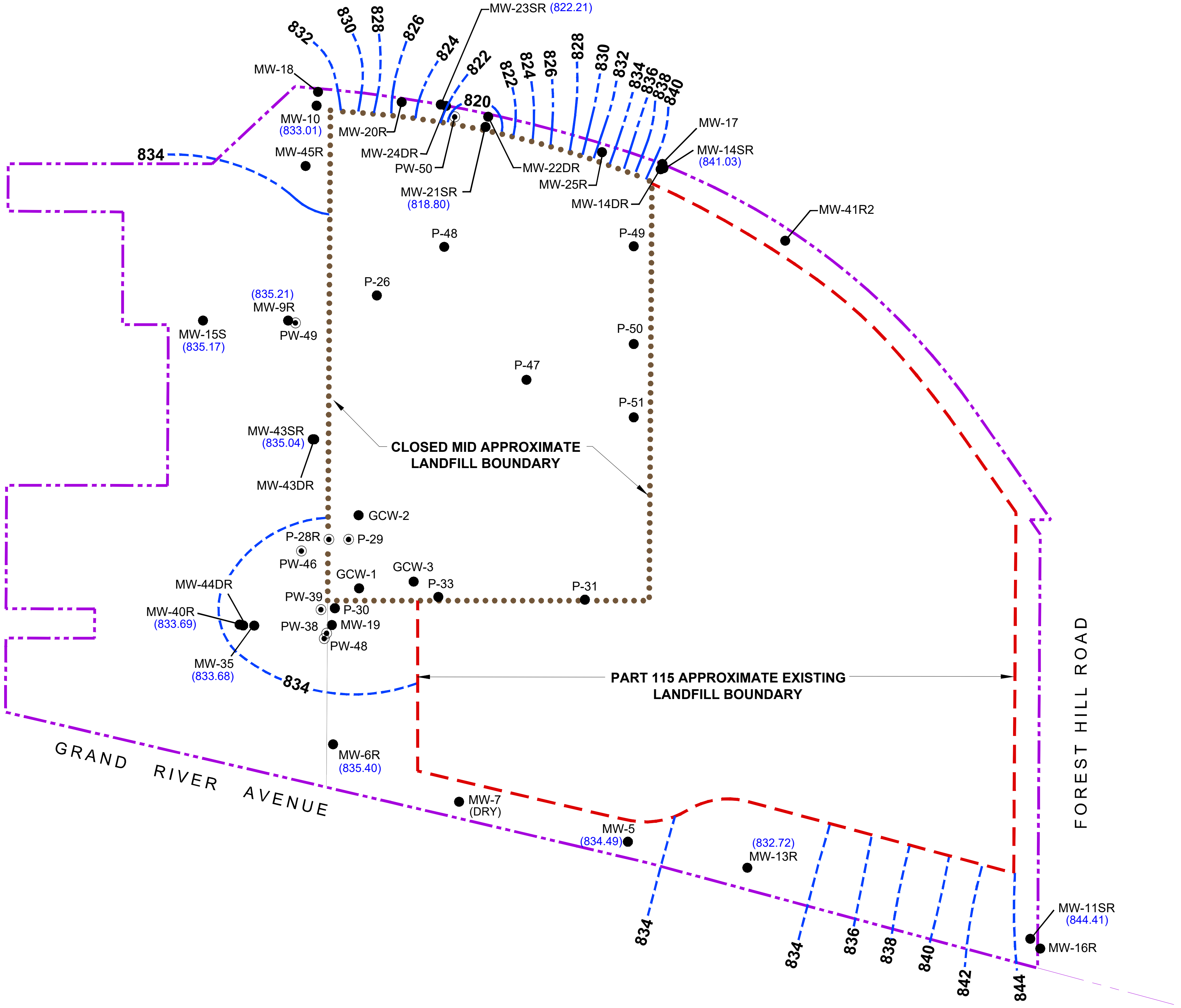
GROUNDWATER CONTOURS SHALLOW GLACIAL AQUIFER JANUARY 2021

DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K. LOWERY		
APPROVED BY:	S.HOLMSTROM	**FIGURE 5**	
DATE:	MARCH 2021		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.05 2021 1st SA.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES:
DRAWING NAME: \\Annarbor-fp2\cadd\PJT\00_TRC\Granger LF\414508\0002\01_2021 1stSA Rpt\ 414508.0002.01.05 2021 1st SA.dwg --- PLOT DATE: March 09, 2021 - 10:54AM --- LAYOUT: FIG05 GW Contours Shallow Jan 2021



LEGEND

MW-1 ●	MONITORING WELL LOCATION AND NUMBER
P-1 ●	PIEZOMETER LOCATION AND NUMBER
PW-39 ◉	PURGE WELL LOCATION AND NUMBER
GCW-1 ●	GAS COLLECTION WELL LOCATION AND NUMBER
•••••••••	CLOSED MID APPROXIMATE LANDFILL BOUNDARY
— — —	PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
—·—·—	APPROXIMATE PROPERTY LINE
838 ———	LINE OF EQUAL ELEVATION
(840.34)	GROUNDWATER ELEVATION

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER CO., DATED 05-04-2007, FIGURE 1 GENERAL LOCATIONS.DWG.
2. CONTOURS REPRESENT INTERPRETATIONS OF GROUNDWATER ELEVATION BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS.

PROJECT:

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:

GROUNDWATER CONTOURS
SHALLOW GLACIAL AQUIFER
JULY 2021

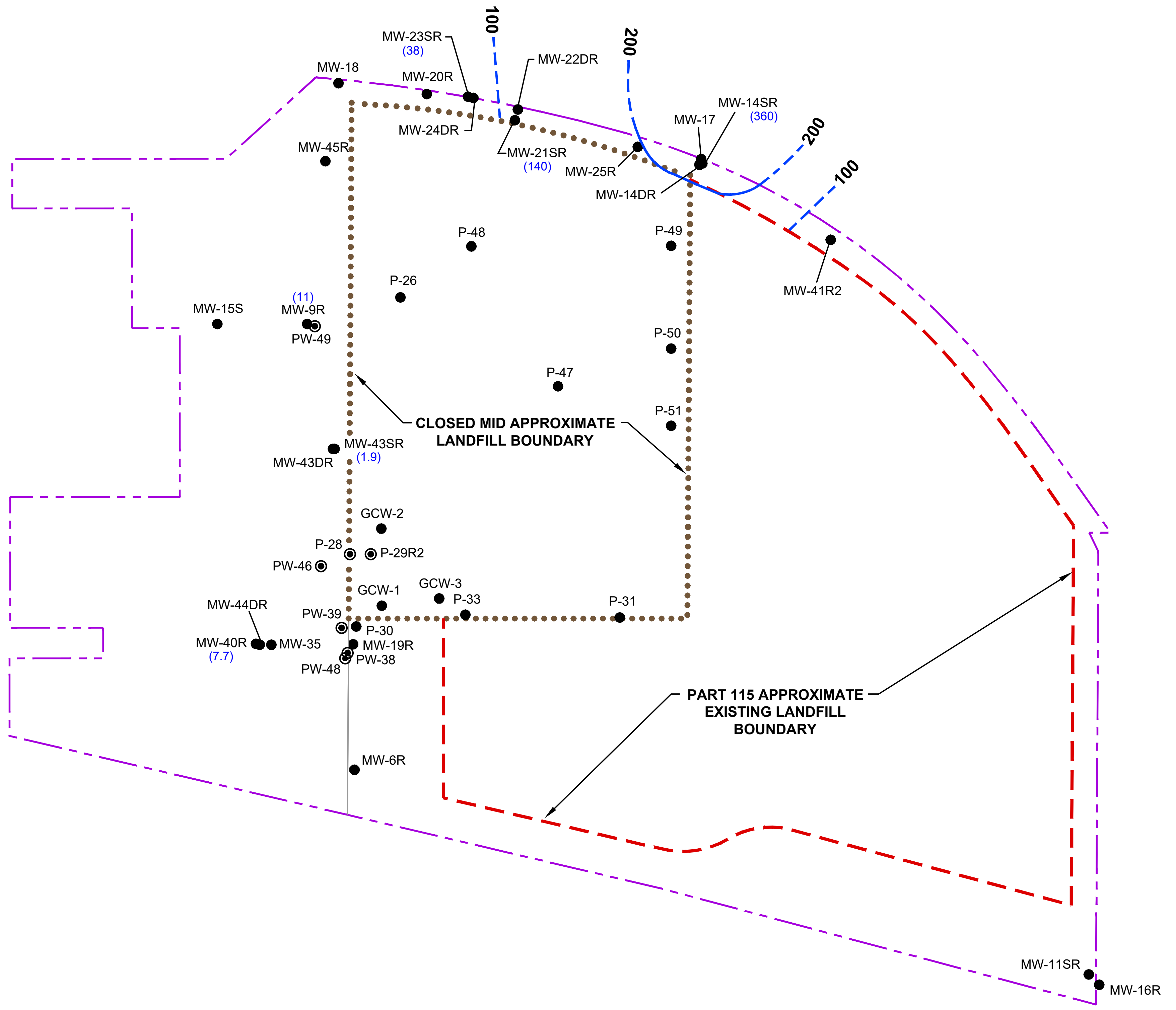
DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K. LOWERY	**FIGURE 5**	
APPROVED BY:	S.HOLMSTROM		
DATE:	SEPTEMBER 2021		

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.05 2021 2nd SA.dwg

11x17 --- ATTACHED XREFS: --- ATTACHED IMAGES:
DRAWING NAME: \\Annarbor-fp2\cadd\PJT\00_TRC\Granger LF\414508\0002\01_2021 2ndSA Rpt\ 414508.0002.01.05 2021 2nd SA.dwg --- PLOT DATE: August 31, 2021 - 4:11AM --- LAYOUT: FIG05 GW Contours Shallow Jul 2021

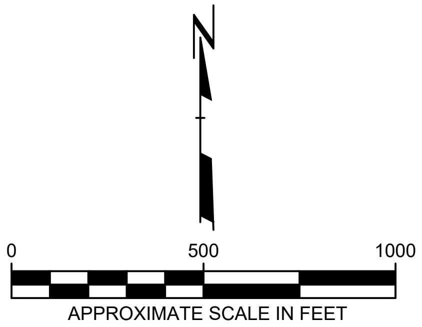


LEGEND

MW-1 ●	MONITORING WELL LOCATION AND NUMBER
P-1 ●	PIEZOMETER LOCATION AND NUMBER
PW-39 ◉	PURGE WELL LOCATION AND NUMBER
GCW-1 ●	GAS COLLECTION WELL LOCATION AND NUMBER
•••••••	CLOSED MID APPROXIMATE LANDFILL BOUNDARY
— — —	PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
— - — -	APPROXIMATE PROPERTY LINE
200 ———	LINE OF EQUAL CONCENTRATION
(44)	CONCENTRATION (mg/L)

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER, DATED FEBRUARY 7, 2001.
2. ISOCHEMS REPRESENT INTERPRETATIONS OF GROUNDWATER CHEMISTRY BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS. ACTUAL CONCENTRATIONS WILL VARY.



PROJECT:
GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

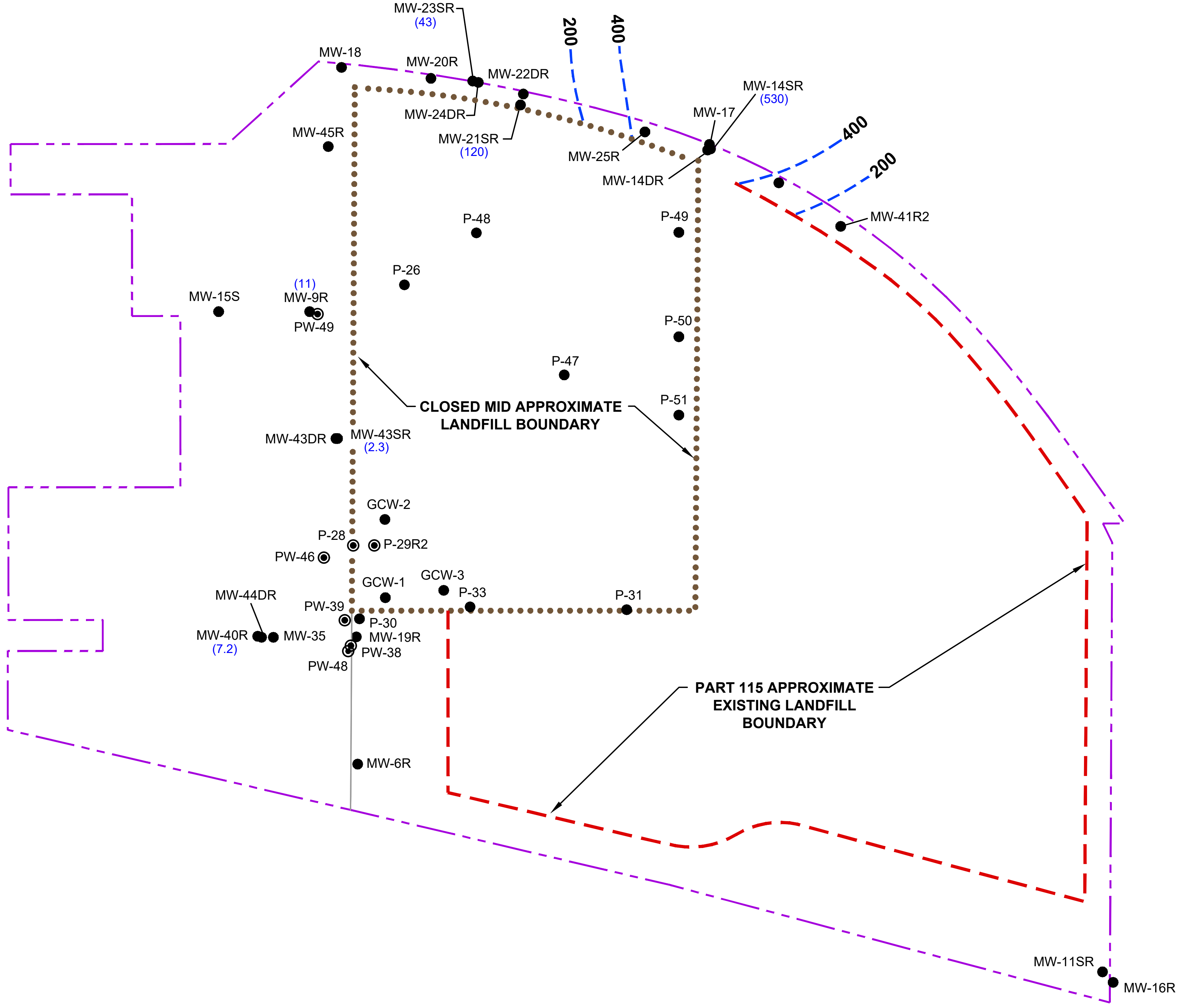
TITLE:
SHALLOW GLACIAL AQUIFER
SODIUM ISOCHEMS
JANUARY 2021

DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K.LOWERY		**FIGURE 5**
APPROVED BY:	S.HOLMSTROM		
DATE:	FEBRUARY 2022		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.05 2021 AR.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES:
DRAWING NAME: \\annarbor-fp2\CADD\PJT\00_TRC\Granger LF\414508\0002\01_2021 Annual Rpt\414508.0002.01.05 2021 AR.dwg --- PLOT DATE: February 14, 2022 - 11:32AM --- LAYOUT: FIG05 Shallow Sodium 2021 Jan



LEGEND

MW-1 ● MONITORING WELL LOCATION AND NUMBER

P-1 ● PIEZOMETER LOCATION AND NUMBER

PW-39 ◉ PURGE WELL LOCATION AND NUMBER

GCW-1 ● GAS COLLECTION WELL LOCATION AND NUMBER

•••••••• CLOSED MID APPROXIMATE LANDFILL BOUNDARY

— — PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY

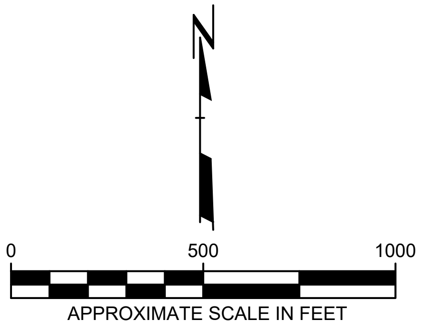
— - — APPROXIMATE PROPERTY LINE

200 —— LINE OF EQUAL CONCENTRATION

(63) CONCENTRATION (mg/L)

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER, DATED FEBRUARY 7, 2001.
2. ISOCHEMS REPRESENT INTERPRETATIONS OF GROUNDWATER CHEMISTRY BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS. ACTUAL CONCENTRATIONS WILL VARY.



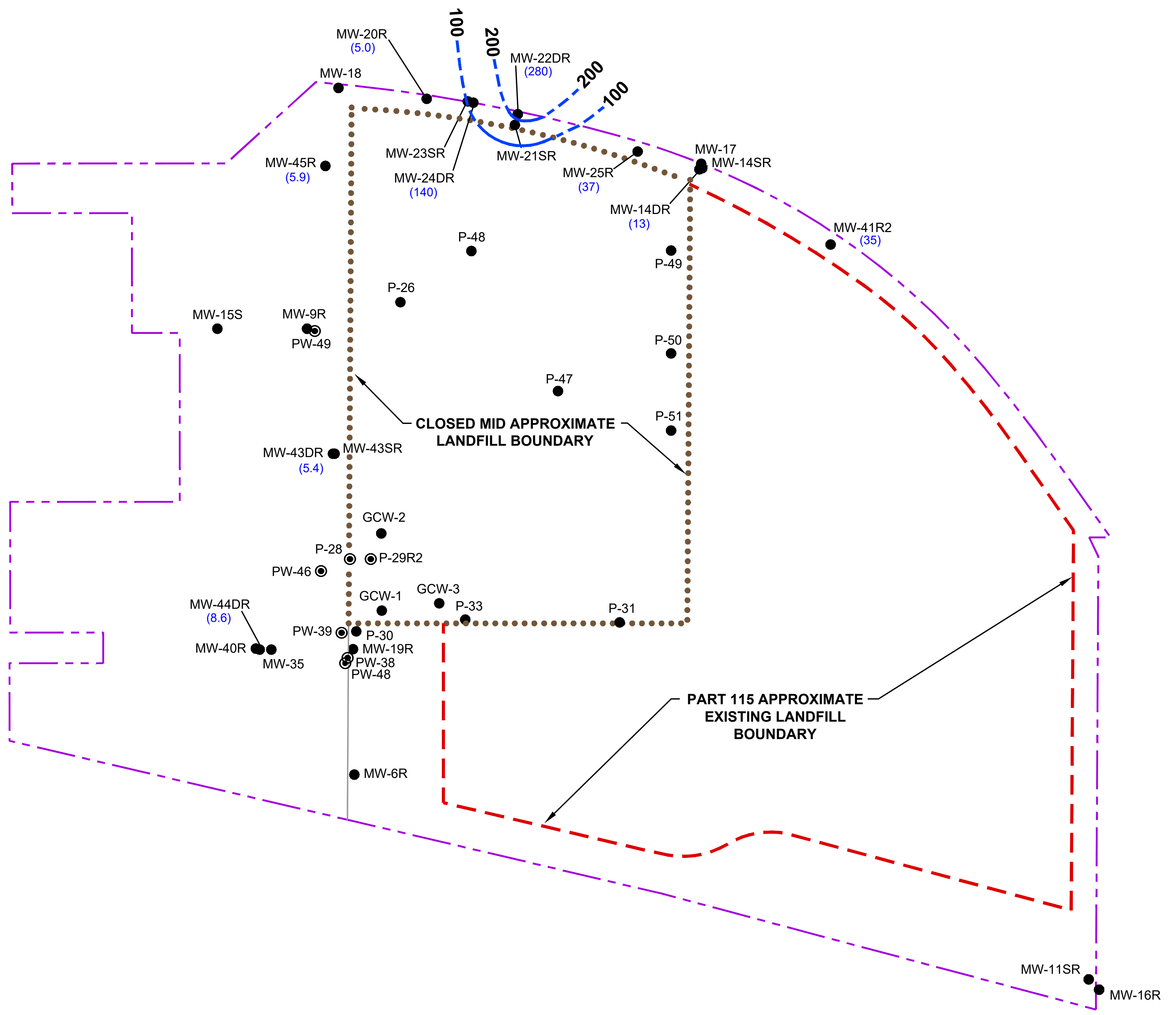
PROJECT:
GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:
SHALLOW GLACIAL AQUIFER SODIUM ISOCHEMS JULY 2021

DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K.LOWERY		
APPROVED BY:	S.HOLMSTROM		**FIGURE 6**
DATE:	FEBRUARY 2022		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.06 2021 AR.dwg

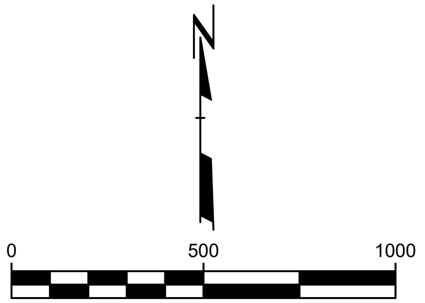


LEGEND

MW-1 ●	MONITORING WELL LOCATION AND NUMBER
P-1 ●	PIEZOMETER LOCATION AND NUMBER
PW-39 ◉	PURGE WELL LOCATION AND NUMBER
GCW-1 ●	GAS COLLECTION WELL LOCATION AND NUMBER
•••••••••	CLOSED MID APPROXIMATE LANDFILL BOUNDARY
— — —	PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
— - — -	APPROXIMATE PROPERTY LINE
200 ——	LINE OF EQUAL CONCENTRATION
(33)	CONCENTRATION (mg/L)

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER, DATED FEBRUARY 7, 2001.
2. ISOCHEMS REPRESENT INTERPRETATIONS OF GROUNDWATER CHEMISTRY BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS. ACTUAL CONCENTRATIONS WILL VARY.



APPROXIMATE SCALE IN FEET

PROJECT:
GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:
DEEP GLACIAL AQUIFER
SODIUM ISOCHEMS
JANUARY 2021

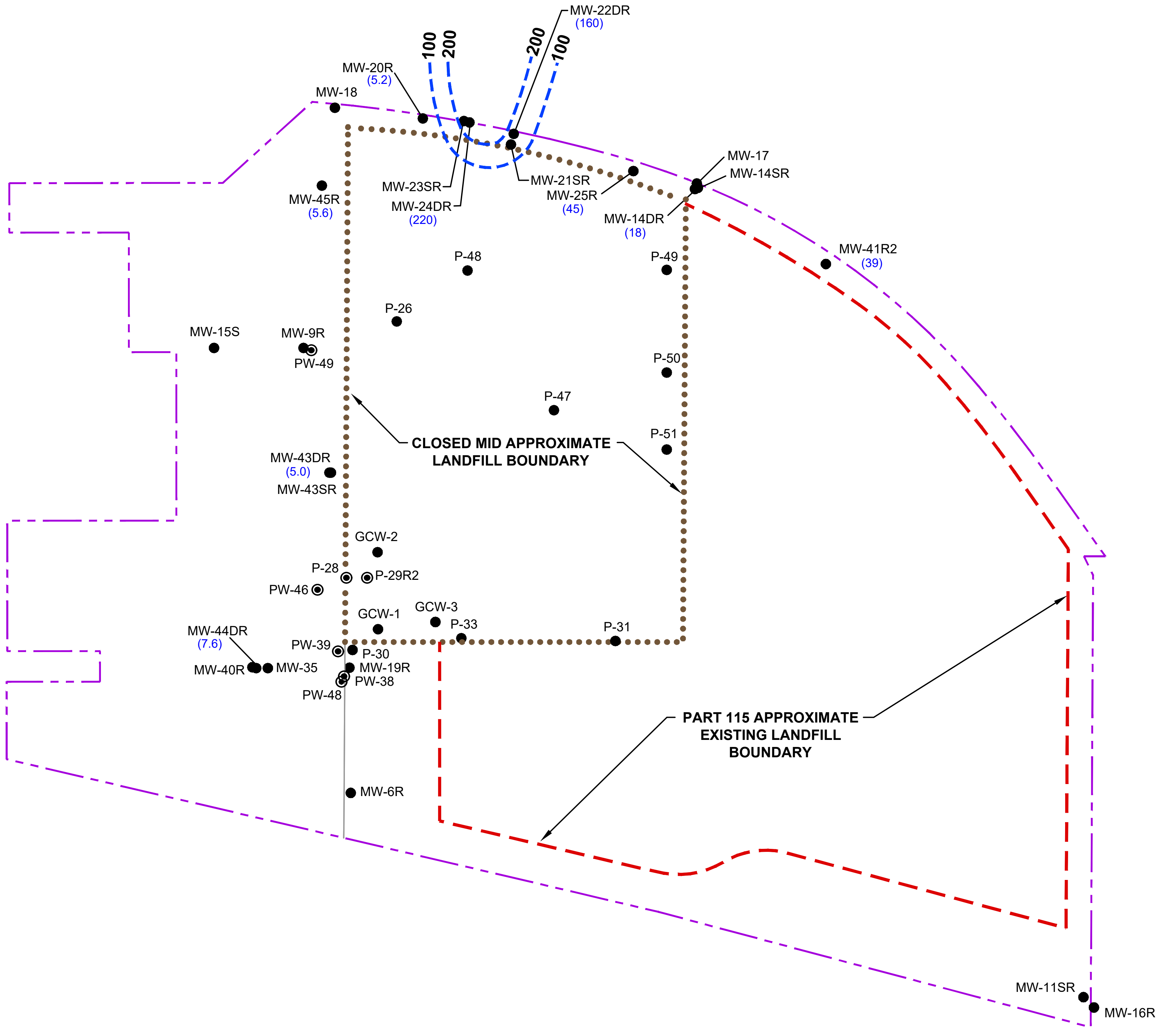
DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K.LOWERY		**FIGURE 7**
APPROVED BY:	S.HOLMSTROM		
DATE:	FEBRUARY 2022		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.07 2021 AR.dwg

11x17 --- ATTACHED XREF'S: --- ATTACHED IMAGES:
DRAWING NAME: \\annarbor-fp2\CADD\PJT\00_TRC\Granger LF\414508\0002\01_2021 Annual Rpt\414508.0002.01.07 2021 AR.dwg --- PLOT DATE: February 14, 2022 - 11:33AM --- LAYOUT: FIG07 Deep Sodium 2021 Jan

11x17 --- ATTACHED XREFS: --- ATTACHED IMAGES:
DRAWING NAME: \\annarbor-fp2\CADD\PJT100_TRC\Granger LF\414508\0002\01_2021 Annual Rpt\ 414508.0002.01.08 2021 AR.dwg --- PLOT DATE: February 14, 2022 - 11:34AM --- LAYOUT: FIG08 Deep Sodium 2021 Jul

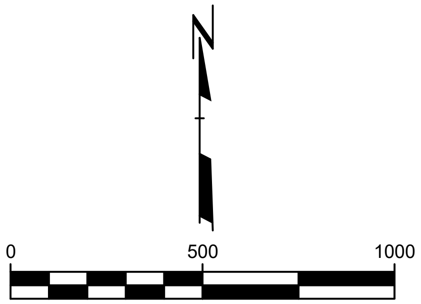


LEGEND

MW-1 ●	MONITORING WELL LOCATION AND NUMBER
P-1 ●	PIEZOMETER LOCATION AND NUMBER
PW-39 ◉	PURGE WELL LOCATION AND NUMBER
GCW-1 ●	GAS COLLECTION WELL LOCATION AND NUMBER
•••••••••	CLOSED MID APPROXIMATE LANDFILL BOUNDARY
— — —	PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
— - —	APPROXIMATE PROPERTY LINE
100 ———	LINE OF EQUAL CONCENTRATION
(28)	CONCENTRATION (mg/L)

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER, DATED FEBRUARY 7, 2001.
2. ISOCHEMS REPRESENT INTERPRETATIONS OF GROUNDWATER CHEMISTRY BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS. ACTUAL CONCENTRATIONS WILL VARY.



APPROXIMATE SCALE IN FEET

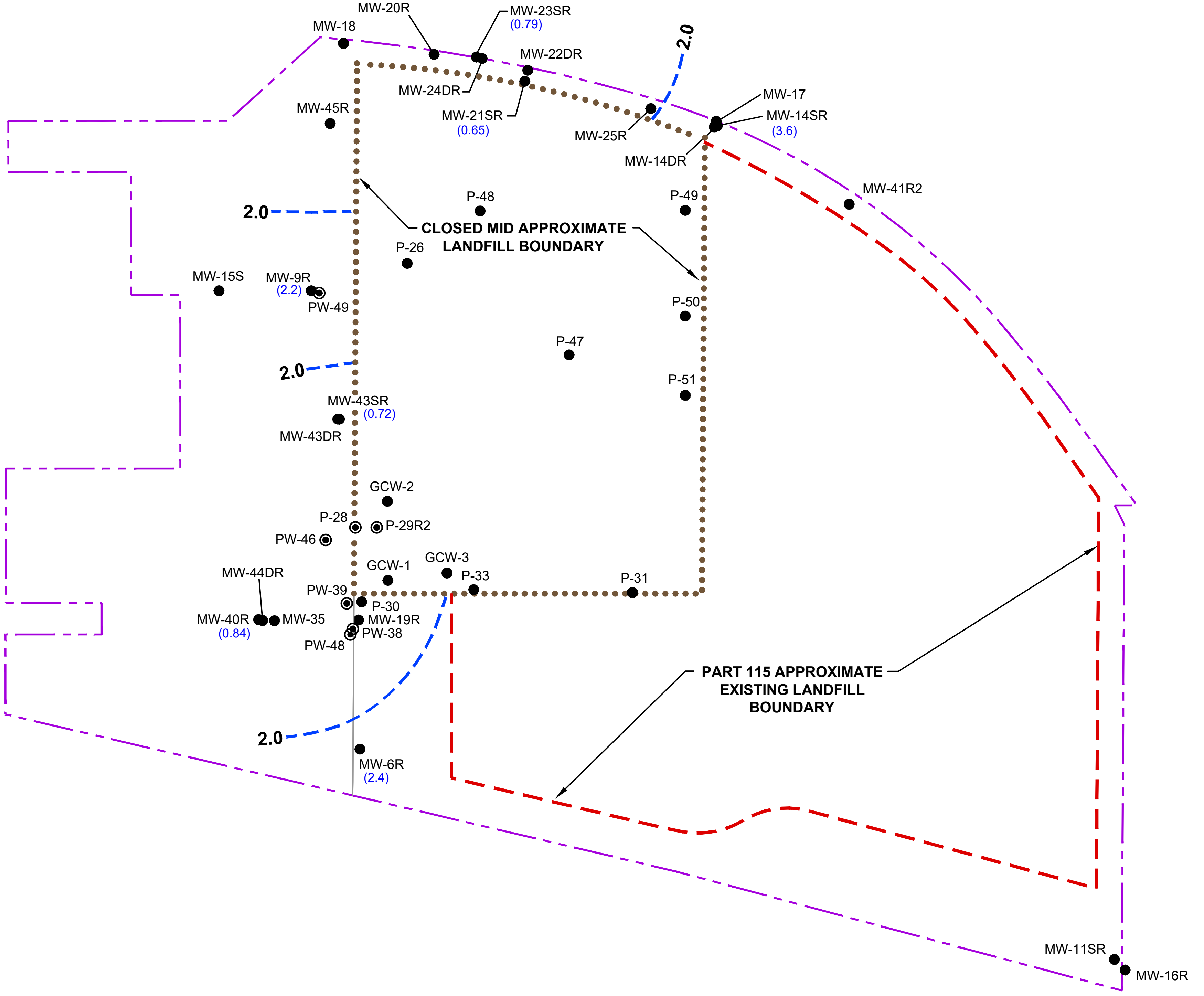
PROJECT:
GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:
DEEP GLACIAL AQUIFER
SODIUM ISOCHEMS
JULY 2021

DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K.LOWERY		**FIGURE 8**
APPROVED BY:	S.HOLMSTROM		
DATE:	FEBRUARY 2022		

1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.08 2021 AR.dwg



LEGEND

MW-1 ●	MONITORING WELL LOCATION AND NUMBER
P-1 ●	PIEZOMETER LOCATION AND NUMBER
PW-39 ◎	PURGE WELL LOCATION AND NUMBER
GCW-1 ●	GAS COLLECTION WELL LOCATION AND NUMBER
•••••••••	CLOSED MID APPROXIMATE LANDFILL BOUNDARY
— — —	PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
— - —	APPROXIMATE PROPERTY LINE
2.0 ——	LINE OF EQUAL CONCENTRATION
(3.6)	CONCENTRATION (mg/L)

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER, DATED FEBRUARY 7, 2001.
2. ISOCHEMS REPRESENT INTERPRETATIONS OF GROUNDWATER CHEMISTRY BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS. ACTUAL CONCENTRATIONS WILL VARY.

N

0 500 1000

APPROXIMATE SCALE IN FEET

PROJECT:

GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:

SHALLOW GLACIAL AQUIFER
POTASSIUM ISOCHEMS
JANUARY 2021

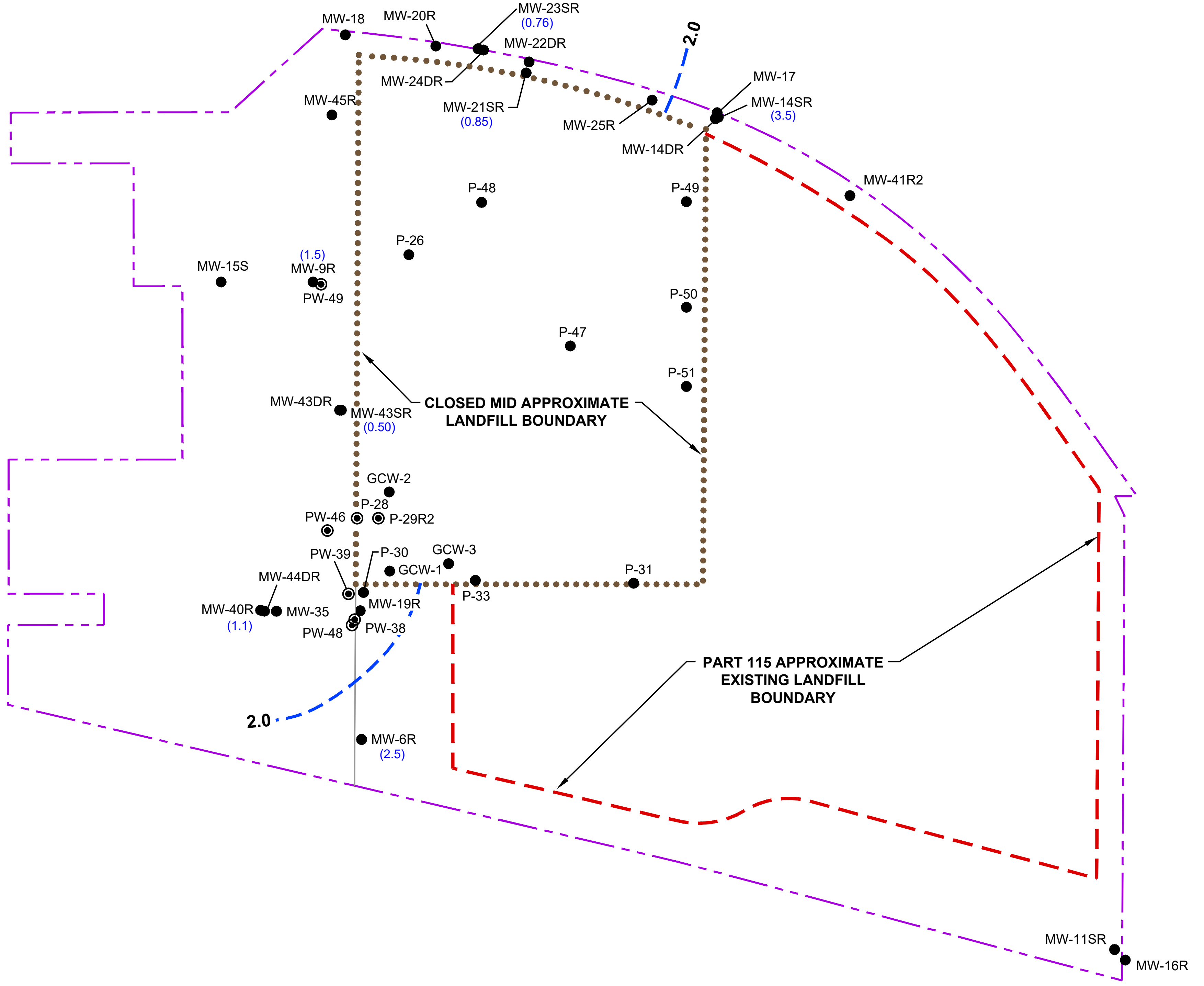
DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K.LOWERY		**FIGURE 9**
APPROVED BY:	S.HOLMSTROM		
DATE:	FEBRUARY 2022		

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.09 2021 AR.dwg

11x17 --- ATTACHED IMAGES: --- ATTACHED XREFS':
DRAWING NAME: \\annarbor-fp2\CADD\PJT\00_TRC\Granger LF\414508\0002\01_2021 Annual Rpt\414508.0002.01.09 2021 AR.dwg --- PLOT DATE: February 14, 2022 - 11:09AM --- LAYOUT: FIG09 Shallow Potassium 2021 Jan



LEGEND

MW-1 ●	MONITORING WELL LOCATION AND NUMBER
P-1 ●	PIEZOMETER LOCATION AND NUMBER
PW-39 ◉	PURGE WELL LOCATION AND NUMBER
GCW-1 ●	GAS COLLECTION WELL LOCATION AND NUMBER
•••••••••	CLOSED MID APPROXIMATE LANDFILL BOUNDARY
— — —	PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
— - — -	APPROXIMATE PROPERTY LINE
2.0 ——	LINE OF EQUAL CONCENTRATION
(4.0)	CONCENTRATION (mg/L)

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER, DATED FEBRUARY 7, 2001.
2. ISOCHEMS REPRESENT INTERPRETATIONS OF GROUNDWATER CHEMISTRY BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS. ACTUAL CONCENTRATIONS WILL VARY.

N

0 500 1000
APPROXIMATE SCALE IN FEET

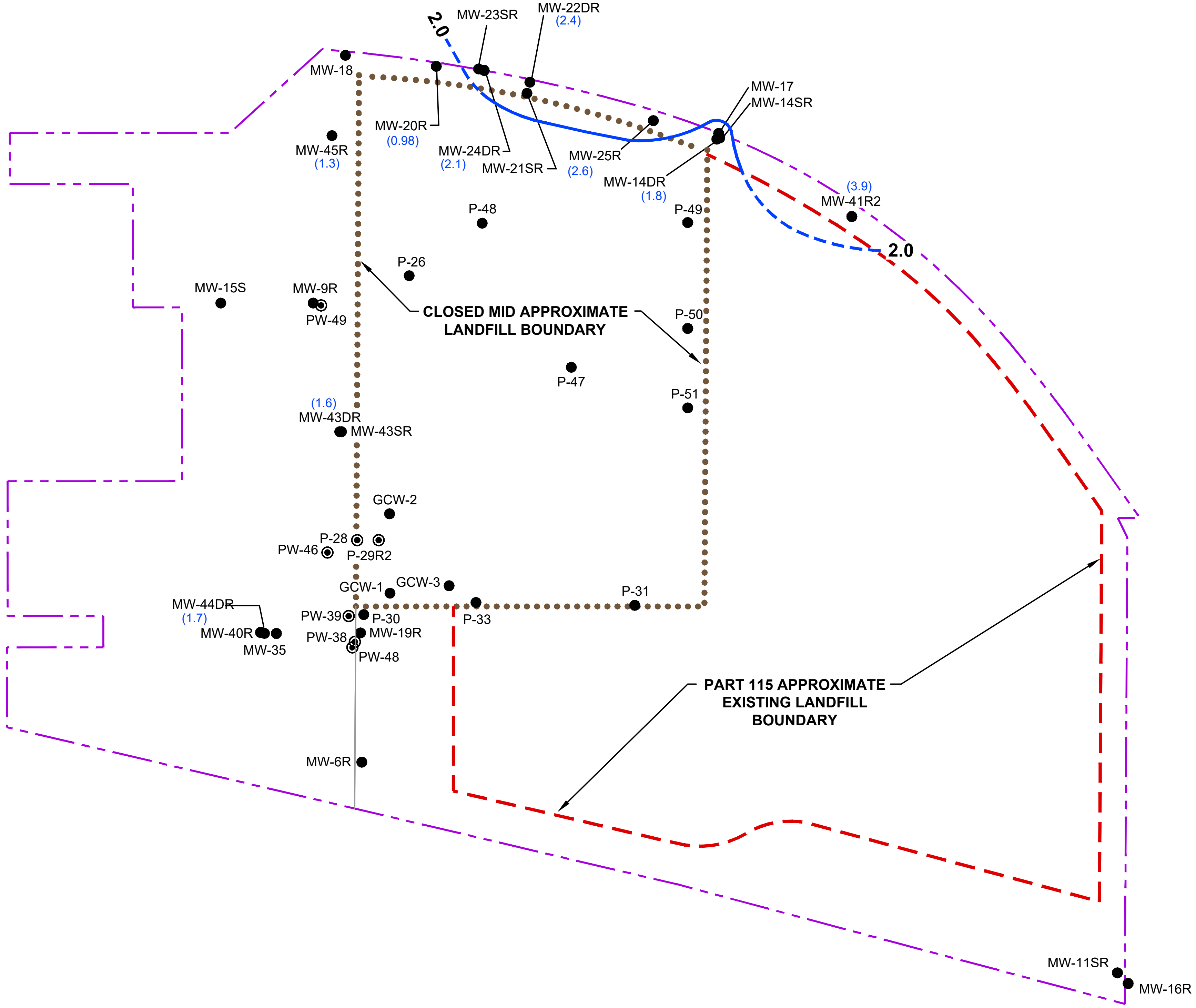
PROJECT:
GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:
SHALLOW GLACIAL AQUIFER
POTASSIUM ISOCHEMS
JULY 2021

DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K.LOWERY		**FIGURE 10**
APPROVED BY:	S.HOLMSTROM		
DATE:	FEBRUARY 2022		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.10 2021 AR.dwg

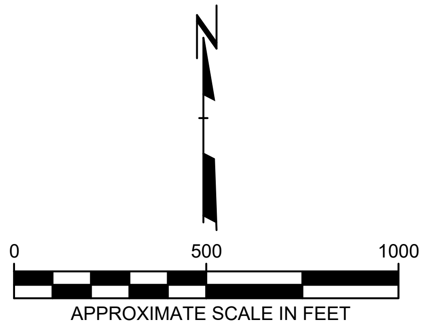


LEGEND

MW-1 ●	MONITORING WELL LOCATION AND NUMBER
P-1 ●	PIEZOMETER LOCATION AND NUMBER
PW-39 ◎	PURGE WELL LOCATION AND NUMBER
GCW-1 ●	GAS COLLECTION WELL LOCATION AND NUMBER
•••••••••	CLOSED MID APPROXIMATE LANDFILL BOUNDARY
— — —	PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY
— - — -	APPROXIMATE PROPERTY LINE
2.0 ——	LINE OF EQUAL CONCENTRATION
(4.1)	CONCENTRATION (mg/L)

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER, DATED FEBRUARY 7, 2001.
2. ISOCHEMS REPRESENT INTERPRETATIONS OF GROUNDWATER CHEMISTRY BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS. ACTUAL CONCENTRATIONS WILL VARY.



PROJECT:
GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

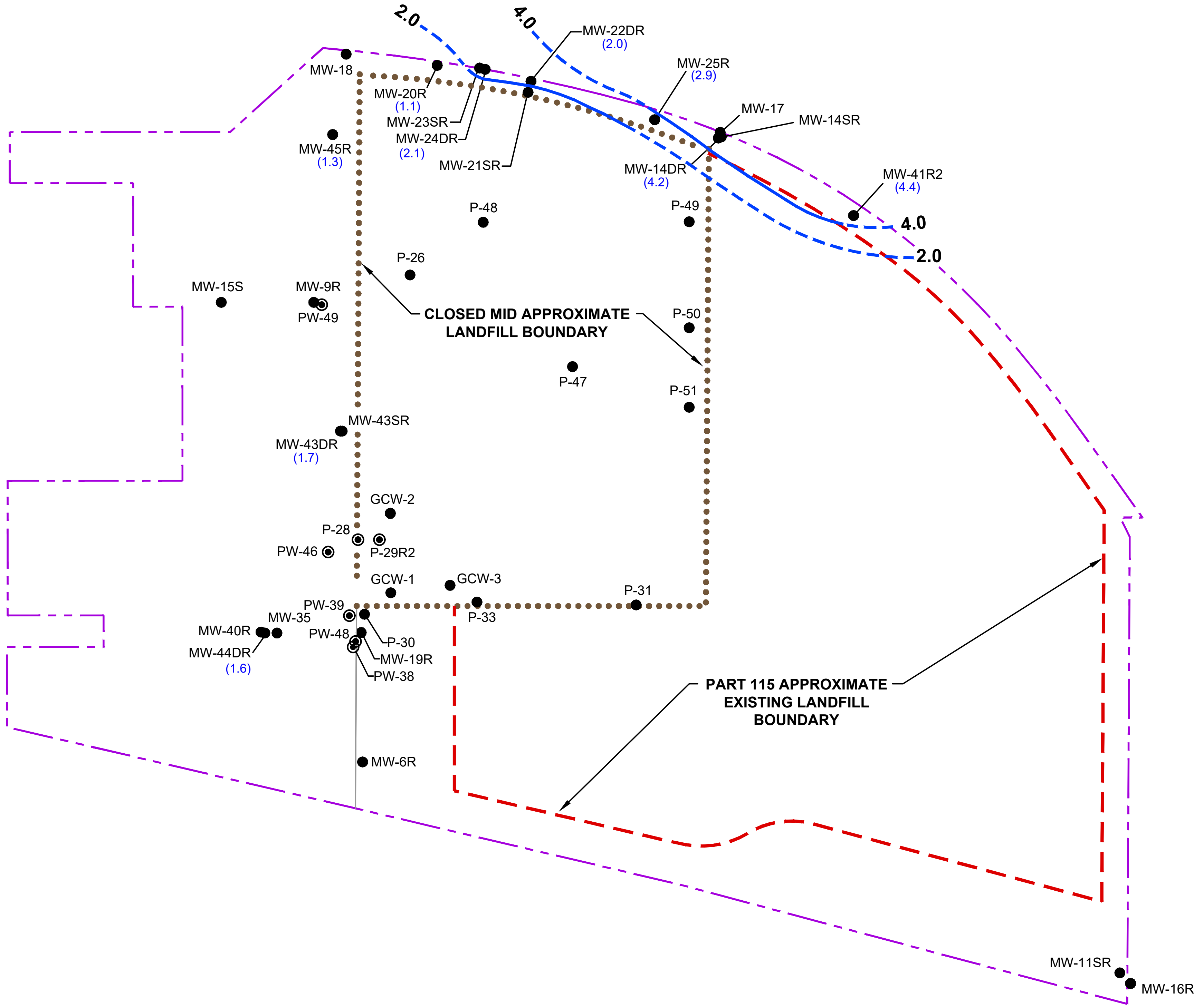
TITLE:
DEEP GLACIAL AQUIFER
POTASSIUM ISOCHEMS
JANUARY 2021

DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K.LOWERY	FIGURE 11	
APPROVED BY:	S.HOLMSTROM		
DATE:	FEBRUARY 2022		

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.11 AR.dwg



LEGEND

MW-1● MONITORING WELL LOCATION AND NUMBER

P-1● PIEZOMETER LOCATION AND NUMBER

PW-39 ◉ PURGE WELL LOCATION AND NUMBER

GCW-1 ● GAS COLLECTION WELL LOCATION AND NUMBER

•••••••• CLOSED MID APPROXIMATE LANDFILL BOUNDARY

— — — PART 115 APPROXIMATE EXISTING LANDFILL BOUNDARY

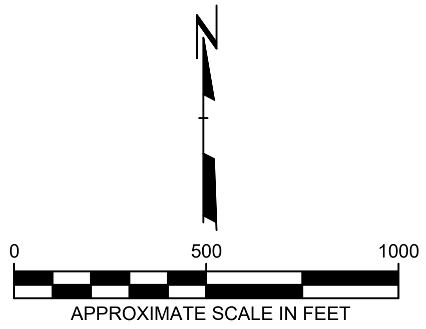
— - — APPROXIMATE PROPERTY LINE

2.0 —— LINE OF EQUAL CONCENTRATION

(3.7) CONCENTRATION (mg/L)

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY GRANGER, DATED FEBRUARY 7, 2001.
2. ISOCHEMS REPRESENT INTERPRETATIONS OF GROUNDWATER CHEMISTRY BASED UPON MEASUREMENTS AT A LIMITED NUMBER OF MONITORING WELLS. ACTUAL CONCENTRATIONS WILL VARY.



PROJECT:
GRANGER GRAND RIVER
MID 082 771 700 LANDFILL
LANSING, MICHIGAN

TITLE:
DEEP GLACIAL AQUIFER
POTASSIUM ISOCHEMS
JULY 2021

DRAWN BY:	SJL / D.STEHLE	PROJ NO.:	414508.0002.01
CHECKED BY:	K.LOWERY	**FIGURE 12**	
APPROVED BY:	S.HOLMSTROM		
DATE:	FEBRUARY 2022		

1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
www.trccompanies.com

FILE NO.: 414508.0002.01.12 2021 AR.dwg

11x17 --- ATTACHED XREFS: --- ATTACHED IMAGES:
DRAWING NAME: \\annarbor-fp2\CADD\PJT100_TRC\Granger LF\414508\0002\01_2021 Annual Rpt\ 414508.0002.01.12 2021 AR.dwg --- PLOT DATE: February 14, 2022 - 11:36AM --- LAYOUT: FIG12 Deep Potassium 2021 Jul

GRANGER GRAND RIVER MID 082 771 700 LANDFILL

2021 ANNUAL REPORT

ATTACHMENT D

MAINTENANCE AND INSPECTION REPORTS

APPENDIX A
ANNUAL SITE MAINTENANCE REPORT

APPENDIX B
INSPECTION FOLLOW-UP REPORT

Granger Grand River MID Landfill
MID 082 771 700
Annual Site Maintenance Report
2021

INTRODUCTION

This Annual Site Maintenance Report provides a summary of the activities performed in year 2021 to operate the site in accordance with the post-closure operating permit. Each facet of the site operation/maintenance is discussed in the following sections.

LANDFILL GAS COLLECTION SYSTEM

The landfill gas collection system continued to effectively remove gas from the landfill, as evidenced in the lack of gas migration from the site. Granger accomplished this by sending the gas to the on-site electrical generation plant. Even with the controls in place, Granger observed some areas of sparse vegetation during the cap inspection that may be attributable to methane.

SITE SECURITY

As noted in the following inspection reports, no significant site security problems were encountered throughout the year. The gates are intact and only routine fence maintenance has been required.

GROUNDWATER MONITORING / MONITORING WELLS

A detailed discussion of the groundwater monitoring data is provided in the routine quarterly reports and the annual report. The routine groundwater monitoring did not reveal any unusual problems associated with the monitoring wells. In June, the paths to the site's groundwater monitoring wells were maintained by removing brush to allow the sampling crew and equipment access.

LEACHATE EXTRACTION SYSTEM

Maintenance

A leachate extraction system of six windmills and interconnecting force main was installed at the site in 2000. As reported in previous years, the effectiveness of the wind-powered windmills was hindered by compounding maintenance issues. The continued need for windmill maintenance resulted in converting the wells to solar powered units with battery packs. The result is greater overall pumping times and a more reliable system. Further, these improvements include timers that control the pumping sequencing and duration. The systems were also winterized. By September 2018 all wells had been converted to solar power with the final well (LMW-3) replaced in June 2018. Based on investigations in 2019, a seventh solar powered extraction well was installed in the spring of 2020. Granger maintains the well by routinely cleaning electric motor brushes and lubricating the motors.

Two leachate extraction wells are constantly pumping. The remaining five run at staggered times. The wells are programmed to run for 30 minutes at a time and cycle five times per day.

Monitoring

Leachate monitoring is performed by analysis of a sample obtained from the solar force main tap that is in the control structure adjacent to the pump station manhole. The collection is performed as the leachate is being pumped by the solar pumps.

In odd numbered years, the annual leachate monitoring includes the modified Appendix IX list of parameters with the addition of boron and the exclusion of dioxane/furans. In even numbered years the annual leachate monitoring includes Method 8260 volatile organics and the inorganic compounds listed in the leachate monitoring plan.

Highlights of the data include the following:

- Cadmium and mercury were reported as non-detect.
- Volatile Organic Compounds: All but two compounds analyzed were reported as non-detect.
- Cyanide: 34 µg/l

GROUNDWATER PURGE SYSTEM

Volatile Organic Compounds (PW-46 and PW-48)

A system of two purge wells was installed on the southwest corner of the site in 1987 after low concentrations of volatile organics were detected in the shallow groundwater. The purge system has been operational since that time. The purge water from the perched aquifer is discharged through the leachate collection system to the local POTW. Because of diminished efficiency of the original purge wells (PW-38 and PW-39); two replacement purge wells (PW-46 and PW-48) were installed in 2004-2005. Those wells have operated since their installation while the original purge wells are maintained as back-up.

Throughout 2021, a total of 2,311,436 gallons was evacuated from the two purge wells. A summary of the evacuation of the purge system is provided in Table 1. The static groundwater elevations obtained from quarterly monitoring indicate that an effective cone of depression was maintained throughout 2021. That effectiveness is depicted in Figures 8-11 of the annual report. The cone of depression extends at least to MW-6 to the south, to MW-43s to the north, and to MW-40 toward the west. The groundwater quality data also reflect the effectiveness of the purge operation as the monitoring continues to indicate the non-detection of all volatile organics in all the wells outside of the immediate purge area, including all the downgradient monitoring wells.

The purge wells are inspected weekly. Those inspections resulted in the following maintenance activities throughout the year which are documented in the Operating Record:

<u>Purge Well 46</u>
June – Pump replaced
October – Heat Lamp plugged in

Purge Well 48
October – Heat lamp plugged in

In summary, both the static groundwater elevations and the groundwater quality data reflect an effective purge system that contains and removes shallow perched groundwater impacted by low concentrations of volatile organics.

Boron (PW-49 and PW-50)

Following the identification of boron concentrations in the groundwater on the west and north side of the site, purge wells PW-49 and PW-50 were installed in 2006 to remediate the impacted groundwater. During 2021, the operation of PW-49 resulted in the evacuation of 423,073 gallons. The operation of PW-50 resulted in the removal of 2,699,499 gallons.

The effectiveness of the purge wells is demonstrated in the groundwater quality data as well as the character of the purge water and the capture zones of the wells. The boron analytical data from the purge wells are summarized in the following table. Maintained decreased concentrations at both purge wells indicate the effectiveness of the remediation systems.

Table A. A Summary of the Detections of Boron (mg/L) in the Purge Water from PW-49 and PW-50 in 2007-2021

	PW-49	PW-50
January 2007	2.1	0.58
April 2007	2.9	0.40
July 2007	5.0	0.32
October 2007	3.9	0.24
January 2008	2.1	0.23
April 2008	1.2	0.19
July 2008	1.2	0.29
October 2008	1.2	0.21
January 2009	1.3	0.19
April 2009	0.78	0.17
July 2009	0.65	0.20
October 2009	0.60	0.19
January 2010	0.74	0.17
April 2010	0.67	0.18
July 2010	0.61	0.20
October 2010	0.48	0.21
January 2011	0.62	0.17
April 2011	0.42	0.14
July 2011	0.37	0.16
October 2011	0.41	0.18
January 2012	0.55	0.19
April 2012	0.53	0.17
July 2012	0.40	0.21
October 2012	0.32	0.22
January 2013	0.37	0.20
April 2013	0.44	0.20
July 2013	0.30	0.17
October 2013	0.22	0.26
January 2014	0.37	0.14
April 2014	0.31	0.13
July 2014	0.25	0.14
October 2014	0.33	0.14
January 2015	0.24	0.11
April 2015	0.23	0.14
July 2015	0.24	0.14
October 2015	0.24	0.16
January 2016	0.28	0.16
April 2016	0.24	0.11
July 2016	0.19	0.14
October 2016	0.26	0.02
January 2017	0.31	0.16
April 2017	0.20	0.14
July 2017	0.25	0.16
October 2017	0.15	0.27
January 2018	0.14	0.20
April 2018	0.24	0.16
July 2018	0.24	0.16
October 2018	0.38	0.31
January 2019	0.38	0.28
April 2019	0.25	0.23
July 2019	0.32	0.23
October 2019	0.40	0.44
January 2020	0.36	0.30
April 2020	0.24	0.22
July 2020	0.31	0.24
October 2020	0.22	0.53
January 2021	0.33	0.43
April 2021	0.36	0.32
July 2021	0.38	0.29
October 2021	0.51	0.23

The routine inspections of PW-49 and PW-50 indicated that, despite brief down-time for maintenance, the systems were effective in removing slightly impacted groundwater. Both purge wells are inspected several times a week. Those inspections resulted in the following maintenance activities throughout the year which are documented in the Operating Record:

Purge Well 49
May – Replaced pump
September – Replaced pump, repaired wiring connection, and repaired wiring
November – Light fixture and heat lamp replaced, GFI outlet replaced

Purge Well 50
October – Pump replaced, Heat lamp replaced and plugged-in heat tape
November – Replaced 1 inch diameter 90-degree elbow and 1 inch diameter nipple

In summary, the static groundwater elevations and the groundwater quality data reflect an effective purge system that contains and removes shallow perched groundwater impacted by low concentrations of boron.

FINAL COVER

A formal final cover inspection was performed in November 2021. Reports on the inspection have been placed in the Operating Record and are provided in the following Appendices. In addition, a formal report on the follow-up work performed as a result of the inspection is also provided as in Attachment D.

Granger continues to perform ongoing maintenance to the cap and the site's storm water controls, leachate collection and handling, and gas systems. In the fall of 2016 Granger conducted a project where significant improvements were made to the sites grading and storm water control structures. Specifically, this included changes to the storm water collection structure located on the northeast corner of the site. Changes were also made to flow paths and down chutes located along the west and north sides of the site. These changes have improved the ability of the cap to shed storm water and consequently reduced areas where storm water can accumulate such as "low areas", where rutting and sparse vegetation may occur. As mentioned above, over the last five years Granger has modified the leachate extraction wells from wind-powered to being solar powered. These projects demonstrate Granger's commitment to performing ongoing maintenance to the site and its cap.

The four items identified in the inspection report are as follows:

- Disturbed Areas Sparse and/or Patchy Vegetation
- Low Areas/Ruts/Erosion
- Standing Water in Gas Control Structure Manholes
- Leachate Well Flow Rates

Disturbed Areas Sparse and/or Patchy Vegetation

Some areas of the cap require the routine passage of maintenance vehicles. Although this includes the manhole structures on the south side and gas structures, it primarily pertains to the solar powered leachate extraction, and especially the wells along the east side of the site. The inspection and maintenance of the leachate extraction structures results in the routine, frequent passage of vehicles. As a result, it is not possible to effectively maintain vegetation in some areas. Therefore, it is proposed that Granger identify a specific area/lane for traffic to follow to those locations and that traffic would be limited, as much as possible, to those areas. Such a decision would be similar to that made to create a roadway for routine access to the leachate pretreatment building on the north side. This would allow for a focus on the maintenance of vegetation outside of that lane.

All areas of sparse and/or patchy vegetation outside of the travel lanes will be addressed in the spring as weather permits. This schedule prevents the causation of further damage to the cap by truck traffic during times of wet weather when the cover soils are soft. The landfill manager has been provided with the locations of the areas and they will be addressed in accordance with the size of the affected area. In either case, the area will be addressed by disrupting the soil followed by the addition of topsoil, as appropriate, and reseeding.

Low Areas/Ruts/Erosion

Areas requiring attention are identified and scheduled for maintenance with the landfill manager. Erosion and washouts were noted in areas where work has taken place in the summer. The areas of erosion have been provided to the landfill manager and will be addressed as weather permits.

Standing Water in Gas Control Structure Manholes

The pumping of the stormwater in gas control manholes is conducted quarterly.

Leachate Well Flow Rates

In 2021, we experienced periods of air entrainment in the leachate force main requiring routine maintenance, but the leachate flow meter was functional and a total of 95,520 gallons of leachate was removed from the site. As intended, the flow meter assisted in the management of the system by providing a metric for determining pumping schedules

Having knowledge of the flow from the site in real time is beneficial in helping identify reoccurring issues as they emerge. While it is likely that similar issues have occurred in the past, having the data to identify problems resulted in a higher than normal maintenance on the system. The results of the static leachate levels and associated maintenance activities are attached in Appendix E.

SUMMARY

In summary, the routine maintenance measures have resulted in the cap maintaining a status of good condition. The “areas of concern” identified in the inspection report continue to be addressed routinely. Per usual, attention will be given to the repair of low areas and disturbed and/or sparse vegetation.

It is believed that all the maintenance issues identified in the inspections have either been effectively addressed or are scheduled for maintenance in 2021. It should be understood, many of the observed features cannot be permanently resolved. Instead, these must be viewed as on-going issues which will require continued attention, as was the case throughout 2021.

Table 1. Groundwater Purge System Data

The following data were obtained from the flow meters on the discharges from purge wells PW-46, PW-48, PW-49, and PW-50.

Purge Well 46

December 23, 2021	5,330,186
December 28, 2020	4,073,225
Gallons pumped:	*1,256,921*

Purge Well 48

December 23, 2021	3,063,849
December 28, 2020	2,009,334
Gallons pumped:	*1,054,515*

Purge Well 49

December 23, 2021	2,945,413
December 28, 2020	2,522,340
Gallons pumped:	*423,073*

Purge Well 50

Total gallons pumped:	*2,699,499*

Accumulative gallons evacuated from the glacial drift aquifer from December 28, 2020 to December 23, 2021:

5,434,048

LANDFILL CAP INSPECTION AND MAINTENANCE LOG

Date: November 5, 2021 Facility: Granger MID

Inspector: Serenity Skillman and Steve Blayer Weather Conditions: Overcast 43F

A. Final Cover Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
A-1	Check integrity of benchmarks	Benchmarks have been modernized	
A-2	What is the general condition of the cap?	The cap is generally in good condition	
A-3	Are there areas of settlement or ponding?	There are a few areas of settlement or ponding	See Map
A-4	Is there evidence of erosion?	None	
A-5	Is there evidence of stressed vegetation?	There are small areas of sparse vegetation	See Map
A-6	Is there evidence of burrowing animals?	None	
A-7	Is there evidence of slope failure?	None	
A-8	Is there any exposed liner?	No liner is present	
A-9	Is there evidence of leachate outbreaks?	Minor areas	See Pictures
A-10	Is there damage to risers or pipes extending thru the cap?	Yes on one riser	See Picture
A-11	Are there undesirable plants capable of damaging the cap?	No	
A-12	Is there damage to spillways or berms?	No	
A-13	What was the date of the last post-closure inspection?	June 22, 2020	

LANDFILL CAP INSPECTION AND MAINTENANCE LOG (Continued)

Date: November 5, 2021

Facility: Granger MID

Inspector: Serenity Skillman and Steve Blayer

Weather Conditions: Overcast 43F

B. Gas Collection System Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
B-1	Is there evidence of odors or gas emissions through the final cover?	Areas of sparse vegetation may be evidence of gas emissions.	See map for areas of sparse vegetation.
B-2	What is the condition of the gas vents?	Good general condition	
B-3	What was the date of the last monitoring of the gas collection system?	The gas system is inspected routinely to ensure effective gas collection and to detect leaks. The monitoring is performed at least weekly.	

LANDFILL CAP INSPECTION AND MAINTENANCE LOG (Continued)
Date: November 5, 2021 Facility: Granger MID
Inspector: Serenity Skillman and Steve Blayer Weather Conditions: Overcast 43F

C. Leachate Collection System Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
C-1	Leachate manhole: • Is the manhole secure?	Yes	
	• Are there visible leaks or structural cracks present?	No	
C-2	Leachate Pump Station: • Is there evidence of leaks, loose plumbing or electrical connections?	No	
C-3	Flow Gauges: • Are flow gauges functional?	Yes	
	• Does the data indicate consistent operation?	See Annual Maintenance Report (Appendix A) for details	

C-4	Leachate Elevations: • Change in static elevations over past six months	Prior Elevation April 2020	Current Elevation October 2021	Change
	-P29r^2	830.83	829.17	-1.66
	-P30	830.94	832.23	+1.29
	-P31	814.44	814.55	+0.11
	-P33	829.57	829.66	+0.09

C-5		Leachate Head (ft)	Are the solar panels operating effectively?	Are broken lines or connections visible?	Do the leachate elevations indicate effective operation?
	LMW-1	0.7	Yes	No	Yes
	LMW-2	2.9	Yes	No	Yes
	LMW-3	3.4	Yes	No	Yes
	LMW-4	0.2	Yes	No	Yes
	LMW-5	0.5	Yes	No	Yes
	LMW-6	0.9	Yes	No	Yes
	LMW-7	0.3	Yes	No	Yes

LANDFILL CAP INSPECTION AND MAINTENANCE LOG (Continued)

Date: November 5, 2021

Facility: Granger MID

Inspector: Serenity Skillman and Steve Blayer

Weather Conditions: Overcast 43F

D. Purge System Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
D-1	Any evidence of loose fittings or leaks at the pump station?	No	
D-2	Are pressure gauges in good working condition? (non-zeroed & cracked cover plate?)	Yes	
D-3	Is there any evidence of physical damage to the purge wells?	No	
D-4	Do the flow data (Cycles/day & cumulative volume) indicate consistent operation?	Yes	
D-5	Indicate flow meter reading.	Yes	

LANDFILL CAP INSPECTION AND MAINTENANCE LOG (Continued)

Date: November 5, 2021 Facility: Granger MID

Inspector: Serenity Skillman and Steve Blayer Weather Conditions: Overcast 43F

E Purge System Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
E-1	Is the fence secure and in proper condition?	Yes	
E-2	Are gates in place and in working order?	Yes	
E-3	Are locks in place and in working order?	Yes	
E-4	Are lockboxes installed and in working order?	Yes	

Granger Grand River MID
MID 082 771 700
Landfill Cap Maintenance
2021 Inspection
Follow-up Report

Maintenance activities for the 2021 calendar year were directed based on continuation from the 2020 and past inspections. The follow-up focused primarily on the status of the cap and included:

- Low Areas and Ruts
- Disturbed Areas Sparse and/or Patchy Vegetation
- Gas Control Structure Manholes
- Animal Burrows
- Undesirable Plant Species

Problematic areas were noted on Figures depicting the site. The maintenance issues were then discussed with the landfill manager.

Low Areas and Ruts

As noted in previous reports, and as is typically the case for closed landfills, subsidence is an on-going maintenance issue at the site. While undoubtedly there are some areas of subsidence it is important not overreact to potential subsidence areas that do not represent a problem. In the spring of 2022, low areas with depressions greater than four inches will be filled, graded, covered with straw blanket, and seeded. Areas that are less than four inches are extremely difficult to address without compromising the cap. In these instances, a practical approach is to allow the subsidence and/or preferential flow to develop to the extent that a clear solution becomes evident.

Disturbed Areas Sparse and/or Patchy Vegetation

In general, areas of sparse and/or patchy vegetation are addressed routinely by Granger. Typically, small areas are addressed by disrupting the soil followed by the addition of topsoil, as appropriate, and seeding. Areas were identified during the annual maintenance inspection and as a result, in the spring of 2022, topsoil will be added to sparce areas and straw blanket and seed will be added.

Gas Control Structure Manholes

As part of routine quarterly maintenance any accumulated storm water is removed.

Animal Burrows

No burrows were identified in the inspection. Granger continues to retain an animal control specialist to routinely remove animals. The effectiveness of the animal removal program is demonstrated by its results of removing numerous burrowing animals. However, burrowing animals are abundant in the areas surrounding the landfill and removal and routine cap inspection/repair is ongoing.

Undesirable Plant Species

Due to enhanced annual mowing efforts and removal of plants on the north slope, the presence of undesirable plant species on the cap has greatly reduced in the last few years. The mowing program will continue in 2022 to maintain the diminished presence of undesirable plant species.

In summary, the routine maintenance measures have resulted in the cap being in reasonably good condition. The “areas of concern” identified in the inspection report continue to be addressed on a routine basis. Per usual, attention will be given to the repair of low areas and disturbed and/or sparse vegetation. The areas of concern have been identified and will be addressed as weather and resources permit.

GRANGER GRAND RIVER MID 082 771 700 LANDFILL

2021 ANNUAL REPORT

ATTACHMENT E

STATIC LEACHATE LEVEL MONITORING

Granger MID 082 771 700 Landfill
Solar Piezometers
Q1 2021

Date of readings: 3/23/2021, 3/25/2021, 3/29/2021, 3/30/2021

	Total Depth	Depth to Liquid	Borehole Head (ft)	Comment
LMW-1	52.8	52.4	0.4	
LMW-2r	62.2	61.9	0.3	
LMW-3	52.7	49.2	3.5	
LMW-4	40.3	40	0.3	
LMW-5	58.9	58.8	0.1	
LMW-6	61.9	61.9	0.0	
LMW-7	32.0	31.2	0.8	

Maintenance actions included the following:

LMW-1: new automated oiler

LMW-2r: new automated oiler

LMW-3: new automated oiler and over under voltage regulator

LMW-4: new automated oiler

LMW-5: entire pump head swap

LMW-6: new automated oiler

LMW-7:

Granger MID 082 771 700 Landfill
Solar Piezometers
Q2 2021

Date of readings: 5/25/2021, 6/1/2021

	Total Depth	Depth to Liquid	Borehole Head (ft)	Comment
LMW-1	52.8	52.2	0.6	
LMW-2r	62.2	61.4	0.8	
LMW-3	52.7	49.6	3.1	
LMW-4	40.3	40.1	0.2	
LMW-5	58.9	58.4	0.5	
LMW-6	61.9	61.9	0.0	
LMW-7	32.0	31.6	0.4	

Maintenance actions included the following:

LMW-1:

LMW-2r:

LMW-3: swapped DC motor for a new one

LMW-4:

LMW-5: took head and down rod out of well and confirmed pumping opertion was normal. Replaced with no issues.
LMW-6:

LMW-7:

Granger MID 082 771 700 Landfill
Solar Piezometers
Q3 2021

Date of readings: 8/5/2021, 8/11/2021, 8/17/2021

	Total Depth	Depth to Liquid	Borehole Head (ft)	Comment
LMW-1	52.8	52.1	0.7	
LMW-2r	62.2	59.3	2.9	
LMW-3	52.7	49.3	3.4	
LMW-4	40.3	40.1	0.2	
LMW-5	58.9	58.4	0.5	
LMW-6	61.9	61.0	0.9	
LMW-7	32.0	31.7	0.3	

Maintenance actions included the following: Forcemain replaced, 6 cleanouts, 1 2-way valve finished 8

LMW-1: new discharge piping

LMW-2r: new discharge piping and ball valve on discharge

LMW-3: new discharge piping

LMW-4: new discharge piping

LMW-5: Rebuilt Pump head and new discharge piping, piston rings

LMW-6: new discharge piping

LMW-7: new discharge piping

Granger MID 082 771 700 Landfill
Solar Piezometers
Q4 2021

Date of readings: 12/28/2021, 12/29/2021, 12/

	Total Depth	Depth to Liquid	Borehole Head (ft)	Comment
LMW-1	52.8	51.8	1.0	
LMW-2r	62.2	61.6	0.5	
LMW-3	52.7	51.3	1.4	
LMW-4	40.3	40.1	0.2	
LMW-5	58.9	58.4	0.5	
LMW-6	61.9	61.6	0.3	
LMW-7	32.0	31.5	0.5	

Maintenance actions included the following:

LMW-1: New over under voltage regulator

LMW-2r:

LMW-3:

LMW-4:

LMW-5: Swapped piston rings

LMW-6:

LMW-7: cleaned Piston and swapped piston rings

ATTACHMENT G

Revised Section 3.2

3.2 Characterization of Impacted Groundwater

Volatile Organics in the Perched Glacial Aquifer in the Southwest Corner:

A system of two purge wells (PW-38 and PW-39) were installed in the southwest corner of the site in late 1987 after low concentrations of volatile organic compounds (VOCs) were detected in the shallow groundwater. The original purge wells were later replaced by PW-46 and PW-48 and the system has consistently operated. As documented in annual groundwater reports, the groundwater quality data indicate a reduction of VOCs within the purge area and non-detection of VOCs outside the immediate purge area. The consistent evacuation rates and monitoring data indicate the purge system is consistent and effective in capturing and controlling migration of VOC impacted groundwater.

Boron Impacted Groundwater in the Northwest and North:

In 2006, confirmed exceedances of boron were detected in monitoring wells to the northwest and north of the site (MW-9r, MW-21s, MW-23s, and MW-24d). The presence of the boron is believed to have originated from a temporary source that has been remediated. As a result of those detections, two purge systems were installed in the glacial aquifer on the northwest and north sides of the site. Both PW-49 on the northwest and PW-50 on the north were operational in September 2006. Since the time of installation, the operation of the purge systems has demonstrated successful capture of the boron-impacted groundwater as demonstrated by significant and rapid decreases in concentrations of boron in the glacial aquifer. As documented in recent annual reports, no statistical exceedances of boron have been document in the recent years (the last exceedance of the boron prediction limit was documented in the 2017 Annual Groundwater Report).

Road Salt Impacted Groundwater:

The adjacent I-96 highway has been identified as of source of sodium, chloride and potassium impacted groundwater at the site as has been documented in recent annual groundwater reports. The road salt source (salt laden runoff from 5.3 acres of adjacent interstate highway) was documented in a March 22, 2002 report Granger submitted to EGLE which included the results of an investigation performed by RMT, Inc. The presence of elevated sodium, chloride, and potassium do not reflect impact from the site as document in annual groundwater reports.

ATTACHMENT H

Revised Section 2.3 and Appendix A

Several piezometers were installed across the site. These piezometers were converted to leachate collection wells. Static elevations are measured in each of the leachate wells on a quarterly basis. These measurements are taken to determine if a significant amount of leachate is present both in the central area and along the eastern edge of the site. The subsequent data have indicated that the pumping systems are effective and that there is no significant "head" of leachate present throughout the site.

2.1.3 Post-Closure

The post-closure time frame began on April 13, 1990 with certification from the Michigan Department of Natural Resources (currently EGLE) that all the requirements of closure had been fulfilled. The post-closure care period will be conducted for at least a 30 year period, and will include the following programs:

- Maintaining the integrity and effectiveness of the final cover;
- Maintaining, operating and monitoring the effectiveness of the leachate collection system;
- Monitoring and maintaining groundwater quality;
- Maintaining and operating the gas monitoring and gas collection systems.

2.2 Security Procedures [40 CFR §270.14(b)(4)]

The Granger Grand River MID 082 771 700 Landfill is equipped with perimeter fencing and a locking entrance gate that is shared with the adjacent Part 115 landfill. Perimeter fences ranging in height from 4 to 8 feet are arranged around the facility. A warning sign is posed on the entrance gate to the facility.

During operating hours, gates are staffed with employees who monitor vehicles and persons entering the facility. Gates are locked to prevent unauthorized access when staff are not present.

2.3 Inspection Schedule [40 CFR §270.14(b)(5)]

Introduction: The Granger Grand River MID landfill has inspection programs for final cover, gas collection system, leachate collection system, purge system, and site security.

Written Schedule:

- Final cover: annual
- Gas collection system: annual/quarterly
- Leachate collection system: annual/monthly
- Purge system: annual/weekly
- Site security: annual

Types of Problems: The types of problems that are to be looked for during the inspections are noted in Sections 2.3.1 through 2.3.5 (below).

Frequency of Inspection: The frequency of the inspections is noted in the written schedule above.

Remedy Schedule: If an imminent hazard to human health and the environment is identified during an inspection, remedial actions will be taken immediately. Typical deficiencies noted during inspections are addressed during the summer-fall construction season.

Inspection Log or Summary: Inspections are documented in the forms included in Appendix A. Inspections are summarized in annual groundwater reports.

APPENDIX A

Inspection and Maintenance

INSPECTION AND MAINTENANCE
GRANGER GRAND RIVER MID LANDFILL (082 771 700)

Introduction: The Granger Grand River MID landfill has inspection programs for final cover, gas collection system, leachate collection system, purge system, and site security.

Written Schedule:

- Final cover: annual
- Gas collection system: annual/quarterly
- Leachate collection system: annual/monthly
- Purge system: annual/weekly
- Site security: annual

Types of Problems: The types of problems that are to be looked for during the inspections are noted in Sections 1 through 5 (below).

Frequency of Inspection: The frequency of the inspections is noted in the written schedule above.

Remedy Schedule: If an imminent hazard to human health and the environment is identified during an inspection, remedial actions will be taken immediately. Typical deficiencies noted during inspections are addressed during the summer-fall construction season.

Inspection Log or Summary: Inspections are documented in the enclosed forms. Inspections are summarized in annual groundwater reports.

1.0 FINAL COVER INSPECTION AND MAINTENANCE

Visual inspections of the final cover are performed each year.

Visual inspections are performed during a walk-over of the site. All problem areas are recorded on the observation form which is enclosed. The inspection will include observations relative to the following:

- areas of settlement and/or ponding;
- the possible presence of erosion, rifts or cracks;
- areas of stressed or dead vegetation;
- areas of sparse vegetation;
- evidence of burrowing animals:
- areas of slope failure;
- areas of exposed liner;
- areas characterized by gas emissions;
- leachate outbreaks;
- damage to any risers or pipes which extend through the cap;
- undesirable plant species capable of damaging the cap;
- damage to spillways or berms;

Maintenance activities will be directed by observations recorded on the inspection form. The activities will be performed as necessary such that the observations identified during the inspection are addressed and the integrity of the final cover is maintained. Survey benchmarks are no longer observed since Granger has incorporated GPS survey equipment and methods. Following completion of the inspection, the information will be given to the site manager for subsequent maintenance. Routine maintenance of the final cover will be performed during the summer/fall construction season.

2.0 GAS COLLECTION SYSTEM INSPECTION AND MAINTENANCE

During the inspections of final cover, the area will also be inspected for the possible presence of odors or gas emissions through the cap. In addition, the gas vents will be inspected for their structural integrity and the data obtained during the quarterly monitoring for possible gas migration will be reviewed. The site manager will be informed of any matters which require maintenance to facilitate their inclusion in the summer/fall construction season.

The landfill does not operate process vents (not subject to Subpart AA). The landfill gas is not classified as hazardous waste (not subject to Subpart BB). No hazardous waste was accepted after December 6, 1996 (not subject to Subpart CC).

3.0 LEACHATE COLLECTION SYSTEM INSPECTION AND MAINTENANCE

The volume of leachate/condensate is reported on a monthly basis to Southern Clinton County Municipal Utilities Authority (SCCMUA), or other comparable facility. The records of discharge volumes are be retained at the Granger Wood Street facility. These records are reviewed regularly.

The leachate manhole, the leachate pump house, and the leachate collection system along the east side are inspected on a monthly basis using the enclosed inspection form. The manhole is inspected for security and structural integrity. The pump house is inspected for any evidence of loose plumbing or electrical fittings and any evidence of leakage. Static elevations are measured in the leachate collection wells to verify the effective operation of the pumps. Data obtained during the monthly inspections is maintained at the Granger Wood Street Office. Any problems requiring repair or maintenance are reported to the manager.

The quarterly monitoring of static leachate elevations will be reported to EGLE annually and maintained in the Operating Record. The data will be examined during each inspection event to assess if any significant change in elevation has occurred.

4.0 PURGE SYSTEM INSPECTION AND MAINTENANCE

The purge system will be inspected on a weekly basis. The purge wells will be inspected for any visible damage. The pump station will then be inspected for any leaks or loose fittings in the plumbing or electrical connections. The valves and gauges at the pump station will be inspected both for leaks and for general working condition. The data from the flow meter will be inspected to determine if the pump operation (cycles/day and discharge volume) are consistent. These discharge data will provide an overview of the effectiveness of the entire system (wells, piping, pumps, valves, meters, etc.) since they provide the composite effectiveness of all the separate components. Any problems encountered will be reported to the landfill manager for correction.

5.0 SITE SECURITY INSPECTION AND MAINTENANCE

The annual inspection of the landfill will include an examination of site security using the enclosed inspection form. The inspection will include a survey of the fences, gates, locks, and lockboxes. Any problems with any aspect of the security system will be reported to the site manager for repair.

LANDFILL CAP INSPECTION AND MAINTENANCE LOG

Date______________________________ Facility____________________________________

Inspector____________________________ Weather Conditions_____________________________

A. Final Cover Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
A-1	Check integrity of benchmarks		
A-2	What is the general condition of the cap?		
A-3	Are there areas of settlement or ponding?		
A-4	Is there evidence of erosion?		
A-5	Is there evidence of stressed vegetation?		
A-6	Is there evidence of burrowing animals?		
A-7	Is there evidence of slope failure?		
A-8	Is there any exposed liner?		
A-9	Is there evidence of leachate outbreaks?		
A-10	Is there damage to risers or pipes extending thru the cap?		
A-11	Are there undesirable plants capable of damaging the cap?		
A-12	Is there damage to spillways or berms?		
A-13	What was the date of the last post-closure inspection?		

LANDFILL CAP INSPECTION AND MAINTENANCE LOG (Continued)

Date______________________________ Facility____________________________________

Inspector____________________________ Weather Conditions_____________________________

B. Gas Collection System Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
B-1	Is there evidence of odors or gas emissions through the final cover?		
B-2	What is the condition of the gas vents?		
B-3	What was the date of the last inspection?		

LANDFILL CAP INSPECTION AND MAINTENANCE LOG (Continued)

Date______________________________ Facility______________________________

Inspector______________________________ Weather Conditions______________________________

C. Leachate Collection System Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
C-1	Leachate manhole: • Is the manhole secure?		
	• Are there visible leaks or structural cracks present?		
C-2	Leachate Pump Station: • Is there evidence of leaks, loose plumbing or electrical connections?		
C-3	Flow Gauges: • Are flow gauges functional?		
	• Does the data indicate consistent operation?		

C-4	Leachate Elevations: • Change in static elevations over past six months	Prior Elevation	Current Elevation	Change
	-P29			
	-P30			
	-P31			
	-P33			
	-LW-1			
	-LW-2			
	-LW-3			
	-LW-4			
	-LW-5			
	-LW-6			

LANDFILL CAP INSPECTION AND MAINTENANCE LOG (Continued)

Date______________________________________ Facility____

Inspector___________________________________ Weather Conditions_____________________________________

D. Purge System Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
D-1	Any evidence of loose fittings or leaks at the purge well manhole plumbing?		
D-2	Are pressure gauges in good working condition? (non-zeroed & cracked cover plate?)		
D-3	Is there any evidence of physical damage to the purge wells?		
D-4	Do the flow data (Cycles/day & cumulative volume) indicate consistent operation?		
D-5	Indicate flow meter reading.		

LANDFILL CAP INSPECTION AND MAINTENANCE LOG (Continued)

Date____________________________________ Facility____

Inspector_________________________________ Weather Conditions____________________________________

E Site Security Inspection

ITEM#	ITEM DESCRIPTION	REMARKS	LOCATION
E-1	Is the fence secure and in proper condition?		
E-2	Are gates in place and in working order?		
E-3	Are locks in place and in working order?		
E-4	Are lockboxes installed and in working order?		

ATTACHMENT I

Appendix J

APPENDIX J

Emergency Action Plan and Stormwater Pollution Prevention Plan

EMERGENCY ACTION PLAN
GRAND RIVER LANDFILL

EMERGENCY ACTION PLAN

Grand River Landfill

October 2021

GRANGER
WASTE SERVICES

TABLE OF CONTENTS

Introduction

Due to the unexpected and potentially dangerous nature of emergencies, it is critical that all Granger associates be prepared with a plan of action in case an emergency occurs. This plan provides a reference guide to help Granger associates choose the most appropriate, thorough and timely response in the event of an emergency.

Associates must review and understand the specific Emergency Action Plan for the facility in which they work.

Chain of Command

The Chain of Command was established to minimize confusion so associates will have no doubt about who has authority for making decisions. Due to the importance of emergency functions, adequate backup must be arranged to ensure trained personnel are always available. If the primary emergency coordinator is not available to oversee an emergency, another emergency coordinator or supervisor must take over. The duties of these coordinators include all the following:

1. Assessing the situation and determining whether an emergency requires activating the emergency response plan
2. Directing all efforts in the facility, including evacuating personnel and minimizing injury and property loss
3. Ensuring that outside emergency services, such as medical aid and local fire departments, are called in when necessary
4. Directing the shutdown of facility operations when necessary

Once emergency coordination has been established, the emergency coordinator or designee should make sure to contact Granger safety and operations management.

Name	Title	Office Phone	Cell Phone
Travis Owen	Emergency Coordinator (1)		517-819-4240
Pete Nichols	Emergency Coordinator (2)		517-819-4328
Kim Smelker	Emergency Coordinator (3)	517-371-9726	517-819-3196
Brian Grammer	Safety Manager	517-372-8351	517-525-0722

Media Communication

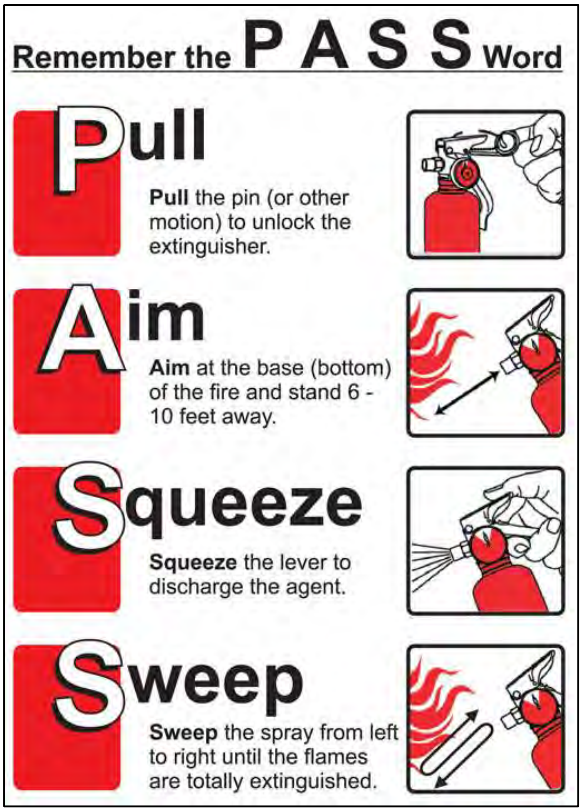
The media coordinator will select an appropriate spokesperson, preferably not the emergency coordinator (EC). This will enable the EC to concentrate on handling the emergency. The Customer Service Department should direct all inquiries about the emergency to the media coordinator, who will screen the calls and determine how and when to arrange interviews with the spokesperson, if deemed appropriate. The media coordinator will notify communications personnel to monitor media and social media outlets. The designated spokesperson should work with communication and management representatives to develop an appropriate media statement, if necessary.

Name	Title	Office Phone	Cell Phone
Charles Hauser	Media Coordinator (1)	517-371-9775	989-430-3155
Andrea Davis	Media Coordinator (2)	517-371-9736	517-980-0442

Fire

In the event of a fire that takes place during operating hours, the following actions should be taken:

1. All associates in the surrounding area must be immediately notified. Associates and customers not directly involved in the emergency must evacuate to an area away from the hazard. Granger associates will assist in evacuating everyone not directly involved in the emergency. All temporary associates shall evacuate the area immediately.
2. A Granger associate should call 911 and provide the following information to the operator.
    - Caller's name
    - Facility name and address (Grand River Landfill, 8550 W Grand River Hwy, Grand Ledge)
    - Telephone number (517-372-2800)
    - Name of the nearest cross street (Grand River and Forest Hill Road)
    - Size and exact location of the fire
    - Action currently being taken by Granger associates and what assistance, if any, is required from the fire department
3. If the fire is small, anyone trained in the use of fire extinguishers may attempt to extinguish it with the appropriate fire extinguisher. (Water should not be used on a petroleum-based fire or electrical equipment; a CO_2 extinguisher should be used instead.) Landfill crew who are trained to extinguish fires using soil and equipment may be called on to help extinguish the fire. NOTE: Associates should only attempt to extinguish a fire if it can be done quickly and safely. If the fire cannot be extinguished quickly and safely using the equipment immediately available near the fire, the facility should be evacuated immediately.
4. Associates should evacuate immediately if any of the following occur: escape path is threatened, correct fire extinguisher is not available, fire cannot be fought with back toward the escape route, fire is spreading, fire extinguisher is ineffective.
5. The emergency coordinator should be notified, following the chain-of-command.
6. A Granger associate should be identified to be a spotter and wait at the main entrance (drive #7 for the landfill and drive #9 for the Disposal Center) for emergency personnel to arrive. This person will guide the responders to the location of the incident.



Pull the pin (or other motion) to unlock the extinguisher.

Aim at the base (bottom) of the fire and stand 6 - 10 feet away.

Squeeze the lever to discharge the agent.

Sweep the spray from left to right until the flames are totally extinguished.

7. An incident report should be completed immediately and should document the situation using as specific and detailed information as possible. The information should include witness interviews, observations and photographs, if possible.

Severe Weather

When there is a chance of severe weather, associates should monitor weather reports for updated information. If a severe weather watch is issued, all on-site associates will be informed. If a tornado or severe thunderstorm warning is issued for the local area, all on-site associates shall be notified, and the actions listed below will be taken. (NOTE: The emergency coordinator may call for these actions without an official tornado or thunderstorm warning.)

1. If associates are on site, they should move to a secure area at the first indication of an approaching tornado or severe thunderstorm. High elevations and areas on or around equipment should be avoided. If a thunderstorm is approaching, any associates who are outside should take shelter.
2. The primary tornado shelter location for landfill and Disposal Center associates is Storage Room A, located on the Garden Level of the Main Office.
3. Customers and contractors on site during the event should be made aware of the weather conditions and asked to stop working or disposing of materials and take shelter. Depending on the severity, speed and location of the storm, customers and contractors should leave the site, shelter in their vehicles or be offered shelter inside.
4. If there are downed wires, the immediate area should be cleared of associates and any ignitable items which might be in jeopardy. No attempt should be made to move, cover or repair downed electrical lines. (Note: Direct contact with high power lines is not required to receive an electrical shock or electrocution. Always keep a safe distance of at least 20 feet from downed power lines.) Downed wires and other hazards should be marked with signs, barricades or other markers to identify them as hazards to unsuspecting associates and the public.
5. The Fire Department, medical authorities and electrical utilities should be notified as needed. All associates should be accounted for with a roll call.

Grand Ledge Police/Fire	**911**
Consumers Energy	**1-800-477-5050**

6. Details about the situation, such as names of witnesses and damage, should be documented.

Associate Injuries

1. If the injury is minor, basic first aid should be provided if it’s appropriate and the area is safe. First aid supplies and the AED can be found in the associate break room. If appropriate, assign a staff member to transport the injured associate to Sparrow Occupational Health Services. Information for Sparrow Occupational Health Services is as follows:

SCAN FOR DIRECTIONS

Weekdays: 7 a.m. to 5 p.m.
Sparrow Occupational Health Services
Medical Arts Building
1322 E. Michigan Ave, Suite 101
Lansing
Phone: 517-364-3900
Fax: 517-364-3914

SCAN FOR DIRECTIONS

Weekdays: 5 p.m. to 8 p.m.
Weekends: 8 a.m. to 8 p.m.
Sparrow Urgent Care
Michigan Ave.
1120 E. Michigan Ave.
Lansing
Phone: 517-364-9790
Fax: 517-364-9794

SCAN FOR DIRECTIONS

Weekdays and weekends: 8 p.m. to 8 a.m.
Sparrow Hospital Emergency Room
1215 E. Michigan Ave.
Lansing
Phone: 517-364-1000

2. If the injury is serious*, EMS should be contacted by calling 911. Basic first aid should be provided if it’s appropriate and the area is safe. The emergency operator should be informed of the exact location of the injured associate and what has occurred. One associate should stand outside to direct the ambulance when it arrives.

3. The emergency coordinator should be notified, following the chain of command notification. The injured person should be made comfortable and proper first aid procedures should be followed. The area where the accident occurred should be secured. An incident report which documents the situation using as specific and detailed information as possible should be completed immediately. The information should include witness interviews, observations and photographs, if possible.

4. If the injury is serious, the media coordinator should be notified. The media coordinator should notify the customer service department to direct all inquiries about the emergency to the designated spokesperson. The designated spokesperson should work with management representatives to develop an appropriate media statement, if necessary.

**Note: A serious injury can be defined as a cut requiring several stitches, significant loss of blood, a serious burn, asphyxiation, a head or eye injury, a broken bone or any condition that requires immediate medical attention or, if left unattended, could develop into a life-threatening condition.*

Visitor/Customer Injuries

1. If the injury is minor, basic first aid should be provided if it's appropriate and the area is safe. AEDs can be found in the landfill and Disposal Center gatehouses. First aid supplies can be found in the landfill and Disposal Center gatehouses, in some pickup trucks and in some equipment.
2. The Granger Main Office emergency coordinator, as well as the employer or person responsible for the visitor (e.g., if the visitor is a student, notify the school), should be notified. The injured person's name, organization and other significant information should be recorded. The injured person should be assisted with making arrangements for medical attention and/or to be picked up.
3. If the injury is serious, EMS should be contacted by calling 911. Basic first aid should be provided if it's appropriate and the area is safe. The emergency operator should be informed of the exact location of the injured person and what has occurred. An associate should stand outside to direct the ambulance when it arrives.
4. The emergency coordinator should be notified, following the chain of command notification. The injured person should be made comfortable and proper first aid procedures should be followed. The area where the accident occurred should be secured. An incident report which documents the situation using as specific and detailed information as possible should be completed immediately. The information should include witness interviews, observations and photographs if possible.
5. If the injury is serious, the media coordinator should be notified. The Customer Service Department should direct all inquiries about the emergency to the media coordinator, who will screen the calls and determine how and when to arrange interviews with the spokesperson, if deemed appropriate. The designated spokesperson should work with communication and management representatives to develop an appropriate media statement, if necessary.

Disruptive, Threatening or Violent Behavior

For Disruptive, but Not Threatening, Behavior

1. The associate should respond quietly and calmly. The associate should try to defuse the situation or set limits using statements like "Please lower your voice so I can understand what you need and try to help you."

2. Associates should ask questions and summarize what they hear the person saying in order to show respectful concern, interest and attention and to promote resolution of the concerns.

3. If this approach does not stop the disruption, but it is the associate's judgment that there is no immediate threat, he or she should seek assistance from supervisors or nearby colleagues.

For Crimes in Progress, Violent Incidents or Specific Threats of Imminent Violence

An associate should immediately call 911 or if an individual makes threats of physical harm toward others or him/herself, has a weapon or behaves in a manner that causes associates to fear for their own or another's safety.

1. Associates should not attempt to intervene physically or otherwise deal with the situation. If demands for money are made, associates should comply and explain what they are going to do before reaching or moving to do it.
2. If possible, a phone line should be kept open to police until they arrive. If the associate cannot stay on the line, 911 can be called and the dispatcher can direct the police to the caller. The more information the police receive, the more likely it is that they can bring a potentially violent situation to a safe conclusion. Associates should be observant of the threatening person and remember details about the person's physical appearance, height and clothing.
3. Whenever possible, associates should get themselves and others to safety.

Emergency Response Contact Information

Ambulance Police Fire	911

Address:

Grand River Landfill
8550 W Grand River Hwy

Major Utility-Related Emergency Numbers

Electrical	Consumers Energy	1-800-477-5050
Street Hydrants	Board of Water and Light	517-702-6490
Building Water	GWS Facilities	517-282-8290
Natural Gas	Consumers Energy	1-800-477-5050
Fuel Pumps	Leak Petroleum	517-669-1252
Spills Cleanup	Shultz Pumping	517-484-7989

Internal Granger Contact Numbers

Landfill Supervisor			
Travis Owen	517-819-4240		
Safety			
Brian Grammer	517-525-0722		
Operations Manager			
Kim Smelker	517-371-9726	517-819-3196 (cell)	
Environmental Compliance			
Steve Blayer	517-371-9724		
Facilities			
Nick Cook	517-282-8290		
Granger Spokespersons			
Charles Hauser	989-430-3155	Andrea Davis	517-980-0442

Non-emergency Agency Numbers

Clinton County Sheriff	989-224-8989
Grand Ledge Police	517-627-2115
Ingham County Sheriff	517-676-2431
Eaton County Sheriff	517-372-8215

STORMWATER POLLUTION PREVENTION PLAN
GRANGER GRAND RIVER AVENUE LANDFILL

FACILITY NAME:

GRANGER LAND DEVELOPMENT – GRAND LEDGE
GRANGER GRAND RIVER AVENUE LANDFILL

STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

Department of Environmental Quality (DEQ)
Water Resources Division (WRD)
Storm Water Pollution Prevention Plan (SWPPP) Template
Template Revision Date: 4/4/2022

TABLE OF CONTENTS

1.0 GENERAL FACILITY INFORMATION

Facility Information:

- Name of Facility: ***Granger Land Development – Grand Ledge***
- Facility Address: ***8550 West Grand River Avenue, Grand Ledge, MI 48837***
- County: ***Clinton***
- Standard Industrial Classification (SIC) Code: ***4953***
- Owner or Authorized Representative: ***Granger Land Development Company***

Facility Contact Information:

- Name: ***Tim Krause***
- Title: ***Director of Engineering***
- Telephone: ***517-372-8342***
- Email Address: ***tkrause@grangernet.com***
- Mailing Address: ***16980 Wood Road, Lansing, MI 48906***

Facility Contact information to be aware of:
The "Facility Contact" was specified in the application. The permittee may replace the facility contact at any time, and shall notify the Department in writing within 10 days after replacement (including the name, address, email address, if available, and telephone number of the new facility contact).

a) The facility contact shall be (or a duly authorized representative of this person):
  - *for a corporation, a principal executive officer of at least the level of vice president, or a designated representative, if the representative is responsible for the overall operation of the facility from which the discharge described in the permit application or other NPDES form originates,*
  - *for a partnership, a general partner,*
  - *for a sole proprietorship, the proprietor, or*
  - *for a municipal, state, or other public facility, either a principal executive officer, the mayor, village president, city or village manager, or other duly authorized employee.*

b) A person is a duly authorized representative only if:
  - *the authorization is made in writing to the Department by a person described in paragraph a. of this section; and*
  - *the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the facility (a duly authorized representative may thus be either a named individual or any individual occupying a named position).*

Certified Storm Water Operator Information:

- Name: ***Tim Krause***
- Certification Number & Expiration Date: ***05879, Expiration Date 2022***
- Telephone: ***517-372-8342***
- Email Address: ***tkrause@grangernet.com***
- Is the Certified Operator an employee at the facility: ☒ Yes ☐ No
  - If the answer to the above question is "No" then include the Certified Operator's business name and mailing address:

Permit Information:

- General Permit Number: ***MIS 410000***
- Certificate of Coverage (COC) or Individual Permit Number: ***MIS 410095***
- COC or Individual Permit Effective Date of Coverage: ***May 21, 2014***
- Receiving Waters: ***Openlander Drain***
- Required Monitoring: ☐ Yes ☒ No
- Identify the Total Daily Maximum Load (TMDL) listed on COC: ***N/A***

Brief Industrial Activity Description: ***Sanitary Landfill***

If this facility is a seasonal facility describe the seasonal operation and what months the facility will be operating:

2.0 STORM WATER POLLUTION PREVENTION TEAM

The storm water pollution prevention team is responsible for developing, implementing, maintaining, and revising this SWPPP. The members of the team and their primary responsibilities (i.e. implementing, maintaining, record keeping, submitting reports, conducting inspections, employee training, conducting the annual compliance evaluation, testing for non-storm water discharges, signing the required certifications) are as follows:

Name & Title	Responsibility
Tim Krause	***Certified Storm Water Operator***
Serenity Skillman	***Certified Storm Water Operator***
Steve Blayer	***Maintaining Documentation, Spill Kit Inventory, Sample Collection, Inspections***
Space to list additional members and their responsibility if necessary:	

3.0 SITE MAP

Preparing a site map or sketch is the first step in assessing the facility. See the DEQ Industrial Storm Water Certified Operator Training Manual for additional information.

The facility's site map includes all applicable items listed in the permit, which include:

1) Buildings and other permanent structures
2) Storage or disposal areas for significant materials
3) Secondary containment structures and descriptions of what they contain in the primary containment structures
4) Storm water discharge points (which include outfalls and points of discharge), numbered or otherwise labeled for reference
5) Location of storm water and non-storm water inlets (numbered or otherwise labeled for reference) contributing to each discharge point
6) Location of NPDES permitted discharges other than storm water
7) Outlines of the drainage areas contributing to each discharge point
8) Structural runoff controls or storm water treatment facilities
9) Areas of vegetation (with brief description such as lawn, old field, marsh, wooded, etc.)
10) Areas of exposed and/or erodible soils and gravel lots
11) Impervious surfaces (roofs, asphalt, concrete, etc.)
12) Name and location of receiving waters
13) Areas of known or suspected impacts on surface waters as designated under Par 201 (Environmental Response) of the NREPA.

SEE FIGURE 1 FOR FACILITY SITE MAP

4.0 SIGNIFICANT MATERIALS

Definition: Significant materials are any material which could degrade or impair water quality, including but not limited to:

- ✓ Raw Materials
- ✓ Fuels
- ✓ Solvents
- ✓ Detergents
- ✓ Plastic pellets

- ✓ Finished materials (i.e. metallic products)
- ✓ Hazardous Substances designated under section 101(14) of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), see 40 CFR 372.65
- ✓ Any chemical the facility is required to report pursuant to section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA)
- ✓ Polluting Materials – Oil and any material, in solid or liquid form, identified as polluting material under the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code)
- ✓ Hazardous Wastes as defined in Part 111 of the Michigan Act
- ✓ Fertilizers
- ✓ Pesticides
- ✓ Waste Products (i.e. ashes, slag, sludge, plant waste, animal waste)

During the significant materials identification phase, all sources of potential storm water contamination need to be identified. Both the inside and outside of the facility must be inventoried to determine the materials and practices that may be sources of contamination to storm water runoff. Note the identification phase must address residual contaminants which may be found on items stored outside.

4.1 Inventory of Exposed Significant Materials

The permit requires a general inventory of significant materials that could enter storm water. For each material listed the SWPPP shall include the ways in which each type of material has been or has reasonable potential to become exposed to storm water (e.g. spillage during handling; leaks from pipes, pumps, or vessels; contact with storage piles, contaminated materials or soils; waste handling and disposal; deposits from dust or overspray; etc.). In addition, the SWPPP must identify the inlet(s) spilled significant materials may enter and the discharge point(s) through which the spilled significant material may be discharged.

SEE TABLE 1 FOR SIGNIFICANT MATERIAL INVENTORY

4.2 Description of Industrial Activities & Significant Material Storage Areas

The permit requires industrial facilities to evaluate the reasonable potential for contribution of significant materials to storm water runoff from at least the following areas or activities:

1) Loading, unloading, and other material handling operations
2) Outdoor storage including secondary containment structures
3) Outdoor manufacturing or processing activities
4) Significant dust or particulate generating processes
5) Discharge from vents, stacks, and air emission controls
6) On-site waste disposal practices
7) Maintenance and cleaning of vehicles, machines, and equipment
8) Areas of exposed and/or erodible soils
9) Sites of Environmental Contamination listed under Part 201 (Environmental Response) of the NREPA
10) Areas of significant material residues
11) Areas where animals congregate (wild or domestic) and deposit wastes
12) Other areas where storm water may contact significant materials

For each applicable item, the permit requires a written description of the specific activity or storage area. Along with the written description of the activities or storage areas, a description of the significant materials associated with those items must be included.

SEE TABLE 1 FOR INDUSTRIAL ACTIVITY AND SIGNIFICANT MATERIAL STORAGE AREA DESCRIPTIONS

4.3 List of Significant Spills

The permit requires a list of significant spills and significant leaks of polluting materials that occurred at areas that are exposed to precipitation or that otherwise discharge to a point source at the facility. The listing shall include spills that occurred over the three years prior to the effective date of a certificate of coverage authorizing discharge under the General Permit. The listing shall include the date, volume, exact location of release, and actions taken to clean up the material and/or prevent exposure to storm water runoff or contamination of surface waters of the state. Any release that occurs after the SWPPP has been developed shall be controlled in accordance with the SWPPP and is cause for the SWPPP to be updated as appropriate within 14 calendar days of obtaining knowledge of the spill or loss. If there have been no spills of polluting materials, state that in this section.

Question: Have there been any significant spills or significant leaks of polluting materials in the last 3 years?
☐ Yes ☒ No

4.4 Summary of Sampling Data

The permit requires a summary of existing storm water discharge sampling data (if available) describing pollutants in storm water discharges associated with industrial activity at the facility. The summary shall be accompanied by a description of the suspected sources of the pollutants detected. (If there is no storm water discharge sampling data, state that in this section.)

Question: Is there any storm water discharge sampling data available? ☒ Yes ☐ No

- If the answer to the above question is "Yes" then summarize the information below and maintain the data with the SWPPP file.

Summary of Sampling Information:
Chloride, Sodium, and Potassium levels are slightly elevated due to salting and de-icing of adjacent highway.

4.5 Actions Taken to Investigate Illicit Connections

The permit requires that the SWPPP include a description of the actions taken to identify and eliminate illicit connections to the storm sewer system. All illicit connections to Municipal Separate Storm Sewer Systems (MS4s) or waters of the state should be permanently plugged or re-routed to the sanitary sewer system, in accordance with the authorization from the local Wastewater Treatment Plant. Any discharge from an illicit connection is a violation of the conditions of this permit.

Actions taken to investigate and eliminate any illicit connections to the storm sewer system:

5.0 NON-STRUCTURAL CONTROLS

Non-structural controls are practices that are relatively simple, fairly inexpensive, and applicable to a wide variety of industries or activities. Non-structural controls are intended to reduce the amount of pollution getting into the surface waters of the state and are generally implemented to address the problem at the source. They do not require any structural changes to the facility. These are typically everyday types of activities undertaken by employees at the facility. Many facilities may already have nonstructural controls in place for other reasons. The permit requires that the SWPPP shall, at a minimum, include each of the following non-structural controls:

5.1 Preventative Maintenance Program (Routine Inspection Program)

The permit requires written procedures and a schedule for routine preventive maintenance which includes inspection and maintenance of storm water management and control devices (e.g. cleaning of oil/water separators and catch basins) as well as inspecting and testing plant equipment and systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters. Generally the focus of this permit requirement is on exterior items. A written report of the inspection and corrective actions shall be maintained on file and shall be retained for three years. See the DEQ Industrial Storm Water Certified Operator Training Manual for additional information.

The Routine Inspection Form is in Section 16.0.

If this requirement is addressed in other facility procedures, reference those procedures here:

5.2 Housekeeping Procedures (Routine Inspection Program)

The permit requires that the SWPPP include written procedures and a schedule to implement routine good housekeeping inspections to maintain a clean, orderly facility. Good housekeeping inspections are intended to reduce the potential for significant materials to come in contact with storm water. The routine good housekeeping inspections should be combined with the routine inspection for the preventative maintenance program. Generally the focus of this permit requirement is on exterior areas. A written report of the inspection and corrective actions shall be maintained on file and shall be retained for three years. See the DEQ Industrial Storm Water Certified Operator Training Manual for additional information.

The Routine Inspection Form is in Section 16.0.

If this requirement is addressed in other facility procedures, reference those procedures here:

The table below describes the Routine Inspection Program Procedures:

Routine Inspection Program Procedures Table		
Description of Area or Equipment Inspected	Tasks Performed During Inspection	Frequency of Inspection
Leachate Pumping Stations	***Look for discharge and erosion of soils.***	***Monthly***
Spill Kits	***Ensure they are fully stocked.***	***Monthly***
Detention Basin and Outfall	***Ensure storm water controls are functioning properly, look for sedimentation.***	***Monthly***

5.3 Comprehensive Site Inspection & Visual Assessments of Storm Water Discharges

The permit requires written procedures and a schedule for comprehensive site inspection. The inspections shall include but not be limited to, the areas and equipment identified in the preventive maintenance program and good housekeeping procedures. The inspection shall also include a review of the routine preventive maintenance reports, good housekeeping inspections reports, and any other paperwork associated with the SWPPP. The comprehensive site inspection shall be conducted by the Industrial Storm Water Certified Operator quarterly. At a minimum one inspection shall be performed within each of the following quarters: January – March, April – June, July – September, and October – December.

The permittee may request Department approval of an alternate schedule for comprehensive site inspections. Such a request may be made if the permittee meets the following criteria: the permittee is in full compliance with the permit, the permittee has an acceptable SWPPP, the permittee has installed and/or implemented adequate structural controls at the facility, the permittee has all required inspection reports available at the facility, and the permittee has an Industrial Storm Water Certified Operator at the facility.

A report of the comprehensive site inspection results shall be prepared and retained for three years. The report shall include the following information:

- ✓ Date of the inspection
- ✓ Name(s), title(s), and certification number(s) of the personnel conducting the inspection
- ✓ Precipitation information (i.e. a description of recent rainfall or snow met events)
- ✓ All observations relating to the implementation of control measures
- ✓ Any required revisions to the SWPPP resulting from the inspection
- ✓ A certification stating the facility is in compliance with this permit and the SWPPP, or, if there are instances of noncompliance, they are identified

The Comprehensive Site Inspection Form is in Section 17.0.

Comprehensive site inspection schedule:
Quarterly

Comprehensive site inspection written procedures:
The Industrial Storm Water Certified Operator will perform the comprehensive site inspections. All areas and items identified in Routine Inspection Procedures Table are included in the comprehensive site inspections. In addition, all paper work associated with the routine inspections will be reviewed. The comprehensive site inspection report form will include a compliance certification statement. List any additional details (if necessary) related to the comprehensive site inspection procedures here:

Visual Assessments of Storm Water Discharges
CHECK YOUR GENERAL PERMIT FOR APPLICABILITY

The permit requires written procedures and a schedule for quarterly visual assessments of storm water discharges. The visual assessments shall be conducted by the Industrial Storm Water Certified Operator. At a minimum one visual assessment shall be performed within each of the following quarters: January – March, April – June, July – September, and October – December. If the Department has approved an alternate schedule for the comprehensive site inspection, the visual assessment may likewise be conducted in accordance with the same approved alternate schedule.

Visual assessment training/informational tutorials are available on the DEQ, WRD Industrial Storm Water webpage or by clicking on the following links:

- Part 1: https://www.youtube.com/watch?v=rhXbA1R_VZk&feature=youtu.be
- Part 2: https://www.youtube.com/watch?v=_AdGziksz_g&feature=youtu.be
- Part 3: https://www.youtube.com/watch?v=ZiajZM6Avlg&feature=youtu.be

The Visual Assessment Report Form is in Section 18.0.

Visual Assessment schedule:
Quarterly

SEE SECTION 14.0 FOR THE VISUAL ASSESSMENT PROCEDURES

5.4 Material Handling & Spill Prevention / Clean-Up Procedures

The permit requires a description of material handling procedures and storage requirements for significant materials. Equipment and procedures for cleaning up spills shall be identified in the SWPPP and made available to the appropriate personnel. The procedures shall identify measures to prevent spilled materials or material residues on the outside of the containers from being discharged into storm water.

The SWPPP may include, by reference, requirements of either a Pollution Incident Prevention Plan (PIPP) prepared in accordance with the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code); a Hazardous Waste Contingency Plan (HWCP) prepared in accordance with 40 CFR

264 and 265 Subpart D, as required by Part 111 of the Michigan Act; or a Spill Prevention Control and Countermeasure (SPCC) plan prepared in accordance with 40 CFR 112.

Question: Does the facility have any additional material handling & spill / clean-up procedures on file in addition to the SWPPP? ☒ No ☐ Yes

- If the answer is "No" complete the table below
- If the answer is "Yes" then reference the procedures and where they are located here and complete the table below as necessary:

Spills and leaks together are the largest industrial source of storm water pollution. Thus, this SWPPP specifies material handling procedures and storage requirements for significant materials. Equipment and procedures necessary for cleaning up spills and preventing the spilled materials from being discharged have also been identified. All employees have been made aware of the proper procedures. See the DEQ Industrial Storm Water Certified Operator Training Manual for additional information.

The DEQ, WRD Industrial Storm Water program spill report compliance assistance document should be kept with the SWPPP. Download the document from the DEQ, WRD Industrial Storm Water webpage or by clicking on the following link: http://www.michigan.gov/documents/deq/wrd-isw-permit_info-spill-reporting_398791_7.pdf

If material handling and spill prevention / clean-up procedures are not addressed in other facility documents (referenced above) then the table below needs to be completed:

Material Handling & Spill Prevention / Clean-up Procedures Table		
Potential Spill Area	Material Handling & Storage Procedures	Spill Response Procedures & Equipment
Active face of landfill	***Any spill on the active face of landfill will be collected in Leachate Collection System.***	***Response consists of measures to ensure spills are contained within the solid waste boundary.***

SEE TABLE 2 FOR SPILL KIT INVENTORY

5.5 Soil Erosion & Sedimentation Control Measures

The permit requires the identification of areas which, due to topography, activities, or other factors, have a high potential for significant soil erosion. Areas commonly prone to soil erosion are: gravel lots, bare earth or gravel at material handling areas around storm water inlets, areas with concentrated storm water runoff into streams or ditches, and access roads over open streams or ditches. Control measures must be implemented in areas prone to soil erosion and sedimentation. More information on soil erosion and sedimentation control may be obtained from the DEQ, Water Resources Division District Office.

Question: Is dust suppression material used on site? ☐ Yes ☒ No

- If "Yes" then describe the actions implemented to prevent an unauthorized discharge to the storm sewer system or surface waters of the state:

Question: Are there areas of the site that are prone to soil erosion and/or sedimentation? ☐ Yes ☒ No

- If "Yes" then complete the table below:

Soil Erosion & Sedimentation Control Measures Table	
Areas Prone to Soil Erosion or Sedimentation	Control Measures Implemented
Space to list additional areas of concerns and control measures if necessary:	

5.6 Employee Training Program

The permit requires a description of employee training programs have been implemented to inform appropriate personnel at all levels of responsibility of the components and goals of the SWPPP. Recent modifications to the General Permits have included a requirement for annual employee training. An employee training video is available at the DEQ, WRD, Industrial Storm Water webpage or by clicking on the following link: https://www.youtube.com/watch?v=IGqvsztguRA&feature=youtu.be

Employee training will be a major component in ensuring the success of the facility's SWPPP. The more knowledgeable all employees are about the facility's SWPPP and what is expected of them, the greater the chance that the plan will be effective. The following is a description of the employee training programs to be implemented to inform appropriate personnel at all levels of responsibility of the components and goals of the SWPPP (i.e. good housekeeping practices, spill prevention and response procedures, waste minimization practices, informing customers of facility policies, etc.).

The Employee Training Form is in Section 19.0.

Employee Training Frequency: ***Yearly***

Employee Training Program Description: ***Spill Response Training is provided to all personnel on a yearly basis. The training is in conjunction with Waste Acceptance Training. These records can be found in the Wood Street SWPPP documents.***

5.7 TMDL Requirements

The permit requires that if there is a Total Maximum Daily Load (TMDL) established by the Department for the receiving water, which restricts the discharge of any of the identified significant materials or constituents of those materials, then the SWPPP shall identify the level of control for those materials necessary to comply with the TMDL.

The TMDL means the amount of pollutant load a water body, such as a lake or stream, can assimilate and still meet water quality standards. If a receiving water body does not meet the water quality standards for a specific pollutant, the DEQ will establish the appropriate daily maximum load for that pollutant to allow the water body to again meet water quality standards. If a permitted facility is expected to discharge that specific pollutant in its storm water to that water body, the General Permit requires the facility to list actions it will take to meet that TMDL requirement.

The applicable TMDLs will be identified on the Certificate of Coverage (COC).

See the DEQ, WRD, Industrial Storm Water Webpage for additional TMDL information or click this link for the TMDL compliance assistance document: http://www.michigan.gov/documents/deq/wrd-isw-permit-info-tmdl_398790_7.pdf

Question: Is there a TMDL Requirement listed on the COC? ☐ Yes ☒ No

5.8 List of Significant Materials Still Present

The permit requires the identification of significant materials expected to be present in storm water discharges following implementation of non-structural preventative measures and source controls. Non-structural controls are used to reduce pollutants at the source before they can get into the storm water runoff. In some cases, these types of controls will not be enough. A list of significant materials expected to be present in storm water discharges after implementation of nonstructural controls must be included in the SWPPP. The materials listed below will be addressed through the use of structural controls. (If there will be no significant materials present after the implementation of non-structural controls, state that in this section.)

Significant Material	Location and Control Measure:	Impacted Inlet(s):	Impacted Discharge Point(s):
Gasoline and Diesel Fuel	***Active face of Landfill, the fuels are within the solid waste boundary, so any leaks or spill are collected by the leachate collection system.***	***N/A***	***Openlander Drain***
Leachate	***Within solid waste boundary; leachate collection system.***	***N/A***	***Openlander Drain***
Space available to add addition information if necessary:			

6.0 STRUCTURAL CONTROLS

The permit requires that where implementation of non-structural controls does not control storm water discharges in accordance with water quality standards, the SWPPP shall provide a description of the location, function, and design criteria of structural controls for prevention and treatment.

Structural controls may be necessary:

1) To prevent uncontaminated storm water from contacting or being contacted by significant materials; or
2) If preventive measures are not feasible or are inadequate to keep significant materials at the site from contaminating storm water. Structural controls shall be used to treat, divert, isolate, recycle, reuse, or otherwise manage storm water in a manner that reduces the level of significant materials in the storm water and provides compliance with the Water Quality Standards

Examples of structural controls include the following:

- ✓ Signs and Labels
- ✓ Safety Posts
- ✓ Fences
- ✓ Security Systems
- ✓ Temporary and Permanent Coverings
- ✓ Storm Water Conveyances
- ✓ Diversion Dikes
- ✓ Grading
- ✓ Paving
- ✓ Curbing
- ✓ Drip Pans
- ✓ Secondary Containment
- ✓ Catch Basin Inserts
- ✓ Detention and Retention Ponds
- ✓ Vegetative Filters
- ✓ Oil/Water Separators

These types of controls are physical features that control and prevent storm water pollution. They can range from preventive measures to collection structures to treatment systems. Structural controls will typically require construction of a physical feature or barrier. Below is a description of the structural controls used at the facility. See the DEQ Industrial Storm Water Operator Training Manual for additional details on structural controls.

Question: Are structural control measures used at the facility? ☐ No ☒ Yes

- If answer above is “Yes” then complete the appropriate information in the table below.

Structural Controls Used at the Facility		
Description of structural control(s)	Location of structural control(s)	Significant Materials intended to be managed by the structural control(s)
Fences	***Around perimeter site***	***Security to prevent any illicit discharge***
Storm Water Swales	***Ditches conveying storm water to detention ponds***	***Control storm water to known locations***
Detention Pond	***North end of property***	***Sedimentation of solids in storm water***
Leachate Collection System	***Within solid waste boundary***	***Leachate, fuel stored on active face of landfill.***

7.0 NON-STORM WATER DISCHARGES

The permit requires that all discharge locations be evaluated for the presence of non-storm water discharges. Any unauthorized storm water discharges must be eliminated, or covered under another NPDES permit.

Storm water shall be defined to include all of the following non-storm water discharges provided pollution prevention controls for the non-storm water component are identified in the SWPPP.

Question: Is any of the 10 non-storm water discharges listed below applicable to the facility? ☒ No ☐ Yes

- If the answer is “Yes” then complete the appropriate sections of the table below:

Check the Applicable Non Storm Water Discharges at the Facility:		Pollution Prevention Controls Implemented:	Impacted Inlet(s):	Impacted Discharge Point(s):
☐	1. Discharges from fire hydrant flushing			
☐	2. Potable water sources including water line flushing			
☐	3. Water from fire system testing and fire fighting training without burned materials or chemical fire suppressants			
☐	4. Irrigation drainage			
☐	5. Lawn watering			
☐	6. Routine building wash-down that does not use detergents or other compounds			
☐	7. Pavement wash waters where contamination by toxic or hazardous materials has not occurred (unless all contamination by toxic or hazardous materials has			

	been removed) and where detergents are not used			
☐	8. Uncontaminated condensate from air conditioners, coolers, and other compressors and from the outside storage of refrigerated gases or liquids			
☐	9. Uncontaminated ground water			
☐	10. Foundation or footing drains where flows are not contaminated with process materials such as solvents			

Discharges from fire fighting activities are authorized by the permit, but are exempted from the requirement to be identified in the SWPPP.

8.0 ANNUAL REVIEW

The permit requires that the permittee shall review the SWPPP annually after it is developed and maintain written summaries of the reviews. Based on the review, the permittee shall amend the SWPPP as needed to ensure continued compliance with the terms and conditions of the permit. The annual review is to be retained on site for three years and depending on the general permit is required to be submitted to the DEQ district office on or before January 10th of each year.

The Annual Review Report Form is in Section 20.0.

Specify the month the Annual SWPPP Review will be performed: ***December***

9.0 INDUSTRIAL STORM WATER CERTIFIED OPERATOR UPDATE

The permit requires that if the Industrial Storm Water Certified Operator is changed or an additional Industrial Storm Water Certified Operator is added, the permittee shall provide the name and certification number of the new Industrial Storm Water Certified Operator to the Department. If a facility has multiple Industrial Storm Water Certified Operators, the name and certification number of the Industrial Storm Water Certified Operators shall be included in the SWPPP.

10.0 RECORD KEEPING

The permit requires that the permittee shall maintain records of all SWPPP related inspection and maintenance activities. Records shall also be kept describing incidents such as spills or other discharges that can affect the quality of storm water runoff. All such records shall be retained for three years. The following records are required by the permit:

- ✓ Routine preventive maintenance inspection reports
- ✓ Routine good housekeeping inspection reports
- ✓ Comprehensive site inspection reports
- ✓ Documentation of visual assessments
- ✓ Employee training records
- ✓ Written summaries of the annual SWPPP review
- ✓ Short Term Storm Water Characterization Study data

11.0 SWPPP CERTIFICATION

The permit requires that the SWPPP shall be reviewed and signed by the Certified Storm Water Operator(s) and by either the permittee or an authorized representative in accordance with 40 CFR 122.22. The SWPPP shall be retained on-site at the facility which generates the storm water discharge.

I certify under penalty of law that the storm water drainage system in this SWPPP has been tested or evaluated for the presence of non-storm water discharges either by me, or under my direction and supervision. I certify under penalty of law that this SWPPP has been developed in accordance with the General Permit and with good engineering practices. To the best of my knowledge and belief, the information submitted is true, accurate, and complete. At the time this plan was completed no unauthorized discharges were present. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

Permittee or Authorized Representative

Printed Name & Title: ***Tim Krause, Director of Engineering***

Signature & Date: 5/6/22

Industrial Storm Water Certified Operator

Printed Name & Certification Number: ***Tim Krause, 05879***

Signature & Date: 5/6/22

Space to list additional Industrial Storm Water Certified Operators if Necessary

Printed Name & Certification Number	Signature & Date
Serenity Skillman, 15838	Serenity Skille 5/6/2022

12.0 FIGURE 1 – FACILITY SITE MAP (Use separate sheet if necessary)

13.0 TABLE 1 – SIGNIFICANT MATERIAL INVENTORY AND DESCRIPTION OF INDUSTRIAL ACTIVITY OR SIGNIFICANT MATERIAL STORAGE AREAS

Instructions - Fill out the applicable areas or activities in the corresponding sections. Add more lines as needed. Once you have described the area or activity, list the significant materials that are associated with the areas or activities, the exposure methods, and evaluate the level of exposure. Once that is completed indicate the inlet(s) and discharge point(s) that would be impacted if significant materials were discharged from the areas or activities described.

Section Listed in General Permit	Storage Areas / Activity Areas	Significant Materials	Exposure Method	Reasonable Potential Evaluation (high,medium,low)	Inlet(s)	Discharge Point(s)
1) Loading, unloading, and other material handling operations	***Refueling is done within the solid waste boundary.***	***Gasoline and Diesel Fuel***	***Leaks and spills when refueling***	***Low – all refueling done in SWB.***	***N/A***	***Open-lander Drain***
2) Outdoor storage including secondary containment structures	***All outdoor storage is within solid waste boundary.***	***Gasoline and Diesel Fuel***	***Leaking of containment structures***	***Low – storage within SWB.***	***N/A***	***Open-lander Drain***
3) Outdoor manufacturing or processing activities	***None***					
4) Significant dust or particulate generating processes	***Onsite Road Traffic***	***Dust particles***	***Inhalation or settling***	***Low***	***N/A***	***Open-lander Drain***
5) Discharge from vents, stacks, and air emission controls	***None***					
6) On-site waste disposal practices	***Working face of landfill***	***Waste consisting of asbestos, construction and demolition and non-household wastes.***	***Asbestos is disposed of in a pit, C&D is unloaded on working face.***	***Low – Liquids collected in Leachate System***	***N/A***	***Open-lander Drain***

13.0 TABLE 1 CONTINUED

Section Listed in General Permit	Storage Areas / Activity Areas	Significant Materials	Exposure Method	Reasonable Potential Evaluation (high,medium,low)	Inlet(s)	Discharge Point(s)
7) Maintenance and cleaning of vehicles, machines and equipment	***None – maintenance performed off-site***					
8) Areas of exposed and/or erodible soils	***Active face of landfill***	***Construction and demolition wastes and soils.***	***Soils on working face of landfill.***	***Low – Soils are within Leachate System***	***N/A***	***Open-lander Drain***
9) Sites of Environmental Contamination listed under Part 201	***None***					
10) Areas of significant material residues	***None***					
11) Areas where animals congregate (wild or domestic) and deposit wastes	***None***					
12) Other areas where storm water may contact significant materials	***None***					

14.0 VISUAL ASSESSMENT PROCEDURES

1. List the discharge point(s) (as indicated on the SWPPP map):
   Openlander Drain – The visual assessment will be completed within one month of the comprehensive site inspection.

   a) Is there substantially identical discharge points? ☐ Yes ☒ No
   If "Yes" then complete a) and b) below, if "No" go to Number 2.

   b) Describe the justification for the substantially identical discharge points determination?

   c) List the schedule for alternating the substantially identical discharge points:

2. Describe the monitoring (sampling) location for each discharge point:
   The outfall of the detention basin is right before the water flows under the highway.

3. List the Qualified Personnel that will collect the water sample:
   Steve Blayer

4. Training for the Qualified Personnel includes viewing the Visual Assessment Webinar and/or the 3 Visual Assessment Tutorials on the DEQ, WRD Industrial Storm Water webpage. Check the appropriate box below:

   ☒ Yes

   ☐ No, however a copy of the training materials used are included with this procedure.

5. List the sampling equipment used for the collecting the water sample(s):
   Sample jar

6. Complete a) through c) below to describe the storm event information.

   a) Describe how qualifying storm events are determined (including nature of the event):
   A qualifying storm event or snow melt is during working hours (Monday – Friday 7:00 am – 4:00pm) and is 72 hours from last rain event.

   b) Describe how each discharge point was evaluated to determine when a discharge would begin:
   Visual observation within 30 minutes of rainfall.

   c) Describe what would constitute an adverse weather condition that would prevent sample collection:
   Lightning, tornado watch, high winds, unsafe road conditions.

7. Describe how the samples will be collected (Determine the timing sequence for water sample collection from the discharge points): **Within 30 minutes of rainfall a sample is collected.**

8. Describe the water sampling instructions that the Qualified Personnel will follow: **Sample jar will be used to take sample. Top lid is labeled with marker. Label includes location, date, and time.**

9. Described how observations made by the Qualified Personnel will be documented during the discharge (include nature of the event): **Documentation is provided is Visual Assessment form.**

10. Describe the sample storage procedures if applicable: **The sample will be assessed in the office within one hour after collection, so no special storage is required.**

11. Describe the procedures the Industrial Storm Water Certified Operator will follow to perform the visual assessment(s) of the water sample(s): **After recording the sample event observations, the quart jar is gently swirled, and the jar is placed in front of a white background and photographed with the operator's camera. The sample is then observed, and the characteristics are recorded on the report form provided on the storm water website. Samples will be assessed in the office within one hour.**

12. List the name(s) of the Industrial Storm Water Certified Operator that will be performing the water sample visual assessment(s): **Serenity Skillman or Tim Krause**

13. The DEQ, WRD Visual Assessment Report form should be used to document each water sample visual assessment. Check the appropriate box below:

    ☒ Yes, the DEQ, WRD Visual Assessment Report form is used.

    ☐ No, the DEQ, WRD Visual Assessment Report form is not used however the form being used to meet this requirement is included with this procedure.

14. Colored Photos shall be used to record the visual assessment(s). If other methods of recording observations will be used describe those methods: **Electronic storage.**

15. All visual assessment documentation should be kept with the SWPPP file. If documentation will be kept at an alternate location state that location:

16. Describe the follow-up actions that will be taken if unusual characteristics are observed during the visual assessment(s): **Re-sample that quarter. Analytical testing may be required,**

15.0 TABLE 2 – SPILL KIT INVENTORY

List the spill response equipment that will be maintained in each location or locker (refer to MSDSs to determine recommended clean-up methods and supplies):

Person responsible for maintaining this inventory: ***Steve Blayer and Mike Marilla***

Locker number or location	Absorbents (pads, booms, kitty litter, etc.)	Tools (shovels, brooms, squeegees, etc.)	Personal Protective Equipment (rubber gloves, boots, masks, etc.)	Other Supplies (warning tape, labels, markers, MSDSs, etc.)

Label each spill kit with the words “SPILL KIT” and the necessary emergency telephone number(s) or pager number(s) of persons to be contacted in case of a spill or leak that is beyond the training and equipment available on or near each spill locker:

Facility Responsible Person/Phone Number: ***Steve Blayer/517-614-3655***
Spill Response Contractor (if any)/Phone Number:
DEQ District Office Phone Number: ***Danielle McLain, 517-899-7034***
DEQ 24-Hour Emergency Spill Reporting Hot-Line: ***1-800-292-4706 (PEAS Number)***

Stencil the following warning on each spill kit:

“WARNING: NEVER HOSE DOWN A SPILL!
CLEAN IT UP PROMPTLY AND DISPOSE OF THE WASTE PROPERLY.”

16.0 ROUTINE INSPECTION FORM

Date:	Time:

Inspector Information	
Print Name:	Signature:

Areas Inspected	Observation	Corrective Actions Taken
Spill kits		
Leachate pump station		
Detention Basin		
Outfall		

17.0 COMPREHENSIVE SITE INSPECTION FORM

Date:	Time:

Certified Operator Information	
Print Name:	Signature:

Precipitation Information

Check the most appropriate box that represents the weather condition during the inspection:
☐ Dry ☐ Rain ☐ Snow ☐ Other, explain:

Compliance Certification Statement

Based on the results of this inspection the facility is in compliance with the general permit and the SWPPP:
☐ Yes ☐ No, explain:

Areas Inspected	Observation	Corrective Actions Taken
Routine Inspection Paperwork		
Outdoor oil storage		
Soils on working face		
Detention Basin		
Outfall		

18.0 VISUAL ASSESSMENT REPORT FORM

Visual Assessment Sample Information	
Facility Name:	COC No. or NPDES Permit No:
Industrial Storm Water Certified Operator Name:	
Name / Title of person collecting sample if other than Cert. Operator:	
Date of Comprehensive Inspection:	Is this a substitute sample? ☐ No ☐ Yes Explain:
Discharge Point # / Name:	Substantially Identical Discharge Point? ☐ No ☐ Yes List:
Description of sample collection location:	

Date / Time Discharge Began:	Date / Time Sample Collected:	Date / Time Sample Examined:
For rain events - if sample was collected > 30 minutes from start of discharge, provide explanation:		
Snowmelt ☐	Rainfall ☐ Inches:	If rain event - previous storm ended > 72 hours prior to start of this event? ☐ No ☐ Yes

Observations	
Color: ☐ None ☐ Yes (describe):	Floating Solids: ☐ No ☐ Yes (describe):
Oil Films / Sheens: ☐ None ☐ Flecks ☐ Globs ☐ Sheen ☐ Other Describe appearance of film/sheen:	
Foam (gently shake sample): ☐ No ☐ Yes	Suspended Solids: ☐ No ☐ Yes (describe):
Settleable Solids: ☐ No ☐ Yes (describe):	
Odor: ☐ None ☐ Musty ☐ Sewage ☐ Sulfur ☐ Sour ☐ Hydrocarbons ☐ Chemical ☐ Other (describe):	
Turbidity/Clarity: ☐ Clear ☐ Slightly Cloudy ☐ Cloudy ☐ Milky ☐ Other (describe):	
Picture of sample taken (required): ☐ No ☐ Yes Storage location:	
Receiving waters observed? ☐ N/A ☐ No ☐ Yes (describe):	

Follow-up:
Based on the visual observation, are there unnatural characteristics in the discharge (cloudiness, color, sheen, etc.)? ☐ No ☐ Yes
Potential sources of observed unnatural characteristics ☐ N/A or describe:
Implemented / recommended corrective action(s) ☐ N/A or describe: Scheduled date for correction:

I certify that the above information is correct	
Certified Operator Signature	Date

RETAIN THIS FORM FOR A MINIMUM OF 3 YEARS

19.0 EMPLOYEE TRAINING FORM

Date of Session:

Trainer Information	
Print:	Signature:

Training Session Information
Topics Covered:

Attendee Name	Attendee Signature

20.0 ANNUAL SWPPP REVIEW REPORT FORM

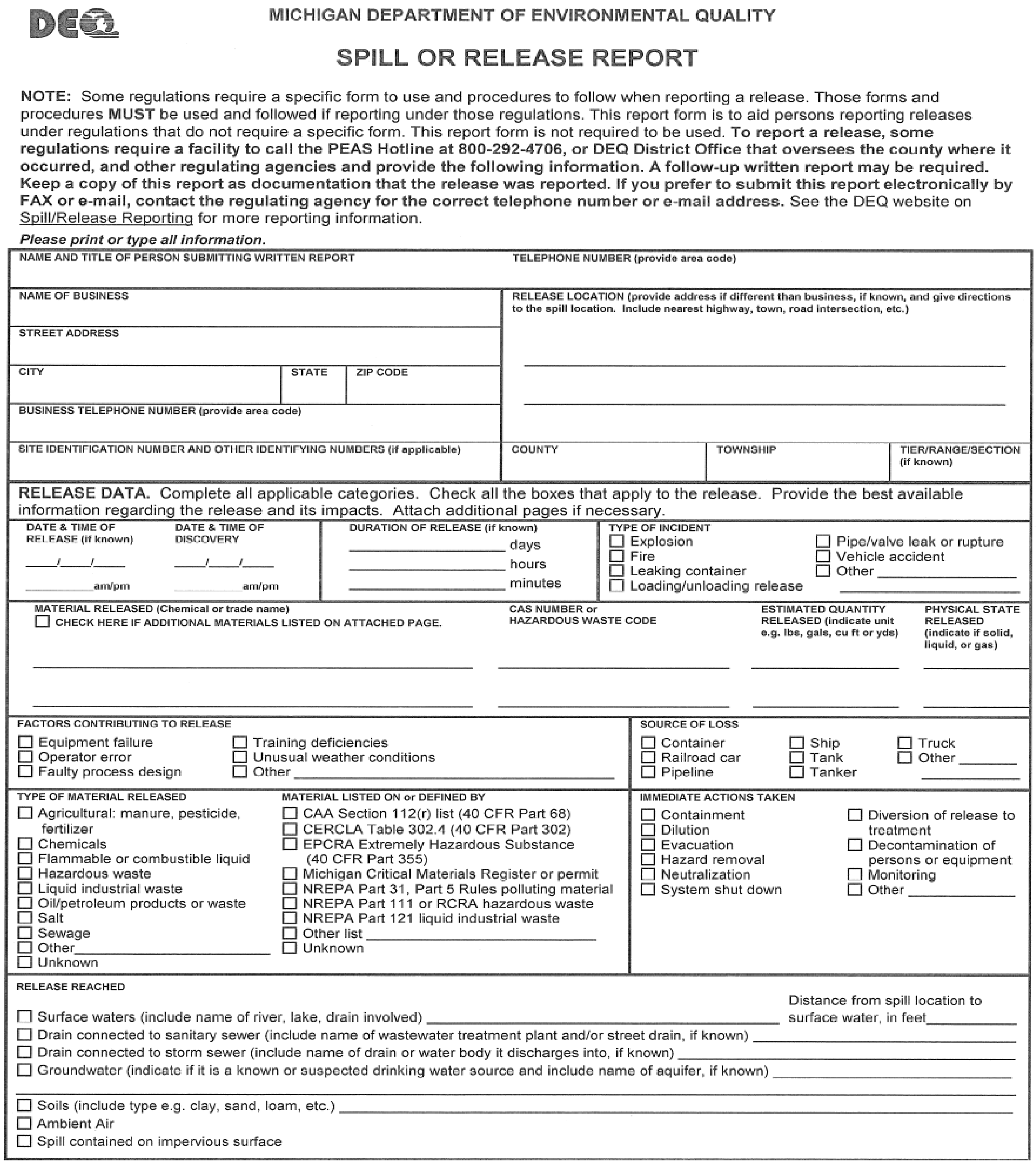
Facility Information	
Designated Name:	Certificate of Coverage No. <u>or</u> Individual Permit No.:
Facility Address:	County:
Facility Contact Information	
Name:	Telephone No.:
Email Address:	Certification No.:
Backup Facility Contact Information	
Name:	Telephone No.:
Email Address:	Certification No.:
Industrial Storm Water Certified Operator Information	
Name:	Telephone No.:
Email Address:	Certification No.:
Space to list additional operators if applicable:	

The SWPPP Checklist on the DEQ, WRD Industrial Storm Water webpage should be used to review the facility's SWPPP and <u>before</u> the following 10 questions are completed.			
1. Facility general information is current and accurate	Yes ☐	No ☐	
2. Site map is current and accurate	Yes ☐	No ☐	
3. Significant material inventory is current and accurate	Yes ☐	No ☐	
4. New exposures, processes and related controls have been documented appropriately in the SWPPP	Yes ☐	No ☐	NA ☐
5. Spills have been recorded and reported as appropriate	Yes ☐	No ☐	NA ☐
6. Employee SWPPP training was conducted and documented	Yes ☐	No ☐	
7. Records of routine preventative maintenance and housekeeping inspections are available in the SWPPP file	Yes ☐	No ☐	
8. Comprehensive site inspections have been completed, certified and filed in the SWPPP file	Yes ☐	No ☐	
9. Visual Assessments have been completed and the reports have been filed in the SWPPP file	Yes ☐	No ☐	NA ☐
10. Corrective actions noted in the inspection reports have been completed	Yes ☐	No ☐	
11. The SWPPP is compliant with the permit and has been reviewed and signed by the Certified Storm Water Operator and the permittee or designated representative	Yes ☐	No ☐	
Additional Comments:			

I certify that the above information is correct:	
Name:	Signature / Date:

SUBMIT THIS FORM TO THE DEQ, WRD DISTRICT OFFICE IDENTIFIED ON YOUR CERTIFICATE OF COVERAGE ON OR BEFORE **<u>JANUARY 10TH</u>** OF EACH YEAR

21.0 DEQ SPILL OR RELEASE REPORT



MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

SPILL OR RELEASE REPORT

NOTE: Some regulations require a specific form to use and procedures to follow when reporting a release. Those forms and procedures **MUST** be used and followed if reporting under those regulations. This report form is to aid persons reporting releases under regulations that do not require a specific form. This report form is not required to be used. **To report a release, some regulations require a facility to call the PEAS Hotline at 800-292-4706, or DEQ District Office that oversees the county where it occurred, and other regulating agencies and provide the following information. A follow-up written report may be required. Keep a copy of this report as documentation that the release was reported. If you prefer to submit this report electronically by FAX or e-mail, contact the regulating agency for the correct telephone number or e-mail address.** See the DEQ website on Spill/Release Reporting for more reporting information.

Please print or type all information.

NAME AND TITLE OF PERSON SUBMITTING WRITTEN REPORT

TELEPHONE NUMBER (provide area code)

NAME OF BUSINESS

STREET ADDRESS

CITY

STATE

ZIP CODE

BUSINESS TELEPHONE NUMBER (provide area code)

RELEASE LOCATION (provide address if different than business, if known, and give directions to the spill location. Include nearest highway, town, road intersection, etc.)

SITE IDENTIFICATION NUMBER AND OTHER IDENTIFYING NUMBERS (if applicable)

COUNTY

TOWNSHIP

TIER/RANGE/SECTION (if known)

RELEASE DATA. Complete all applicable categories. Check all the boxes that apply to the release. Provide the best available information regarding the release and its impacts. Attach additional pages if necessary.

DATE & TIME OF RELEASE (if known)
____/____/____
__________am/pm

DATE & TIME OF DISCOVERY
____/____/____
__________am/pm

DURATION OF RELEASE (if known)
__________________ days
__________________ hours
__________________ minutes

TYPE OF INCIDENT
- ☐ Explosion
- ☐ Fire
- ☐ Leaking container
- ☐ Loading/unloading release
- ☐ Pipe/valve leak or rupture
- ☐ Vehicle accident
- ☐ Other ______________

MATERIAL RELEASED (Chemical or trade name)
☐ CHECK HERE IF ADDITIONAL MATERIALS LISTED ON ATTACHED PAGE.

CAS NUMBER or HAZARDOUS WASTE CODE

ESTIMATED QUANTITY RELEASED (indicate unit e.g. lbs, gals, cu ft or yds)

PHYSICAL STATE RELEASED (indicate if solid, liquid, or gas)

FACTORS CONTRIBUTING TO RELEASE
- ☐ Equipment failure
- ☐ Operator error
- ☐ Faulty process design
- ☐ Training deficiencies
- ☐ Unusual weather conditions
- ☐ Other ______________________________

SOURCE OF LOSS
- ☐ Container
- ☐ Railroad car
- ☐ Pipeline
- ☐ Ship
- ☐ Tank
- ☐ Tanker
- ☐ Truck
- ☐ Other __________

TYPE OF MATERIAL RELEASED
- ☐ Agricultural: manure, pesticide, fertilizer
- ☐ Chemicals
- ☐ Flammable or combustible liquid
- ☐ Hazardous waste
- ☐ Liquid industrial waste
- ☐ Oil/petroleum products or waste
- ☐ Salt
- ☐ Sewage
- ☐ Other______________________
- ☐ Unknown

MATERIAL LISTED ON or DEFINED BY
- ☐ CAA Section 112(r) list (40 CFR Part 68)
- ☐ CERCLA Table 302.4 (40 CFR Part 302)
- ☐ EPCRA Extremely Hazardous Substance (40 CFR Part 355)
- ☐ Michigan Critical Materials Register or permit
- ☐ NREPA Part 31, Part 5 Rules polluting material
- ☐ NREPA Part 111 or RCRA hazardous waste
- ☐ NREPA Part 121 liquid industrial waste
- ☐ Other list ______________________
- ☐ Unknown

IMMEDIATE ACTIONS TAKEN
- ☐ Containment
- ☐ Dilution
- ☐ Evacuation
- ☐ Hazard removal
- ☐ Neutralization
- ☐ System shut down
- ☐ Diversion of release to treatment
- ☐ Decontamination of persons or equipment
- ☐ Monitoring
- ☐ Other ____________

RELEASE REACHED
- ☐ Surface waters (include name of river, lake, drain involved) ______________________ Distance from spill location to surface water, in feet__________
- ☐ Drain connected to sanitary sewer (include name of wastewater treatment plant and/or street drain, if known) ______________________
- ☐ Drain connected to storm sewer (include name of drain or water body it discharges into, if known) ______________________
- ☐ Groundwater (indicate if it is a known or suspected drinking water source and include name of aquifer, if known) ______________________
- ☐ Soils (include type e.g. clay, sand, loam, etc.) ______________________
- ☐ Ambient Air
- ☐ Spill contained on impervious surface

EXTENT OF INJURIES, IF ANY

____

____

WAS ANYONE HOSPITALIZED?

☐ Yes NUMBER HOSPITALIZED:____

☐ No

TOTAL NUMBER OF INJURIES TREATED ON-SITE:

____

DESCRIBE THE INCIDENT, THE TYPE OF EQUIPMENT INVOLVED IN THE RELEASE, HOW THE VOLUME OF LOSS WAS DETERMINED, ALONG WITH ANY RESULTING ENVIRONMENTAL DAMAGE CAUSED BY THE RELEASE. IDENTIFY WHO IMMEDIATELY RESPONDED TO THE INCIDENT (own employees or contractor — include cleanup company name, contact person, and telephone number). ALSO IDENTIFY WHO DID FURTHER CLEANUP ACTIVITIES, IF PERFORMED OR KNOWN WHEN REPORT SUBMITTED

☐ CHECK HERE IF DESCRIPTION OR ADDITIONAL COMMENTS ARE INCLUDED ON ATTACHED PAGE

____

____

____

____

____

ESTIMATED QUANTITY OF ANY RECOVERED MATERIALS AND A DESCRIPTION OF HOW THOSE MATERIALS WERE MANAGED (include disposal method if applicable)

☐ CHECK HERE IF DESCRIPTION OR ADDITIONAL COMMENTS ARE INCLUDED ON ATTACHED PAGE

____

____

ASSESSMENT OF ACTUAL OR POTENTIAL HAZARDS TO HUMAN HEALTH (include known acute or immediate and chronic or delayed effects, and where appropriate, advice regarding medical attention necessary for exposed individuals.)

☐ CHECK HERE IF DESCRIPTION OR ADDITIONAL COMMENTS ARE INCLUDED ON ATTACHED PAGE

____

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY NOTIFIED:

INITIAL CONTACT BY: ☐ Telephone ☐ Fax ☐ Email ☐ Other

DATE/TIME INITIAL CONTACT:_______________

☐ PEAS: 800-292-4706 Log Number Assigned _______________

☐ DEQ District or Field Office

- ☐ Baraga
- ☐ Bay City
- ☐ Cadillac
- ☐ Crystal Falls
- ☐ Detroit
- ☐ Gaylord
- ☐ Grand Rapids
- ☐ Gwinn
- ☐ Jackson
- ☐ Kalamazoo
- ☐ Lansing
- ☐ Newberry
- ☐ Warren
- ☐ Wyoming

DEQ Office locations are subject to change

Divisions or Offices Contacted:

- ☐ Air Quality
- ☐ Land & Water Management
- ☐ Office Geological Survey
- ☐ Remediation and Redevelopment
- ☐ Waste and Hazardous Materials
- ☐ Water Bureau

NAME AND TITLE OF PERSON MAKING INITIAL REPORT:

____

DEQ STAFF CONTACTED & PHONE NUMBER:

____

____

OTHER ENTITIES NOTIFIED:

	Date:	Time:
☐ National Response Center (NRC): 800-424-8802	________	_____
☐ US Coast Guard Office: ☐ Detroit ☐ Grand Haven ☐ Sault Ste. Marie	________	_____
☐ US Department of Transportation	________	_____
☐ US Environmental Protection Agency	________	_____
☐ 911 (or primary public safety answering point)	________	_____
☐ Local Fire Department	________	_____
☐ Local Police and/or State Police	________	_____
☐ Local Emergency Planning Committee	________	_____
☐ State Emergency Response Commission via MI SARA Title III Program	________	_____
☐ Wastewater Treatment Plant Authority	________	_____
☐ Hazmat Team	________	_____
☐ Local Health Department	________	_____
☐ Department of Labor & Economic Growth MIOSHA	________	_____
☐ Department of Labor & Economic Growth Fire Safety	________	_____
☐ Michigan Department of Agriculture: 800-405-0101		
☐ Other _______________		

PERSON CONTACTED & PHONE NUMBER:

____

____

DATE WRITTEN REPORT SUBMITTED

SIGNATURE OF PERSON SUBMITTING WRITTEN REPORT