NORTH CAMU ENGINEERING REPORT

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Exide Technologies Frisco Recycling Center

RCRA Permit Renewal Application

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5/3/19

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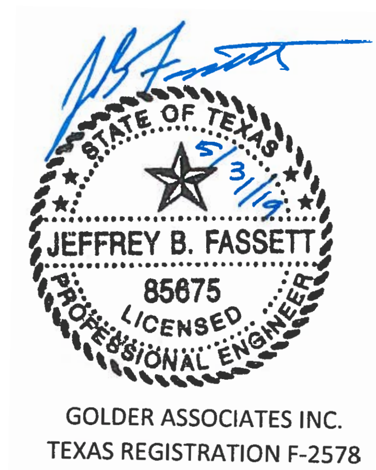
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1.0 INTRODUCTION AND GENERAL ENGINEERING REPORT REQUIREMENTS (SECTION V)

This Engineering Report describes the design, construction and operation of the class 2 landfill corrective action management unit (referred to herein as the North CAMU) located within the former operating plant (FOP) area of the Exide Technologies (Exide) Frisco Recycling Center. This North CAMU Engineering Report was developed in accordance with the requirements described in Section V of the Resource Conservation and Recovery Act (RCRA) Part B permit renewal application and includes information required in the Engineering Report as listed in other sections of the permit renewal application.

Initial notification for construction of an onsite class 2 industrial landfill to ultimately include 15 cells, including engineering plans and a landfill operations plan, was provided to the Texas Natural Resource Conservation Commission (TNRCC) by GNB Technologies, Inc., in August 1995 (the 1995 Notification). The 1995 notification also included a Closure and Post-Closure Plan. TNRCC acknowledgement of receipt and review of the notification was provided in a September 14, 1995, letter. Construction of the landfill commenced thereafter and Exide's records indicate that the landfill operations began in 1996.

In 1997, prior to the construction of cells 4, 5, and 6, the liner system was revised; specifically, the thickness of the clay liner component of the composite liner system was revised from 3 feet to 2.5 feet. The TNRCC acknowledged receipt of this notification of revision on January 28, 1998.

The landfill received treated slag generated at the FOP. The class 2 landfill was designated as a CAMU in 2015 per Agreed Order No. 2013-2207-IHW-E dated April 24, 2015 (the Agreed Order). In accordance with 40 Code of Federal Regulations (CFR) 264.552(b), the designation of the class 2 landfill as a CAMU will enhance the implementation of effective, protective, and reliable remedial actions for the facility.

The North corrective action management unit (CAMU) is regulated under 40 CFR Part 264, Subpart S. It is not a miscellaneous unit but is referenced as miscellaneous unit for purposes of the template for the Part B permit renewal application supplemental filing for the FOP. Although the North CAMU is regulated under Resource Conservation and Recovery Act (RCRA) Subpart S and being added as a miscellaneous unit in the template, because many of the design requirements listed in Section V.G (Landfills) of the Part B permit renewal application are applicable to the North CAMU, the Section V.G requirements have also been addressed in this Engineering Report, where appropriate.

The sections below are identified according to the corresponding instructions in the Part B permit renewal application and references to applicable sections of 40 CFR 264.552 have also been added where appropriate.

2.0 GENERAL ENGINEERING REPORTS REQUIREMENTS (SECTION V.A)

2.1 General Information (Section V.A.1)

Current and past waste management units used at the Site are summarized in Table V.A. The major routes of travel in the vicinity of the FOP are identified on Figure V.A-1. An overall plan view of the entire facility is attached as Figure V.A-2. A map showing the information specified in Rule 40 of the CFR 270.14(b)(19), 270.14(c)(3), and 270.14(d)(1)(i) is attached as Figure V.A-3 (the wind rose is shown on Figure V.A-4). Access roads are shown on Figure V.G-1 and are either gravel or partially concrete. Waste hauling vehicles use a concrete paved road to access the North CAMU area; once in the landfill area, vehicles use an access road located on the west side of the landfill as directed by the construction manager.

2.2 Features to Mitigate Unsuitable Site Characteristics (Section V.A.2)

This section describes the North CAMU's design specifications and/or operating procedures which preclude migration of contaminants to groundwater or surface water given the unsuitable site characteristics identified in Section II.A and II.F of the Part B permit renewal application supplemental filing for the FOP. The unsuitable site characteristics are each addressed separately below.

Section II.A.4: The Site is located in an area overlying a regional aquifer.

According to the Texas Water Development Board's (TWDB's) maps of Major Aquifers and Minor Aquifers, the facility is located in an area overlying the following aquifers:

- Trinity Aquifer (subcrop), which TWDB considers a major aquifer
  - According to Phillip L. Nordstrom's 1982 report, "Occurrence, Availability, and Chemical Quality of Groundwater in the Cretaceous Aquifers of North-Central Texas," the Trinity Aquifer includes the Antlers, Twin Mountains, and Paluxy Formations. Geological cross-sections included with that report indicate that the Twin Mountains Formation is located between approximately 1,400 and 2,000 feet below mean sea level (msl) in the vicinity of the FOP, and the Paluxy Formation is located between approximately 750 and 1,000 feet below msl beneath the FOP. (The Antlers Formation begins approximately 24 miles to the east of the Site.)
- Woodbine Aquifer, which TWDB considers a minor aquifer
  - According to Nordstrom (1982), the Woodbine Aquifer is located between approximately 200 feet below msl and 100 feet above msl beneath the facility. For reference, according to the specifications included with the 1995 Notification, the lowest portion of the North CAMU's compacted clay layer is at an elevation of approximately 635 feet above msl.

Nordstrom (1982) indicates that both the Trinity Aquifer and the Woodbine Aquifer are separated from the land surface by the Eagle Ford Shale, which extends to approximately 500 feet below ground surface (or approximately 200 feet above msl) in the vicinity of the facility. According to the United States Geological Survey's report "Basic Ground-Water Hydrology," revised in 2004, the hydraulic conductivity of shale ranges from 10^{-8} meters per day (m/d) (10^{-11} centimeters per second [cm/s]) to 10^{-4} m/d (10^{-7} cm/s). Given the thickness and low hydraulic conductivity of the Eagle Ford Shale, the possibility of contaminant migration from the North CAMU to the Trinity Aquifer or Woodbine Aquifers is highly unlikely.

Section II.A.5: The Site is located in an area where soil unit(s) are within five feet of the containment structure, or treatment zone, as applicable, that have a Unified Soil Classification of GW, GP, GM, GC, SW, SP, or SM, or a hydraulic conductivity greater than 10^{-5} centimeters per second (cm/sec).

As described in the Geology Report included with the Part B permit renewal application, the geology encountered at the Site generally consists of approximately 10 to 30 feet of moist to wet, clay-rich, colluvial soils. The colluvial soils at the Site typically consist of clay or silty clay with minor occurrences of gravelly clay (gravel suspended in a clay matrix), sand, and clayey gravel lenses. As shown on the boring logs and cross sections included with the Geology Report, these lenses are not sufficiently thick and/or laterally continuous to provide significant pathways for waste migration.

Section II.F: Portions of the Site are located within a 100-year flood plain.

The North CAMU portion of the Site is located north of (i.e., not within) the 1% and 0.2% chance (annual) flood plains (see figures included with Section II.F of the Part B permit application). Therefore, flood protection devices for the North CAMU are not addressed in this Engineering Report.

2.3 Construction Schedules (Section V.A.3)

As indicated in the Agreed Order, the North CAMU's liner, leachate collection system (LCS), and cap meet the criteria for designation as a North CAMU. No compliance schedule is necessary because the design standards for the North CAMU are already satisfied.

2.4 Plans and Specifications (Section V.A.4)

The plans and specifications for the bottom liner, the North CAMU's two LCS's, and the final cover are summarized in Section 4 below as required in Section V.K of the permit renewal application; figures and calculations have been attached as necessary. The plans and specifications summarized in Section 4.0 are based on the original designs described in the following reports:

- The 1995 Notification, which is included as Attachment A
- The 1997 Notification of revision to the clay liner
- The technical memorandum describing the leachate collection system for cells 13, 14, and 15 prepared by Golder Associates Inc. (Golder), which is included as Attachment B
- The Closure Plan, which is included as Attachment C to the Part B permit renewal application supplemental filing for the FOP

3.0 MISCELLANEOUS UNITS (SECTION V.K)

3.1 Table V.K (Section V.K.1)

Table V.K as shown on the RCRA Part B permit renewal application is attached as Table V.K.1 (as applicable to the North CAMU).

3.2 Relationship Between the Miscellaneous Unit and the Environment (Section V.K.2)

As described above, the North CAMU is being added to the Part B Permit as a miscellaneous unit for purposes of the template. Although the North CAMU is regulated under RCRA Subpart S and is being added as a miscellaneous unit for the template, because many of the design requirements listed in Section V.G (Landfills) of the permit renewal application are applicable to the North CAMU, the Section V.G requirements have also been addressed in this Engineering Report, where appropriate.

3.3 Requirements for a Unit that Involves Combustion (Section V.K.3)

This section is not applicable for the North CAMU.

4.0 LANDFILLS (SECTION V.G)

4.1 List of Landfills (Section V.G.1)

This section is not applicable for the North CAMU. However, the information that would be included in Table V.G.1 is included in this Engineering Report.

4.2 Ignitable or Reactive Waste (Section V.G.2)

This section is not applicable for the North CAMU. The North CAMU does not and will not manage ignitable or reactive waste.

4.3 Incompatible Waste (Section V.G.3)

This section is not applicable for the North CAMU. The North CAMU does not and will not manage incompatible waste as defined in TCEQ Technical Guideline No. 9 revised on October 21, 2014.

4.4 Hazardous Wastes from Non-Specific Sources (V.G.4)

This section is not applicable for the North CAMU. The North CAMU does not and will not manage waste with United States Environmental Protection Agency (EPA) codes F020, F021, F022, F023, F026, or F027.

4.5 North CAMU Description (Section V.G.5)

The North CAMU is located within the boundaries of the closed Exide Technologies Frisco Recycling Center in Frisco, Collin County, Texas.

The North CAMU currently consists of fifteen cells, nine of which (Cells 1 through 9) have been closed and capped. The closed cells of the North CAMU consist of treated slag monofills. The cells 10 through 12 of the North CAMU currently contain treated slag, but they, along with the new cells 13 through 15 also contain Class 2 wastes, including metals-impacted soils from an adjacent, undeveloped site currently owned by Exide and called the Undeveloped Buffer Property or J-Parcel.

The North CAMU has an area of approximately 8.25 acres and a capacity of approximately 190,000 cubic yards. It is constructed both below and above grade. It is surrounded by a perimeter containment dike. A plan view of the North CAMU is shown on Figure V.G-1. Two cross-sections of the North CAMU are shown on Figure V.G-2.

4.6 Containment System (Section V.G.6)

The minimum design requirements for CAMUs are stated in 40 CFR 264.552 and are described in the Agreed Order. The requirements of Section V.G.6 that are applicable to the North CAMU are described below.

4.6.1 Landfill Liner System

The North CAMU base liner system provides control layers and containment barriers that are designed and constructed to contain leachate and protect groundwater from potential impacts associated with the landfill contents. Infiltration to groundwater is limited by naturally-occurring clay beneath the North CAMU and 2.5 to 3.0 feet of compacted clay with a permeability of less than 1 x 10^{-7} cm/sec. This clay is overlain by a 60-mil high density polyethylene (HDPE) flexible membrane liner (FML), a drainage geocomposite LCS, and two feet of protective soil. The specifications for the bottom liner are included in Table V.G.3. The landfill liner system meets the requirements of 40 CFR 264.552(e)(3)(i).

4.6.2 Design, Installation, Construction, and Operation of the Liner and Leachate Collection System

The liner and leachate collection systems for the existing cells consist of a compacted clay liner, a 60-mil HDPE geomembrane liner, a geosynthetic drainage layer, and 2 feet of protective cover soil. As mentioned previously, the thickness of the clay liner was revised from 3 feet in cells 1, 2, and 3 to 2.5 feet for all subsequent cells.

With the exception of several items listed in the table below, the composite liner system for the expansion cells 13 through 15 was installed and all construction executed in accordance with the Soils and Liner Quality Control Plan (SLQCP). The SLQCP is included in Appendix 6-B to the 1995 Notification (Attachment A). Field sampling and testing was performed by a qualified professional experienced in geotechnical engineering and/or engineering geology or a qualified engineering technician under his/her direct supervision.

Revisions to SLQCP

Item	Description
Clay liner thickness	Revised from 3 feet thick to 2.5 feet thick.
FML Tensile Properties	Section 5.2 of the SLQCP provides tensile properties (yield & break strength, elongation at yield & break) appropriate for smooth FML only. The tensile properties for textured FML will meet the requirements provided in GM13[1].
FML Test Parameters	Several tests listed in Section 5.2 of the SLQCP are outdated and no longer performed by FML manufacturers. Only the test methods listed in GM13 will be required.

4.6.2.1 Compatibility Demonstration

The compatibility of the liner system is discussed in Section 4.6.3.

GRI Test Method GM13, "Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes", Rev. 10, Geosynthetics Institute, 2011[1]

4.6.2.2 Foundation Design

The foundation of the North CAMU is 2.5 to 3 feet of compacted clay overlying naturally occurring clay; the FML is installed directly on top of the compacted clay layer. The information below is compiled from Appendix 6-A (Geotechnical Report) and Appendix 6-B (Soils and Liner Quality Control Plan, or SLQCP) of the 1995 Notification.

- Settlement potential
  - Settlement analyses are discussed in Section 7.4 of the Geotechnical Report.
  - Settlement estimates are summarized in the following table.

Location	Total Settlement (feet)
Landfill bottom (maximum)	1-2
Landfill bottom (minimum)	0.5-1
Top of cap (center)	1.5-2.5
Top of cap (edge)	0.75-1.25

  - The North CAMU bottom estimates represent subgrade settlement which will affect the bottom liner. Top of cap settlements represent long term total settlements which are the accumulated subgrade settlements and cap settlements. Differential settlement of the North CAMU floor should approach 0.3%. Therefore, the design slope of the North CAMU bottom can be expected to be reduced by about 0.3% after the completion of long term settlement. The settlement calculations are included in Attachment 6-A.3 of the 1995 Notification.
- Slope stability
  - Slope stability analyses are presented in Section 7.1 of the Geotechnical Report included in the 1995 Notification.
  - Slope stability of various critical slope configurations of the North CAMU were analyzed. These included the following:
    - The perimeter berm cut/fill slopes
    - The highest waste face slopes during filling
    - The global stability of the North CAMU units after closure
  - The factors of safety against failure for each condition analyzed were all well above 1.5, indicating stable conditions.
- Bearing capacity
  - Bearing capacity analyses are presented in Section 7.2 of the Geotechnical Report included in the 1995 Notification.
  - The results of the analysis and the strength parameters used are presented in the table below. Detailed calculation sheets are included in Attachment 6-A.3 of the 1995 Notification.

	Bearing Pressure	Factor of Safety
North CAMU subgrade-clays	**5,400 psf**	**2.0**
North CAMU subgrade-shale	**5,400 psf**	**4.7**

- The calculated factors of safety against bearing failure indicate that the subgrade soils should not experience bearing failure under the maximum North CAMU unit loads.

- Potential for bottom heave blow-out
  - The potential for liner uplift due to high groundwater levels is addressed in Section 11 of the SLQCP included with the 1995 Notification.
  - Portions of the North CAMU excavation extend below the seasonal high water table.
  - The North CAMU is designed to use the weight of the liner system and waste as ballast to resist uplift and provide long-term stability of the liner system.
  - Ballast calculations, which are included in Attachment 6-B.2 of the SLQCP, demonstrate that long term stability against hydrostatic uplift will be maintained since the thickness of the waste in the North CAMU will exceed the thickness needed to resist liner uplift.

4.6.2.3 Compacted Clay Layer (Soil Liner)

The compacted clay liner consists of clay which was excavated from the Site, taken from existing soil stockpiles, or taken from other locations as approved by the engineer. Material properties, testing procedures and frequencies, construction methods, and construction monitoring of the clay liner are discussed in the SLQCP, included as Appendix 6-B of the 1995 Notification.

4.6.2.3.1 Waste Migration Analysis

Golder performed a waste migration analysis as part of the Exide Class 2 Landfill Risk Evaluation of Remedial Alternatives, dated August 2014, which was included with the Closure Plan.

Golder determined that long-term effects to groundwater, surface water, and sediments from the North CAMU are unlikely because the liner and cap system is designed to be effective for at least 1,000 years. This is based on the fact that failure would require three occurrences: 1) failure of the cap, 2) failure of the liner, and 3) the occurrence of both failures in an area where treated slag has constituents that leach to levels that may affect groundwater.

4.6.2.4 Leachate Collection System

The design of the LCS was originally outlined in the 1995 Notification. The original LCS conveys leachate to the gravel-filled leachate sump in the southwest corner of the North CAMU. Details of the original LCS are shown on Figures V.G-3 and V.G-4. Golder's technical memorandum includes designs for a second sump located in the northwest corner of the North CAMU which conveys leachate from the North CAMU's northernmost cells (cells 13-15). The additional LCS is shown on Figures V.G-5 through V.G-7. The technical specifications for the two LCS's are summarized in Table V.G.4 and discussed separately below.

4.6.2.4.1 Capacity of the System

	Cells 1-12 LCS	Cells 13-15 LCS
(a) Rate of leachate removal	40 gallons per minute (gpm)	21.3 gpm
(b) Capacity of sumps	3,700 gallons	2,528.6 gallons
(c) Thickness of mounding/maximum hydraulic head*	12 inches	0.2 inches
*The system is designed to maintain maximum hydraulic heads less than 30 centimeters in accordance with 40 CFR 264.552(e)(3)(i).		

4.6.2.4.2 Pipe Material and Strength

	Cells 1-12 LCS	Cells 13-15 LCS
Leachate collection lateral piping materials	Not applicable. The original LCS does not use piping to convey the leachate to the southwestern sump.	4-inch diameter perforated HDPE
Leachate collection lateral piping strength		SDR-17

4.6.2.4.3 Pipe Network Spacing and Grading

The LCS for cells 1-12 uses a geocomposite drainage layer to convey leachate to the sump in the southwest corner of the North CAMU. As shown on Figure V.G-3, the north-south slope is graded at 2.5% and the east-west slope is graded at 2%, which yields an overall slope of 3.2%. The side slopes of the North CAMU are graded at 3H:1V.

The LCS for cells 13-15 includes a single leachate pipe on the south edge of the three cells, as shown on Figure V.G-5. The cell floor grades are a minimum 1% and leachate pipe is graded at 1% with the LCS trench.

4.6.2.4.4 Collection Sump(s) Material and Strength

The sump for cells 1-12 is 4 feet deep with bottom dimensions 10 feet by 10 feet and 3H:1V side slopes. The sump is backfilled with stone or gravel free of shale, clay, friable materials, and debris. The gravel is overlain with a geotextile filter to prevent the intrusion of fines into the gravel backfill. Access to the sump is provided through two 12-inch diameter SDR-17 HDPE riser pipes installed along the 3H:1V side slope adjacent to the sump (one houses a sump pump and the other functions as a spare). The configuration of the sump and risers is shown on Figure V.G-4.

The sump for cells 13-15 is 2 feet deep with bottom dimensions 10 feet by 10 feet and top dimensions 18 feet by 14 feet. The sump is backfilled with drainage aggregate made up of natural stone or gravel, subrounded to subangular, free of shale, clay, friable materials and debris, and not derived from limestone or dolomite origin. The riser pipe is an 18-inch diameter SDR-11 HDPE pipe. The configuration of the sump and riser is shown on Figures V.G-6 and V.G-7. The configuration of the riser house and leachate pump controls are shown on Figure V.G-8.

4.6.2.4.5 Drainage Media Specifications and Performance

The drainage medium for the bottom surface of cells 1-12 consists of a geonet with geotextile fused to its upper surface; the drainage medium on the side slopes has geotextile fused to both the upper and lower surfaces of the geonet. The specifications for the two materials are presented in Section 5.2 of the SLQCP, included as Appendix 6-B to the 1995 Notification.

The drainage medium for cells 13-15 is a double-sided geocomposite consisting of a 200-mil geonet with a 6-ounce/square yard nonwoven geotextile heat-laminated to both sides. The design and specifications for the double-sided geocomposite are presented in the LCS Technical Memorandum, which is included as Attachment B to this Engineering Report.

4.6.2.4.6 Clogging and Free Liquid Access to the Pipe

4.6.2.4.6.1 Cells 1-12

In Cells 1 through 12, the bottom 3 feet of the two riser pipes which extend along the bottom of the sump are perforated to allow leachate to flow into the submersible pump intake. The perforated sections are wrapped with 2 layers of geonet. Furthermore, to prevent clogging of pipe perforations, the drainage aggregate for cells 1-12 meets the following requirements:

Sieve	% Passing
2 inch	100
#4 (0.187 inch)	0-20
#200 (0.0029 inch)	0-3%

4.6.2.4.6.2 Cells 13-15

In cells 13 to 15, the portion of the riser pipe at the bottom of the sump is perforated with 3/8-inch holes. The drainage aggregate for cells 13-15 meets the following requirements:

Sieve	% Passing
1-1/2 inch	90-100
1/2 inch	10-50
3/8 inch	0-15
#200 (0.0029 inch)	0-5%

Sieve analyses are performed, in accordance with ASTM D422, at a minimum frequency of 1 test per 3,000 cubic yards.

4.6.2.4.7 Compatibility demonstration

The compatibility of the LCS components is discussed in Section 4.6.5.

4.6.3 Chemical Resistance of the Liner System

HDPE FMLs are resistant to a great number and combinations of chemicals – it is the property that makes HDPE the most common FML in waste facilities.

Cells 10 through 12 of the North CAMU contain treated slag, but they, along with the new cells 13 through 15 also contain class 2 wastes, including metals-impacted soils, from an adjacent, undeveloped site called the Undeveloped Buffer Property or J-Parcel. Wastes of this type do not damage HDPE.

4.6.4 Quality Assurance/Quality Control

Quality assurance/quality control for the liner system is presented in the SLQCP, included as Appendix 6-B of the 1995 Notification.

4.6.5 Chemical Resistance of the Leachate Collection System

The geotextiles used for filtration of fines around the leachate collection pipes and sumps, and which comprise the geotextile portion of the geocomposite for the drainage layer, utilize 100 percent continuous-filament polyester or polypropylene. Extensive testing, including EPA 9090 for chemical resistance, has demonstrated that polyester and polypropylene are relatively inert to a wide range of chemical classes encountered in soil and typical leachates. All other components of the leachate collection system (i.e., the geonet in the geocomposite and the pipes) consist of HDPE, which has also been demonstrated to be inert to typical leachates.

4.6.6 Response Action Plan for Exceedance of Action Leakage Rate

No leak detection system has been installed as part of the LCS, and no action leakage rate has been calculated.

4.7 Dikes (Section V.G.7)

A perimeter containment dike is constructed around the North CAMU. The interior side slopes of the containment dike are at a 3H:1V slope and the exterior side slopes are at a 4H:1V slope. The top width provides sufficient area for termination of the liner system and the final cover system. The containment dike crest slope assists in drainage off the final cover and containment dike.

4.7.1 Slope Stability Analysis

Slope stability analyses are presented in Section 7.1 of the Geotechnical Report in the 1995 Notification. The most critical perimeter berm slopes of the North CAMU were assessed to be the highest berm interior fill/cut slopes and highest dike located along the northern edge of the North CAMU. The results of the PC STABL 5M computer slope stability analysis indicated minimum factors of safety in excess of 1.5 for both total and effective stress conditions. Therefore, it appears the planned 3H:1V perimeter berm slopes will be stable for both short-term (undrained) and long-term (drained) conditions.

4.7.2 Hydrostatic and Hydrodynamic Analyses

Hydrostatic and hydrodynamic analyses are not necessary for the dikes surrounding the North CAMU because the dikes will be dry.

4.7.3 Ability to Withstand Scouring from Leaking Liner

Scouring of the dike due to a leaking liner is not an issue at the North CAMU because the hydraulic head over the bottom liner will be maintained at a relatively low level and the underlying clay is not readily erodible.

4.8 Conformance with 30 TAC 335.173 and 40 CFR 264.301(c) (Section V.G.8)

Not applicable for the North CAMU.

4.9 Site Development Plan (Section V.G.9)

The operating procedures for depositing waste not currently placed in the North CAMU are described in section 2 of the North CAMU Operation & Maintenance Plan (the O&M Plan), which is included with the Closure Plan.

4.9.1 Waste Acceptance Limits and Testing

Based on the Agreed Order, the following wastes are CAMU-eligible wastes that are authorized to be placed in the North CAMU:

- The treated slag that currently exists in cells 1 through 12
- Waste in the two Treated Slag Piles at the Site at the time of the Agreed Order that meets class 2 non-hazardous waste criteria; this material has now been placed in cells 10-12
- Class 2 non-hazardous remediation waste associated with clean-up activities for Voluntary Cleanup Program (VCP) No. 2541 (J Parcel)
- Other Class 2 remediation waste approved in the Closure Plan

Waste characterization for the Treated Slag Piles was performed in accordance with the Revised Sampling & Analysis Plan, Stockpiled Treated Slag Adjacent to Class 2 Non-Hazardous Waste Landfill, prepared by W&M and dated March 2015. Samples were analyzed for toxicity characteristic leaching procedure (TCLP) lead, cadmium, arsenic, and selenium. Material meeting class 2 non-hazardous waste criteria was disposed of in the North CAMU. The balance of the material in the Treated Slag Piles was disposed of offsite at an appropriate permitted facility.

Waste characterization for the class 2 non-hazardous remediation waste associated with clean-up activities for the J-Parcel was performed in accordance with the Response Action Soil Sampling and Analysis Plan included in the Undeveloped Buffer Property VCP Response Action Plan, prepared by Pastor, Behling & Wheeler, LLC. (PBW). One soil sample was collected for every 50 cubic yards of soil stockpiles or in-place soil (where in-place waste characterization for soils was performed) generated during remediation; where roll-off containers were used to store excavated soil, one soil sample was collected per roll-off container. The soil samples were analyzed for TCLP arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Material meeting class 2 non-hazardous waste criteria was disposed of in the North CAMU.

Other class 2 remediation waste approved in the Closure Plan may also be placed in the landfill. These wastes may include soils from surface or subsurface excavation areas, concrete, sediment, or other wastes generated during demolition activities at the FOP. Any other class 2 remediation waste will be characterized in accordance with an approved Waste Analysis Plan for the FOP (included as Attachment Q to the Part B permit renewal application). Any waste characterized as class 1 waste or hazardous waste will not be placed in the North CAMU.

Some class 2 wastes from the UBP were characterized in-situ. A description of the waste characterization activities is included in Attachment C in the report, “Summary of Waste Characterization Sampling of Placed Soil in Exide Technologies Class 2 Landfill CAMU”, prepared by Golder Associates Inc. and dated September 6, 2017. This report was approved by TCEQ on September 20, 2017 and is included as Attachment C.

Waste characterization methods are also described in Section IV of the Part B permit renewal application.

4.9.2 Method of Landfill Filling

Class 2 waste is placed in the existing constructed North CAMU in lifts to allow for some compaction to reduce settlement below the final cover.

The waste placement technique is based on the existing footprint of the North CAMU. As shown on Figure V.G-1, waste hauling vehicles use a paved road to access the North CAMU area, then, once in the North CAMU area, use an access road located to the west side of the North CAMU, as directed by the construction manager. These waste hauling vehicles back down the interior North CAMU embankment ramp and unload in the designated drop area. The drop area is demarcated with temporary barriers.

Tracked equipment (excavator and dozer) are stationed within the North CAMU and work in tandem to place the waste in lifts as required.

4.9.3 Interim Storage and Initial Waste Placement

Interim storage areas are not anticipated to be needed for North CAMU operations.

Soil waste is placed and graded to direct drainage away from the work and to minimize ponding. The drop area is uniformly graded to provide a finished surface that is smooth, compacted, and free of irregularities.

A dozer is used as the primary spreading machine for the initial lift of soil waste from the remediation activities. The initial lift of waste is free of woody roots and sticks or other angular materials that could pose a hazard to the lining system. The initial lift (or protective cover layer) consists of soil only and is a minimum of 24 inches thick. Equipment is prohibited from operating directly on liner materials or geosynthetics during waste placement.

4.9.4 Subsequent Waste Lifts

After completion of the initial waste layer on the side slopes, a route of travel for subsequent lifts in the North CAMU is established. Waste placed in subsequent lifts is compacted to a thickness of approximately 1 foot. The waste is compacted by a combination of the tracked dozer operating on the surface and by the haul trucks traveling over the in-place soil waste. Following compaction, the soil waste should have sufficient strength to adequately support construction equipment.

4.9.5 Ponded Water

Ponding of water over waste filled areas is prevented using the following techniques:

- Interim waste slopes are graded to promote positive water surface drainage toward drainage features. Collected contact surface water is handled as described below.
- Final waste slopes are graded to the elevations shown in the design plans, which are included in Appendix C of the Closure Plan, and in such a way that they provide surface water drainage without depressions or low spots.
- Upgradient temporary diversion berms are installed as required to minimize the amount of water entering the disposal area.

Waste fill areas are inspected to identify depressions or other potential ponding locations. In the event ponded water on the active portion of the North CAMU is observed, action will be taken to remedy the problem. If water begins to accumulate in the active portion of the North CAMU, it will be removed with a small portable pump. The area of ponding will be filled with clean soil or waste fill and re-graded within seven days of the occurrence, weather permitting. Water that has been in contact with waste will be handled as described in Section 4.0 of the North CAMU Operation & Maintenance Plan.

4.9.6 Rainfall Events

A significant rainfall event, as determined by the Construction Manager, stops all loading and transportation activities at the North CAMU. No waste is loaded, transported, or placed into the North CAMU during such an event. Work resumes as soon as possible after the rain stops and conditions allow. The Construction Manager decides when it is appropriate to resume work.

4.9.7 Physical Criteria of Waste

Soil, slag, sediment and other approved remediation waste placed in the North CAMU does not contain free water. Putrescible wastes are not placed in the North CAMU. Wastes are placed in a manner that minimizes formation of bridging or voids and allows adequate compaction to prevent excessive consolidation, piping, or settlement after placement.

4.9.8 Daily Cover Operations

Daily cover during North CAMU filling operations (i.e., prior to placement of an interim cover or final cover) is not required because the waste does not attract birds or animals and does not contain material susceptible to being windblown. A Dust Control Plan is included as Appendix I to the Closure Plan. The exposed face of the North CAMU is limited to the area actively being filled. Other areas of exposed waste may be covered by a spray-applied cover as necessary.

4.9.9 Equipment Decontamination

An equipment decontamination area is located within the North CAMU. Berms are constructed around the perimeter. The decontamination area is large enough to accommodate the largest piece of equipment that will be used during the operation and closure activities. The area is graded to drain to one corner to allow the fluids generated during decontamination to be removed. A 40-mil high density polyethylene (HDPE) geomembrane is placed over the graded area extending over the berms. The HDPE geomembrane is anchored at the bottom of the berms to prevent it from becoming windblown. Timbers are installed over the HDPE geomembrane to protect it from the tracks and tires of the heavy equipment during the decontamination activities.

The equipment is decontaminated using potable water and high pressure washers. The decontamination fluids are pumped out of the lined decontamination area into a tank and transferred to the Site's on-site wastewater treatment facility for treatment and disposal in accordance with applicable regulations. To limit the generation of contact storm water, the decontamination pad is covered with poly sheeting weighted with sandbags during periods of inactivity and during significant storm events.

During the operation and closure activities, decontamination residue are containerized and transferred to a less than 90-day container for characterization, storage and disposal in accordance with local, state and federal requirements. If non-liquid decontamination residue meets class 2 non-hazardous waste criteria, it is placed in the North CAMU provided capacity is available for this waste. The geomembrane and timbers will be decontaminated using high pressure water which will subsequently be collected and transferred to the Site’s onsite wastewater treatment facility for treatment and disposal in accordance with applicable regulations. Once decontamination is complete, the liner and timbers will be transferred to a less than 90-day container for characterization, storage and disposal in accordance with local, state and federal requirements. If the liner and timbers meet class 2 non-hazardous waste criteria, it will be placed in the North CAMU provided capacity is available for this waste.

Following completion of decontamination activities and removal of the decontamination pad, three grab samples will be collected from the top six inches of soil using a hand auger or hand trowel beneath the decontamination area (exact dimensions of the decontamination pad to be determined) to confirm that there are no soil impacts beneath the decontamination pad from decontamination activities. Sampling and decontamination procedures will be the same as those described for excavation floor samples in Appendix 6.1 of the Response Action Plan included as Attachment M to the Part B Renewal Application.

If the decontamination pad is within the North CAMU, the samples will be analyzed for TCLP lead, cadmium, arsenic and selenium. Should any of the results exceed class 2 standards for any of these four metals, a minimum of six (6) inches of material underlying the decontamination area will be removed and placed into a temporary less than 90-day container meeting applicable standards for waste characterization and analysis. This process will be repeated as required until the grab samples exhibits TCLP results that meet the class 2 standards for these four metals. Material that does not meet the class 2 standards will be transported offsite for disposal in accordance with local, state and federal requirements.

If the decontamination pad is outside the North CAMU, the samples will be analyzed for total lead, cadmium, arsenic and selenium. Should any of the results exceed applicable Protective Concentration Limits (PCLs) for any of these four metals, a minimum of six (6) inches of material underlying the decontamination area will be removed and placed into a temporary less than 90-day container meeting applicable standards for waste characterization and analysis. This process will be repeated as required until the grab sample exhibits results that meet the PCLs for these four metals. Material will be transported off-Site for disposal in accordance with local, state and federal requirements.

4.9.10 Inspections

The following is a summary of the inspection procedures for the North CAMU. The full inspections, maintenance, and monitoring program for the North CAMU can be found in Section 6.0 of the O&M Plan.

During active operations, the North CAMU is inspected a minimum of weekly and after each significant storm event to detect evidence of the following:

- Deterioration, malfunction, or improper operation of surface water control features
- Erosion of the North CAMU cap or berms
- The presence of leachate in and proper functioning of leachate collection and removal systems
- Procedures followed by operations and maintenance staff
- The condition of the operating equipment, including earth moving equipment, alarms and pumps

An inspection check form with explanations of observations documents each of these weekly inspections and becomes part of the North CAMU records. In addition, inspections of the security system (existing fences, gates, locks, etc.), emergency equipment, communications equipment, and alarm system for the LCS are conducted weekly during active operations. The results of these inspections are documented on the Inspection Form.

If, during a periodic inspection, damage, deterioration, or malfunction of any of the systems, components, or facilities is observed, steps are initiated to rectify the situation. Site personnel, or their designated contractor, will perform minor maintenance activities as described in the O&M Plan. Maintenance and repair actions are documented on the Repair Report Form.

4.10 Run-on Control (Section V.G.10)

Run-on control is not an issue for the majority of the North CAMU due to the height of the perimeter berm above existing grade. A drainage channel will be constructed along the northern and western portion of the unit to divert surface water and direct it to an existing tributary of Stewart Creek.

4.11 Run-off Control (Section V.G.11)

Run-off will be controlled using mulch and erosion control netting on exposed slopes, placement of lining materials on concentrated flow paths, and installation of culverts for road crossings over channels. Particular attention will be paid to the handling, control and management of storm water during the active filling operation and after cover installation to minimize leachate generation and avoid erosion and sediment deposition in drainage ways.

4.12 Wind Dispersal (Section V.G.12)

No daily cover is used at the North CAMU since the waste is not subject to being wind-blown. The design of the final cover is shown on Figure V.G-9.

4.13 Liquid Waste (Section V.G.13)

Soil, slag, sediment and other approved remediation waste placed in the landfill does not and will not contain free water or other liquids.

4.14 Approval of Alternate Design or Operating Practice (Section V.G.14)

Not applicable for the North CAMU.

4.15 Exemption from Double-Liner Requirements for Monofills (Section V.G.15)

Not applicable for the North CAMU.

4.16 Above-grade Benefits (Section V.G.16)

The North CAMU was designed as both a below- and above-grade waste unit. The majority of the waste is placed below grade.

5.0 CLOSURE

Golder trusts that the information provided is sufficient to meet the project needs. If there are any questions or comments, please contact the undersigned.

Sincerely,

Golder Associates Inc.

Jeffrey B. Fassett, PE
Associate and Senior Consultant

Anne M Faeth-Boyd, P.G
Associate and Senior Engineer

TABLES

Table V.A: Facility Waste Management Handling Units

TCEQ Permit Unit No.	Unit Name	NOR No.	Unit Description	Capacity	Unit Status
001	Raw Material Storage Building	005	Containment building	4,150 tons	Inactive (demolished)
002	Battery Receiving/Storage Building	011	Container storage area	3,581 cy	Inactive (demolished)
N/A	North CAMU	012	Miscellanous unit	190,000 cy (approx)	Active
N/A	Remediation Consolidation Area	A	Miscellanous unit	82,000 cy	Proposed (not yet built)

Notes:
cy - cubic yards

Table V.K.1: Miscellaneous Units

Permit Unit No.[1]	Miscellaneous Unit	NOR No.	Storage, Processing, and/or Disposal	Waste Nos.[2]	Rated Capacity	Approximate Dimensions	Unit will manage Ignitable, Reactive, Incompatible, or F020, F021, F022, F023, F026, and F027 Waste (state all that apply)
N/A	North CAMU (monofill with 15 cells)	012	Disposal	1-3	~190,000 cubic yards (~12,000 cubic yards/cell)	Length: 660 feet Width: 550 feet Depth: 17 feet Total area: 8.25 acres	No ignitable, reactive, incompatible, or F020, F021, F022, F023, F026, or F027 wastes will be treated at the CL2LF CAMU.
N/A	RCA (monofill)	A	Disposal	3, 4, 5, 6, 8, 10	82,000 cy	Length: 1,000 ft Width: 400 ft Depth (height): approx. 17 ft Area: 7.94 ac	No ignitable, reactive, incompatible, or F020, F021, F022, F023, F026, or F027 wastes will be disposed of at the RCA.

Notes:
[1] Permit unit number is not applicable.
[2] Waste numbers are consistent with those listed in Table IV.B of the RCRA Part B permit renewal application for the Exide Technologies Frisco Recycling Center.

Table V.G.3: CAMU Liner System

Permit Unit No.	Miscellaneous Unit	Primary Liner			Secondary Liner			Clay Liner		
		Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness
N/A[1]	North CAMU	High density polyethylene (HDPE) flexible membrane liner (FML)	HDPE is essentially impermeable (flow limited to defects)	60 mil (1.5 mm)	The CAMU's bottom liner does not include a secondary liner.			The clay liner is a component of the primary liner for the CAMU.		
		Compacted Clay	$<1*10^{-7}$	2.5 to 3 feet						

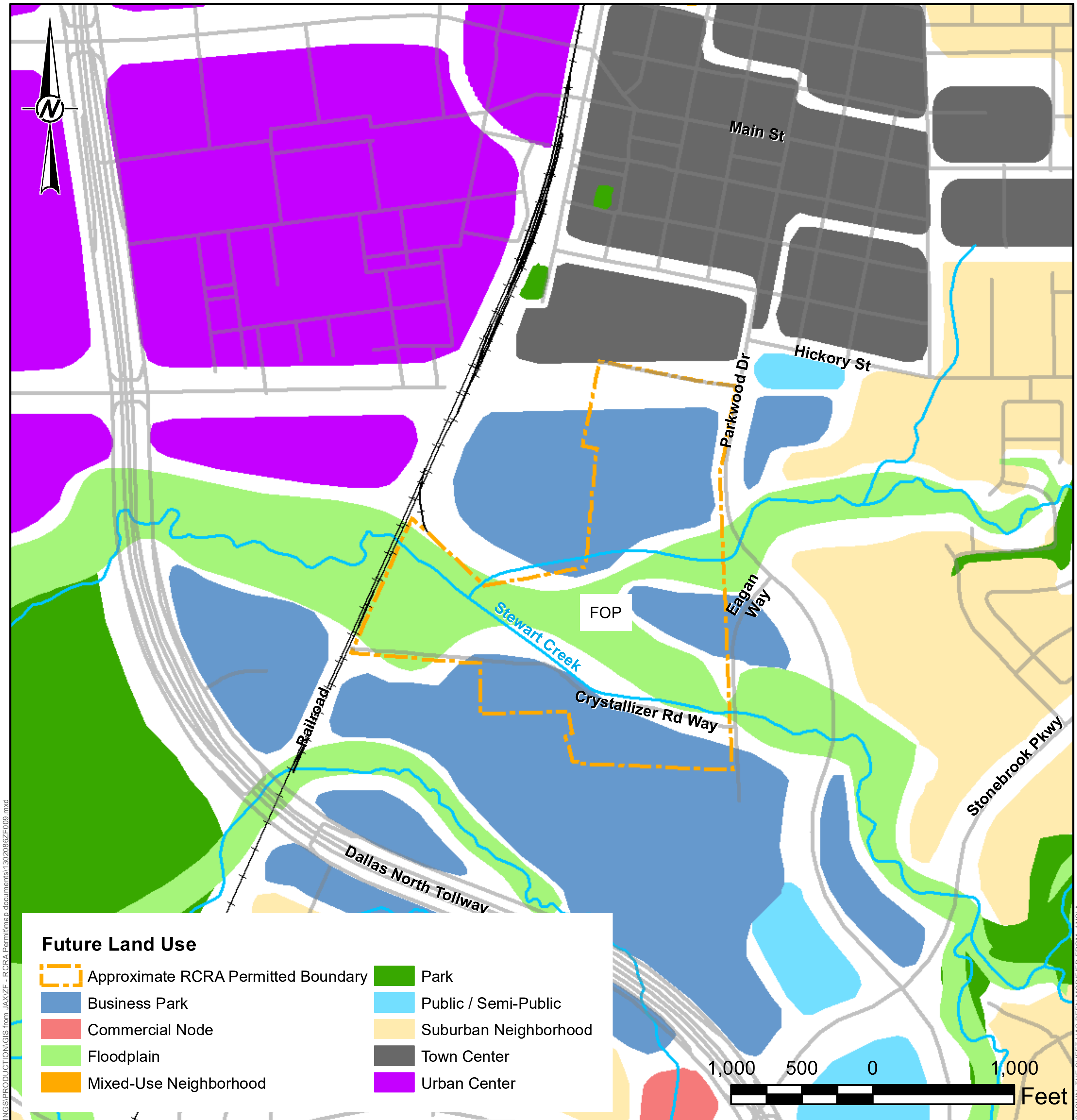
Notes:

[1] Permit unit number is not applicable.

Table V.G.4: CAMU Leachate Collection Systems

Landfill	Primary Leachate Collection System					Secondary Leachate Collection System				
	Drainage Media	Collection Pipes (including risers)	Filter Fabric	Geofabric	Sump Material	Drainage Media	Collection Pipes (including risers)	Filter Fabric	Geofabric	Sump Material
North CAMU Cells 1-12	Geonet with geotextile filter fabric fused to its upper surface (on flat surfaces) or to both surfaces (on side slopes)	The LCS for cells 1-12 uses a geocomposite drainage layer to convey leachate to the sump in the southwest corner of the landfill.	Geotextile	N/A	Clean gravel	The North CAMU does not have a secondary leachate collection system.				
North CAMU Cells 13-15	Double-sided geocomposite (200-mil geonet with a nonwoven geotextile heat-bonded to both sides)	Collection pipe: 4-inch diameter perforated SDR-17 HDPE Risers: 18-inch diameter SDR-11 HDPE	Nonwoven geotextile around drainage aggregate	N/A	1-1/2 inch minus drainage aggregate	The North CAMU does not have a secondary leachate collection system.				

FIGURES



LEGEND

- Roadway
- Railroad
- Creek Centerline
- Approximate RCRA Permitted Boundary

STATE OF TEXAS
ANNE M FAETH-BOYD
GEOLOGY
12300
LICENSED
PROFESSIONAL GEOSCIENTIST

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED
PROFESSIONAL ENGINEER

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

REFERENCE

1. FUTURE LAND USE - CITY OF FRISCO COMPREHENSIVE PLAN 2015

CLIENT
EXIDE TECHNOLOGIES

PROJECT
RCRA PERMIT RENEWAL

TITLE
LAND USE PATTERNS AND ROUTES OF TRAVEL NEAR THE FACILITY

CONSULTANT

GOLDER

YYYY-MM-DD	2019-05-28
PREPARED	EFT
DESIGN	JWT
REVIEW	EPW
APPROVED	AMF

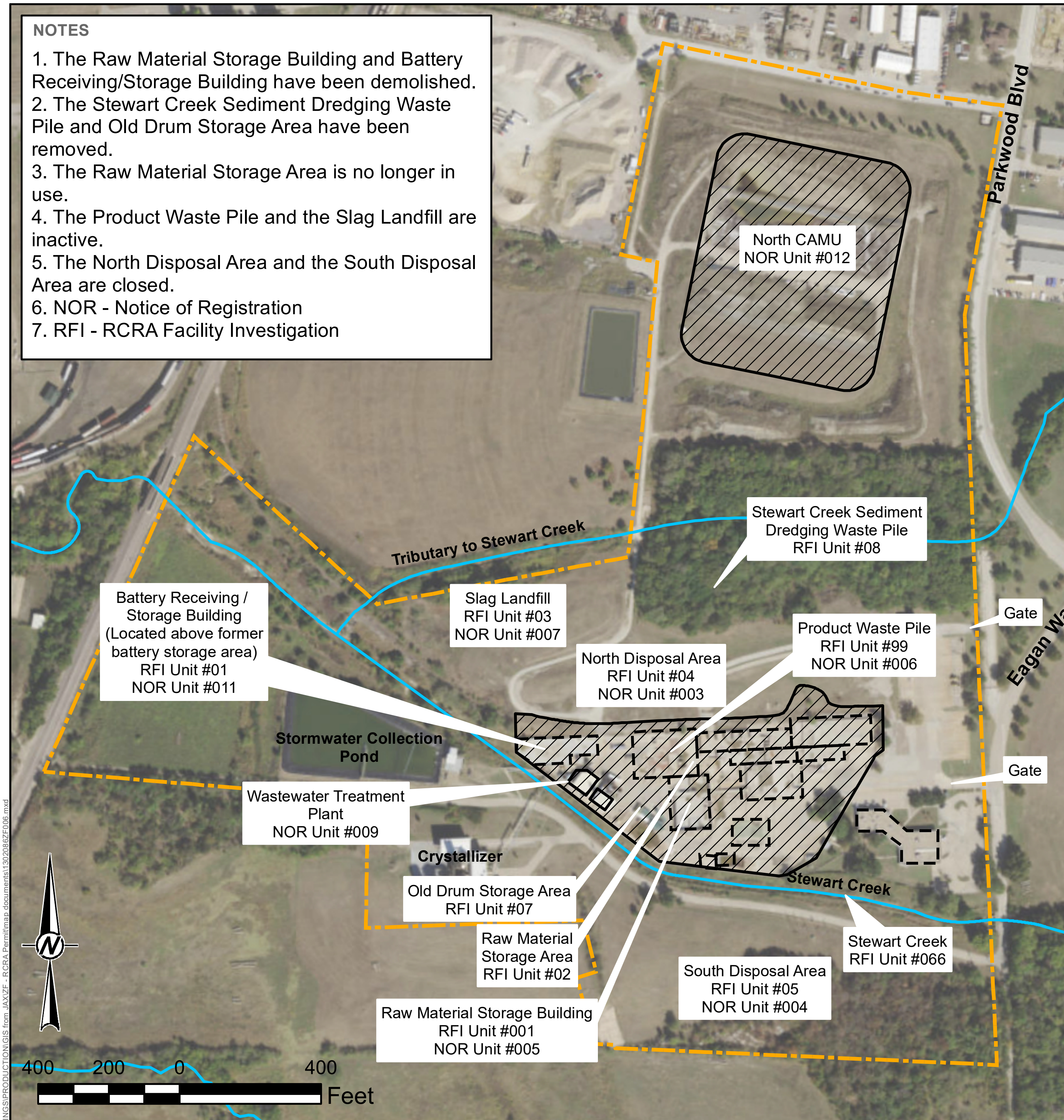
PROJECT No.	CONTROL	Rev.	FIGURE
13-02086-06	1302086ZF009.mxd	0	V.A-1

Path: G:\Projects\130 Projects\1302086-06 - Exide Frisco RCRA Permit Mod\800 - FIGURES-DRAWINGS\PRODUCTION\GIS from JAXZF - RCRA Permit\map documents\1302086ZF009.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI A

NOTES

1. The Raw Material Storage Building and Battery Receiving/Storage Building have been demolished.
2. The Stewart Creek Sediment Dredging Waste Pile and Old Drum Storage Area have been removed.
3. The Raw Material Storage Area is no longer in use.
4. The Product Waste Pile and the Slag Landfill are inactive.
5. The North Disposal Area and the South Disposal Area are closed.
6. NOR - Notice of Registration
7. RFI - RCRA Facility Investigation



LEGEND

- Creek Centerline
- Existing Building
- Former Building
- Corrective Action Management Unit
- Approximate RCRA Permitted Boundary

STATE OF TEXAS
ANNE M FAETH-BOYD
GEOLOGY
12300
LICENSED
PROFESSIONAL GEOSCIENTIST
Anne Faeth-Boyd 5-30-19

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED
PROFESSIONAL ENGINEER
5/30/19
GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

REFERENCE

1. AERIAL IMAGERY - SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT
EXIDE TECHNOLOGIES

PROJECT
RCRA PERMIT RENEWAL

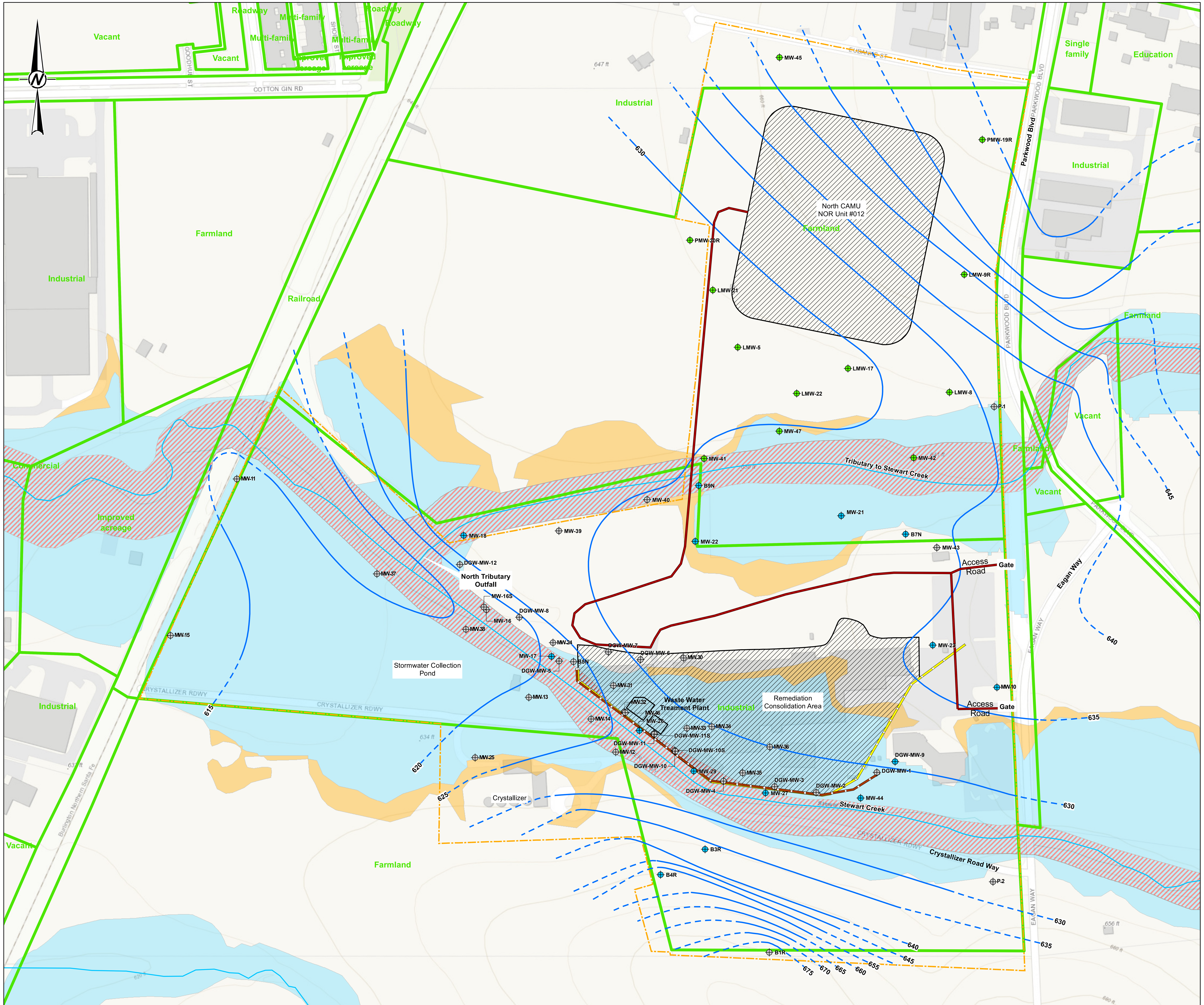
TITLE
PLAN VIEW OF THE FORMER OPERATING PLANT

CONSULTANT

GOLDER

YYYY-MM-DD	2019-05-28
PREPARED	EFT
DESIGN	JWT
REVIEW	EPW
APPROVED	AMF

PROJECT No.	CONTROL	Rev.	FIGURE
13-0208606	1302086ZF006.mxd	0	**V.A-2**

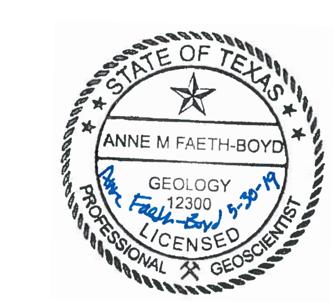


LEGEND

- North CAMU Monitoring Well
- Additional FOP Monitoring Wells
- Existing Wells to be Decommissioned
- Access Road
- Groundwater Elevation (Measured)
- Groundwater Elevation (Estimated)
- Creek Centerline
- Existing Flood Control Wall
- Proposed Flood Control Wall
- Existing Building
- Corrective Action Management Unit
- Land Use Boundary
- Floodway
- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Approximate RCRA Permitted Boundary
- Farmland -- Land Use Description

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

0 150 300
Feet



NOTE(S)

1. GROUNDWATER ELEVATIONS ARE BASED ON WATER LEVEL MEASUREMENTS COLLECTED IN JANUARY 2014.

REFERENCE(S)

1. BASEMAP - SOURCES: ESRI, HERE, DELORME, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), SWISSTOPO, MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY.
2. LANDUSE: DATA FROM THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS (NCTCOG).
3. FLOODPLAIN: DATA DOWNLOADED FROM FEMAS MAP SERVICE CENTER (MSC).

CLIENT
EXIDE TECHNOLOGIES

PROJECT
RCRA PERMIT RENEWAL

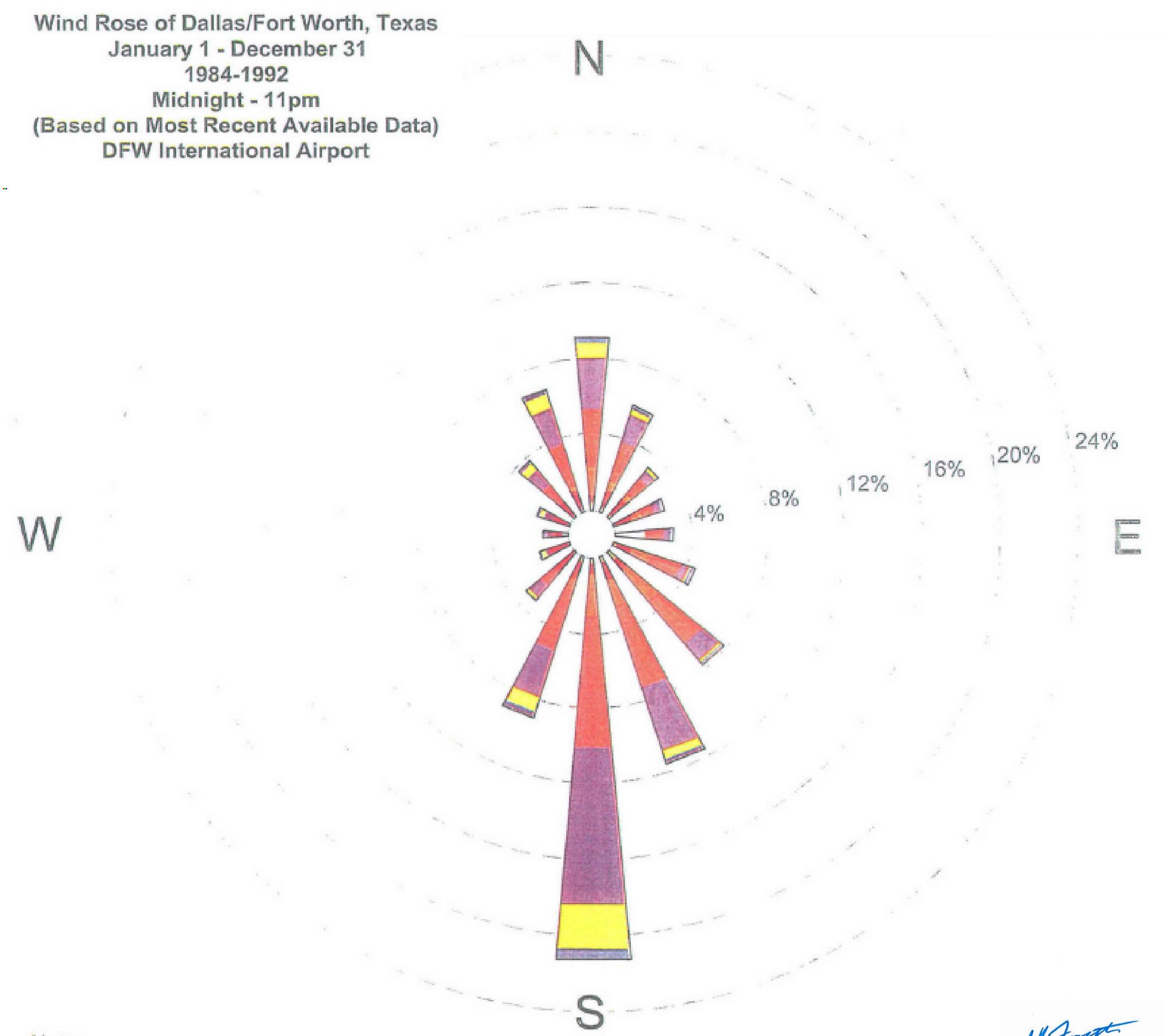
TITLE
FACILITY DETAILS

CONSULTANT
GOLDER

YYYY-MM-DD	2019-05-30
DESIGNED	JWT
PREPARED	EFT
REVIEWED	EPW
APPROVED	AMF

PROJECT NO.	CONTROL	REV.	FIGURE
13-0208606	1302086ZF007.MXD	0	V.A-3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D



Note:
1) Frequencies indicate direction from which the wind is blowing. For example, according to the wind rose, the wind is blowing from the south approximately 21 percent of the time.
2) ≥ = greater than or equal to.

JEFFREY B. FASSETT
85675
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
5/30/19

GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

LEGEND

WIND SPEED
(Knots)

- ≥22
- 17-21
- 11-16
- 7-10
- 4-6
- 1-3

Calm Winds - 4.64%

REFERENCE

1. THE WIND ROSE WAS ORIGINALLY INCLUDED IN APPENDIX V-1 OF THE APPLICATION FOR RENEWAL OF INDUSTRIAL AND HAZARDOUS WASTE PERMIT FOR THE FRISCO BATTERY RECYCLING CENTER DATED SEPTEMBER 28, 2010.

CLIENT
EXIDE TECHNOLOGIES

PROJECT
RCRA PERMIT RENEWAL

TITLE
WIND ROSE

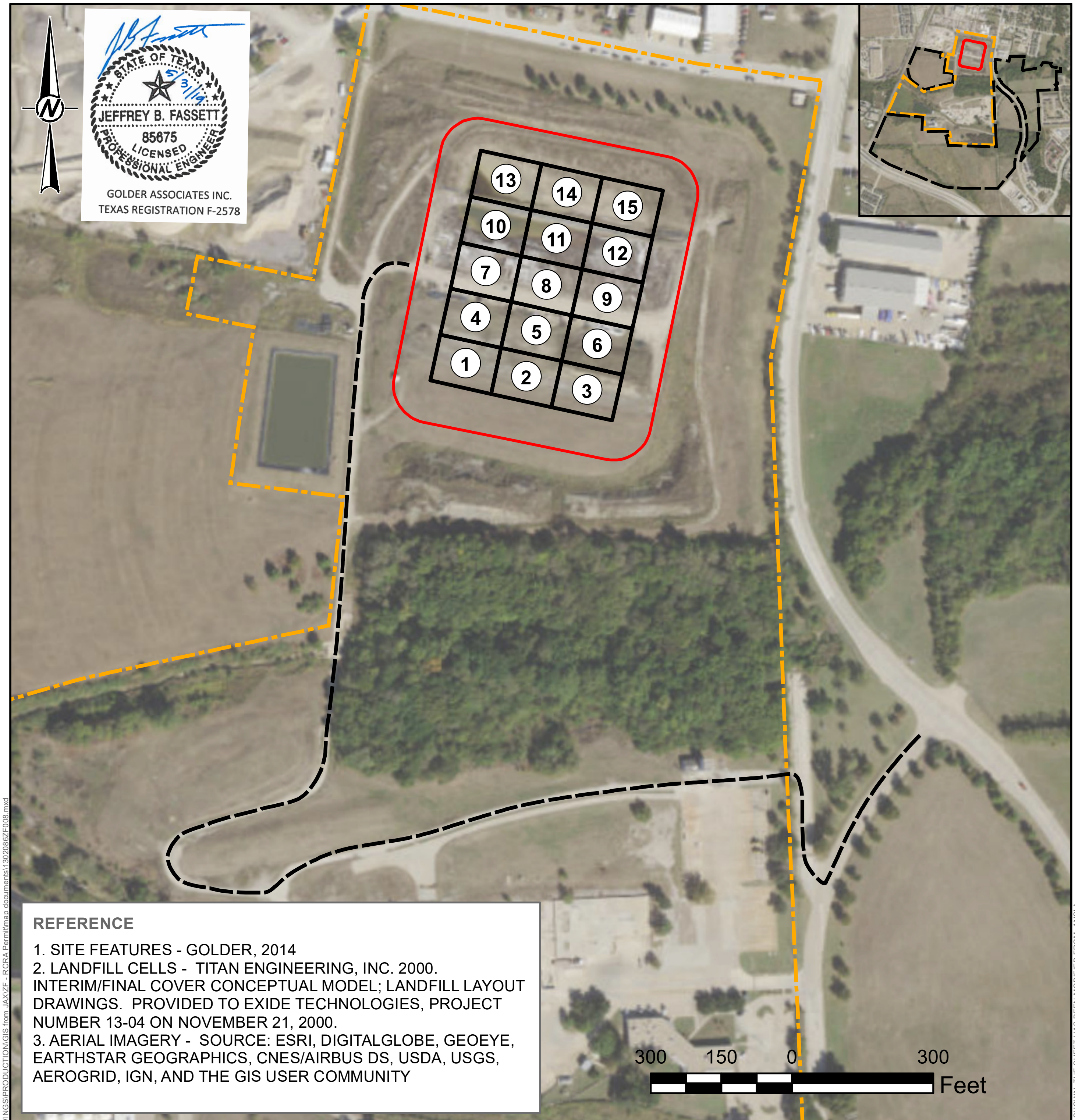
CONSULTANT
GOLDER

YYYY-MM-DD	2019-05-02
PREPARED	JWT
DESIGN	JWT
REVIEW	GS
APPROVED	AMF

PROJECT No.	CONTROL	Rev.	FIGURE
13-02086	1302086ZF032.mxd	0	V.A-4

Path: G:\Projects\130 Projects\1302086-06 - Exide Frisco RCRA Permit Mod\800 - FIGURES-DRAWINGS\PRODUCTION\GIS from JAXZF - RCRA Permit\map documents\1302086ZF032.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI A



REFERENCE

1. SITE FEATURES - GOLDER, 2014
2. LANDFILL CELLS - TITAN ENGINEERING, INC. 2000. INTERIM/FINAL COVER CONCEPTUAL MODEL; LANDFILL LAYOUT DRAWINGS. PROVIDED TO EXIDE TECHNOLOGIES, PROJECT NUMBER 13-04 ON NOVEMBER 21, 2000.
3. AERIAL IMAGERY - SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

LEGEND

- Access Road
- Approximate Layout of CAMU Cells
- Approximate CAMU Extent
- Approximate Boundary of the Former Operating Plant

NOTES

1. THE CELL LAYOUT IS APPROXIMATE AND IS FOR CONCEPTUAL PURPOSES ONLY.

CLIENT
EXIDE TECHNOLOGIES

PROJECT
RCRA PERMIT RENEWAL

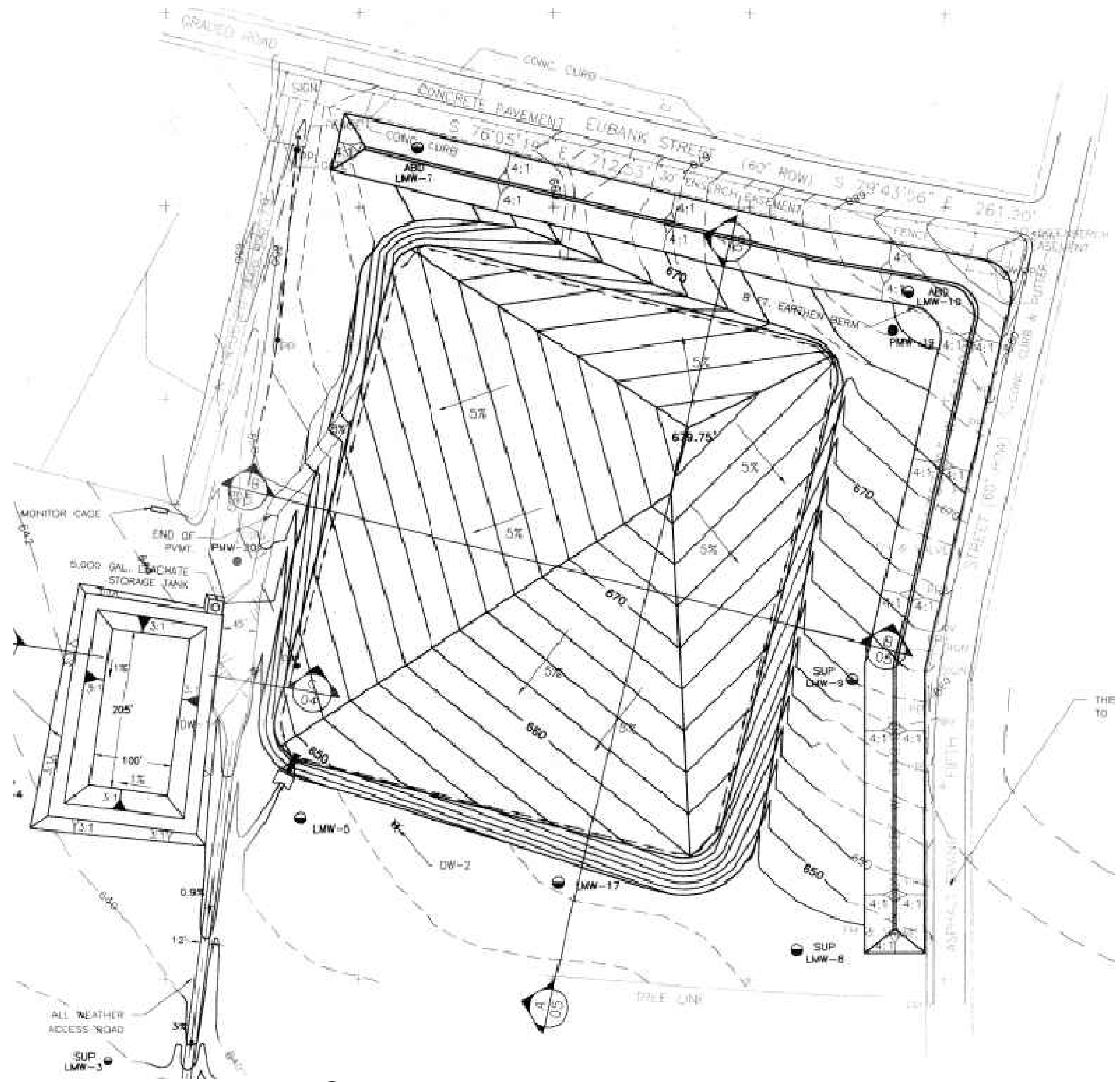
TITLE
CAMU PLAN VIEW

CONSULTANT

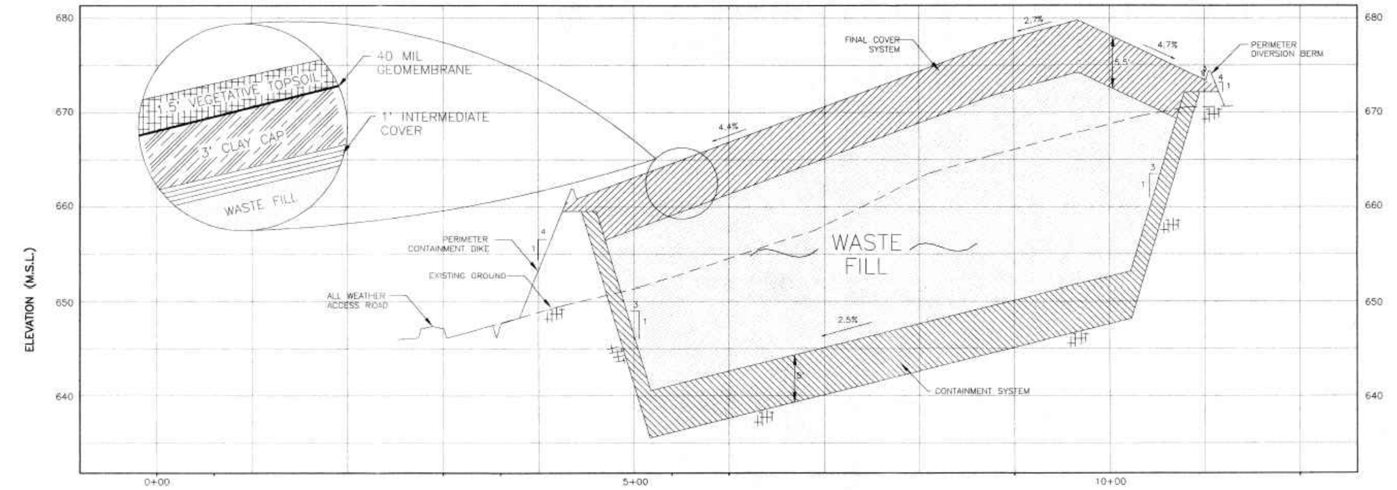
GOLDER

YYYY-MM-DD	2019-05-03
PREPARED	EFT
DESIGN	JWT
REVIEW	EPW
APPROVED	AMF

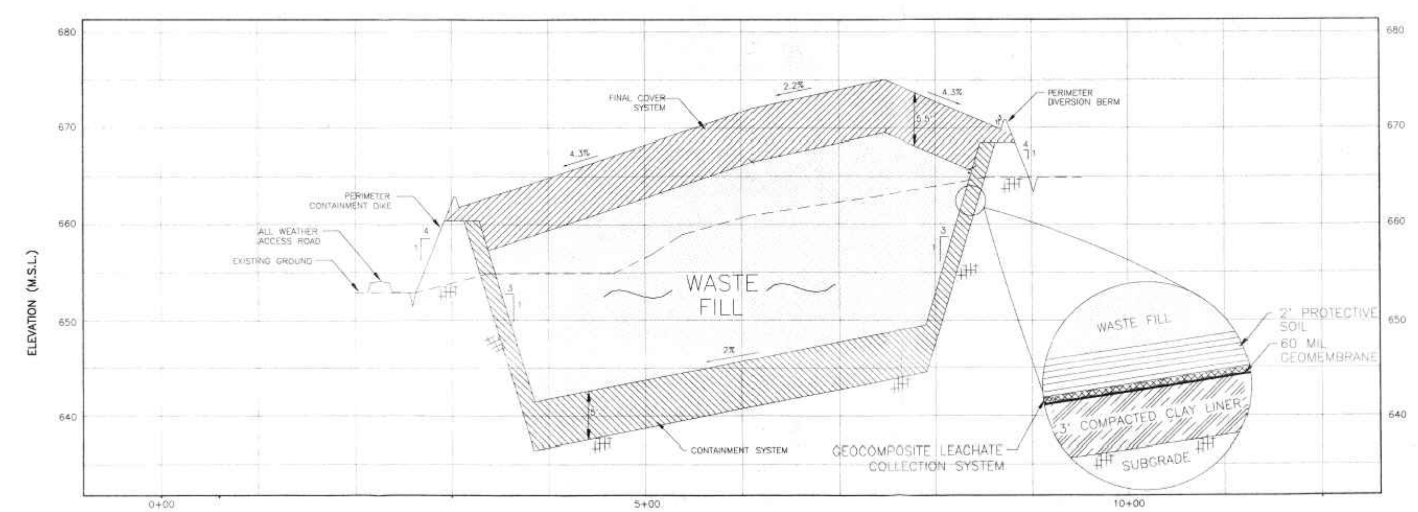
PROJECT No.	CONTROL	Rev.	FIGURE
13-02086-06	1302086ZF008.mxd	0	V.G-1



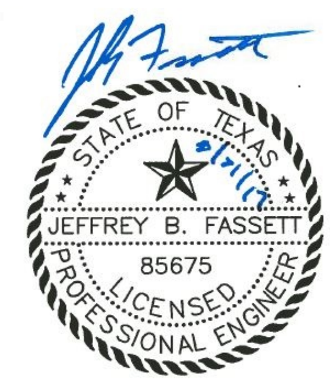
SCALE NTS 1 V.G-2 FINAL COVER PLAN



SECTION A 4 5



SECTION B 4 5



GOLDER ASSOCIATES, INC
TEXAS REGISTRATION F-2578

NOTE(S)

1. FINAL COVER GRADES TAKEN FROM JONES & NEUSE, ATTACHMENT 4, FINAL COVER PLAN, DATED JULY 27, 1995.
2. FILL CROSS-SECTIONS TAKEN FROM JONES & NEUSE, ATTACHMENT 5, FILL CROSS-SECTIONS, DATED AUGUST 9, 1995.

ISSUED FOR PERMITTING PURPOSES ONLY

0 100 200
1" = 200' FEET

CLIENT
EXIDE TECHNOLOGIES

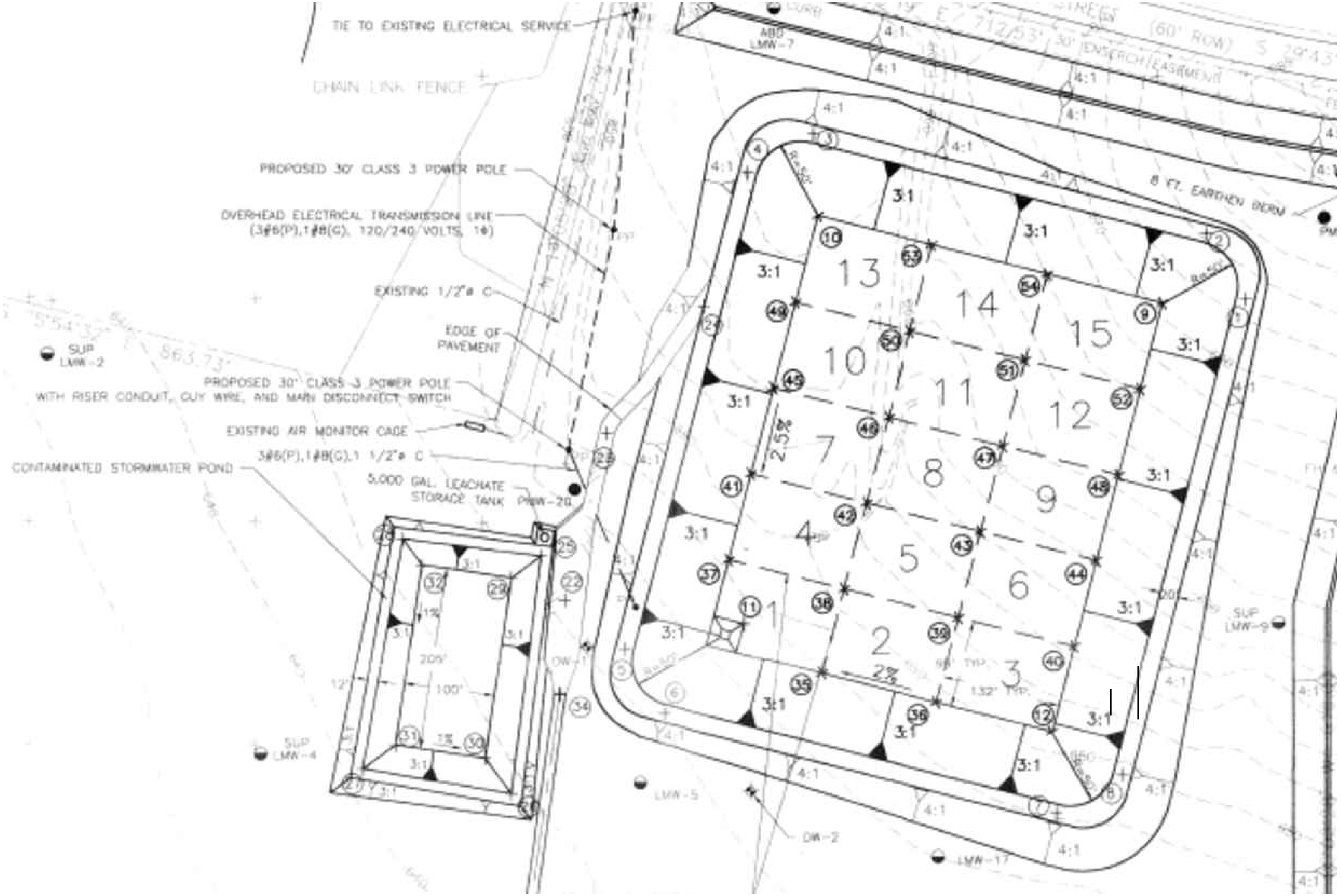
CONSULTANT
Golder Associates

YYYY-MM-DD	2016-10-24
DESIGNED	MGC
PREPARED	MGC
REVIEWED	JBF
APPROVED	JBF

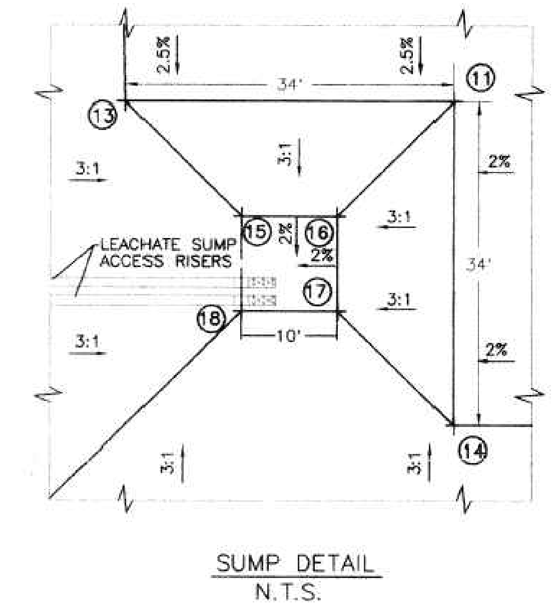
PROJECT
EXIDE TECHNOLOGIES
CAMU ENGINEERING REPORT, TCEQ PERMIT HW-50206
FRISCO, COLLIN COUNTY, TEXAS

TITLE
FILL CROSS-SECTIONS

PROJECT NO.	PHASE	REV.	FIGURE
1302086-02	V	0	V.G-2



SCALE NTS 1 V.G-3 SITE GRADING PLAN



SCALE NTS 2 V.G-3 LEACHATE COLLECTION SUMP DETAIL (CELLS 1-12)

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED PROFESSIONAL ENGINEER

GOLDER ASSOCIATES, INC
TEXAS REGISTRATION F-2578

ISSUED FOR PERMITTING PURPOSES ONLY

NOTE(S)

1. THE SPECIFICATIONS FOR THE LEACHATE COLLECTION SYSTEM FOR CELLS 1-12 WERE ORIGINALLY PUBLISHED IN THE NOTIFICATION OF AN ON-SITE CLASS II INDUSTRIAL WASTE LANDFILL, SUBMITTED TO THE TEXAS NATURAL RESOURCE CONSERVATION COMMISSION IN SEPTEMBER 1995.
2. SITE GRADING PLAN AND SUMP DETAIL TAKEN FROM JONES & NEUSE, ATTACHMENT 1, OVERALL EXCAVATION PLAN, DATED JULY 27, 1995.

CLIENT
EXIDE TECHNOLOGIES

CONSULTANT
Golder Associates

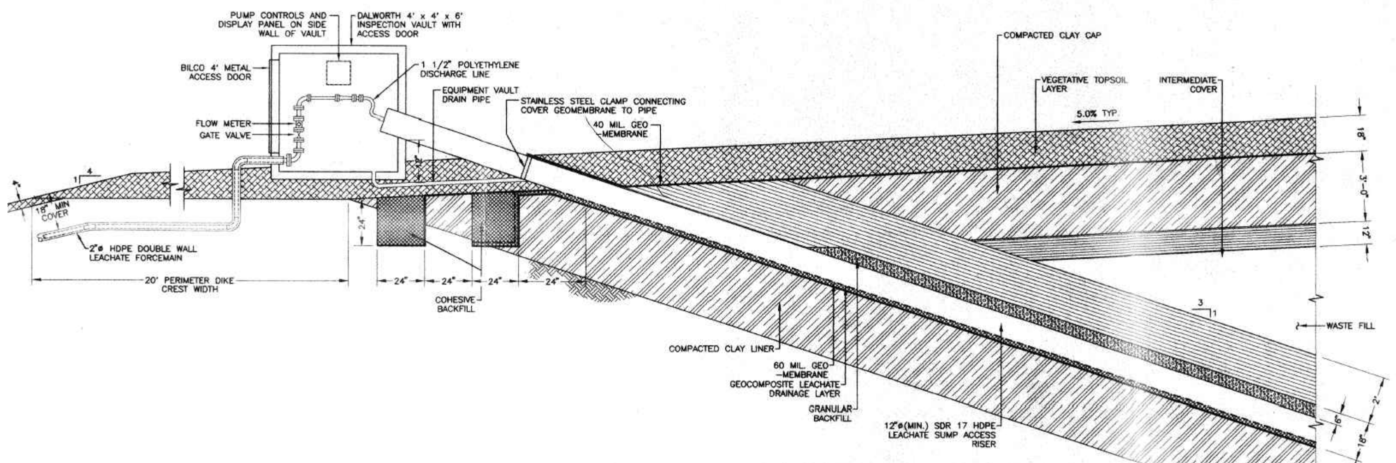
YYYY-MM-DD	2016-10-24
DESIGNED	MGC
PREPARED	MGC
REVIEWED	JBF
APPROVED	JBF

PROJECT
EXIDE TECHNOLOGIES
CAMU ENGINEERING REPORT, TCEQ PERMIT HW-50206
FRISCO, COLLIN COUNTY, TEXAS

TITLE
CELLS 1-12 LEACHATE COLLECTION SYSTEM

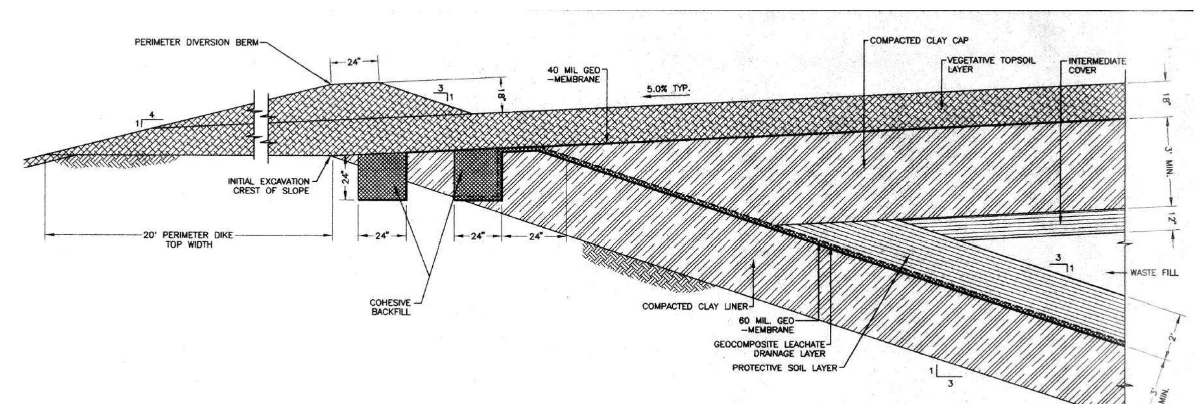
PROJECT NO.	PHASE	REV.	FIGURE
1302086-02	V	0	V.G-3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



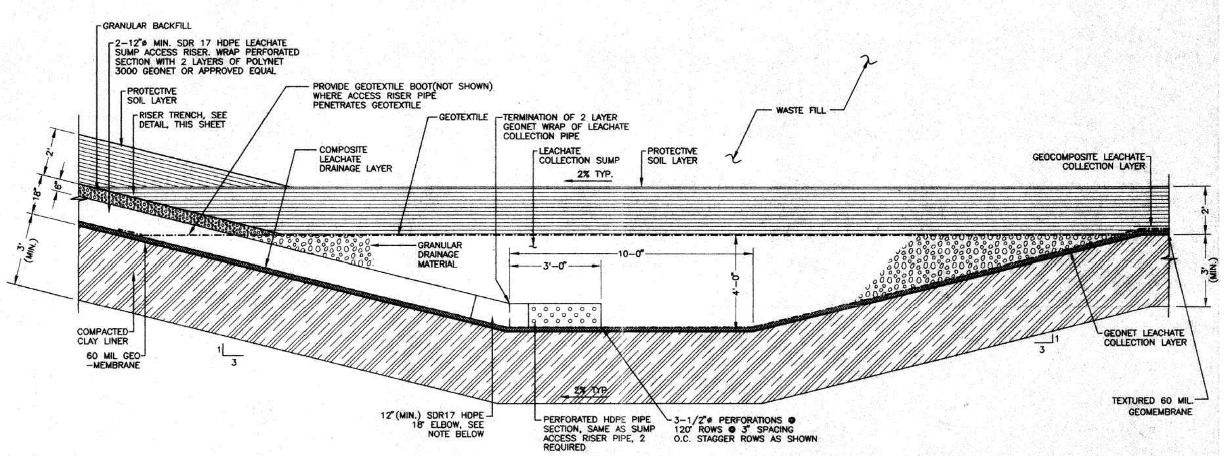
TOP OF LEACHATE SUMP ACCESS RISER W/FINAL COVER

* NOTE: UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE NOMINAL.



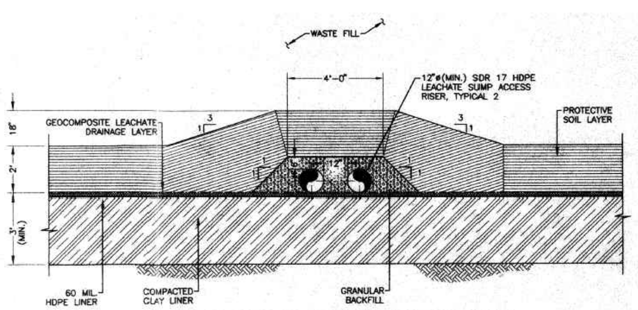
PERIMETER EDGE OF LANDFILL W/FINAL COVER

* NOTE: UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE NOMINAL.



BOTTOM OF LEACHATE SUMP ACCESS RISER

* NOTE: UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE NOMINAL.



SIDE SLOPE RISER ENCASEMENT

* NOTE: UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE NOMINAL.

NOTES

1) SEE APPENDIX C – SOIL AND LINER QUALITY CONTROL PLAN FOR DETAILED SPECIFICATIONS OF SOIL AND GEOSYNTHETIC COMPONENTS OF THE LINER AND LEACHATE COLLECTION SYSTEM. BASIC DESCRIPTIONS OF THESE COMPONENTS ARE GIVEN BELOW.

2) COMPACTED CLAY LINER SOIL SHALL HAVE AN IN–PLACE COEFFICIENT OF PERMEABILITY OF NO GREATER THAN 1 X 10–7 CM/SEC.

3) GRANULAR DRAINAGE MATERIAL SHALL BE A NON–ANGULAR STONE OR GRAVEL HAVING A LABORATORY COEFFICIENT OF PERMEABILITY OF AT LEAST 1x10–1 CM/SEC WITH 0% PASSING THE 3/8" SIEVE 100% PASSING THE 2" SIEVE.

4) GRANULAR BACKFILL SHALL BE A STONE OR GRAVEL WITH 0 TO 30% PASSING THE #200 SIEVE AND 100% PASSING THE 2" SIEVE.

5) COMPACTED CLAY CAP SOIL SHALL HAVE AN IN–PLACE COEFFICIENT OF PERMEABILITY OF NO GREATER THAN 1x10–7 CM/SEC.

6) GEOTEXTILE FILTER FABRIC PLACED ON TOP OF THE GRANULAR DRAINAGE MATERIAL SHALL BE AN 8 OZ/SY (MIN) NONWOVEN NEEDLEPUNCHED SYNTHETIC FABRIC.

7) THE FINAL COVER SYNTHETIC LINER SHALL BE 40 MIL HDPE FLEXIBLE MEMBRANE LINER. LINER MATERIAL SHALL BE SMOOTH ON BOTH SIDES AND MEET REQUIREMENTS OF NATIONAL SANITATION FOUNDATION STANDARD 54.

8) THE SIDE SLOPE GEOCOMPOSITE DRAINAGE LAYER SHALL CONSIST OF A GEONET WITH A GEOTEXTILE BONDED TO BOTH SIDES. THE BOTTOM GEO–COMPOSITE DRAINAGE LAYER SHALL CONSIST OF A GEONET WITH A GEOTEXTILE THE GEONET IN THE GEOCOMPOSITES SHALL BE HDPE, AND SHALL HAVE A HYDRAULIC CONDUCTIVITY GREATER THAN OR EQUAL TO 1.6 CM/SEC AT AN OVERBURDEN STRESS OF 11,000 PSF. THE GEOTEXTILE FILTER FABRIC IN THE GEOCOMPOSITES SHALL BE CAPABLE OF FILTERING THE OVERLYING PROTECTIVE SOIL. GEOCOMPOSITE ON THE BOTTOM OF CELLS ON THE SIDE SLOPES OF THE CELL SHALL BE UNROLLED AND PLACED IN THE DIRECTION OF THE SLOPE.

9) LEACHATE COLLECTION LATERALS AND RISER PIPES SHALL BE HDPE PE 3408 & 345434C, AS COVERED BY ASTM D3350 & F714. PIPING SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, INCLUDING TAMPING OF GRANULAR BACKFILL MATERIALS AROUND PIPE HAUNCHES.

10) BOTTOM GEOMEMBRANE LINER SHALL BE A 60 MIL SMOOTH OR TEXTURED HDPE FLEXIBLE MEMBRANE LINER. THE SIDE SLOPE GEOMEMBRANE LINER SHALL BE A 60 MIL TEXTURED HDPE FLEXIBLE MEMBRANE LINER. LINER MATERIALS SHALL MEET REQUIREMENTS OF NATIONAL SANITATION FOUNDATION STANDARD 54.

11) THE FINEL COVER MEMBRANE LINER SHALL BE A SMOOTH 40 MIL HDPE FLEXIBLE LINER

11) PRIOR TO FINAL COVER CONSTRUCTION, THE GEOMEMBRANE ALONG, & NEAR CREST OF PERIMETER DIKE WILL BE COVERED WITH A 1 FT. THICK (MIM.) LAYER OF TEMP. PROTECTIVE SOIL.

12) MAXIMUM OPENING SIZE OF THE 2 LAYER GEONET WRAP SHALL BE 3/8 INCHES.

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED PROFESSIONAL ENGINEER

GOLDER ASSOCIATES, INC
TEXAS REGISTRATION F–2578

ISSUED FOR PERMITTING PURPOSES ONLY

NOTE(S)

1. THE SPECIFICATIONS FOR THE LEACHATE COLLECTION SYSTEM FOR CELLS 1-12 WERE ORIGINALLY PUBLISHED IN THE NOTIFICATION OF AN ON-SITE CLASS II INDUSTRIAL WASTE LANDFILL, SUBMITTED TO THE TEXAS NATURAL RESOURCE CONSERVATION COMMISSION IN SEPTEMBER 1995.
2. FIGURES AND NOTES ARE TAKEN FROM JONES & NEUSE FILE NO. 15181000/4, ATTACHMENT 6, FINAL COVER SYSTEM & LEACHATE SUMP ACCESS RISER DETAILS, DATED AUGUST 16, 1995.

CLIENT
EXIDE TECHNOLOGIES

CONSULTANT
Golder Associates

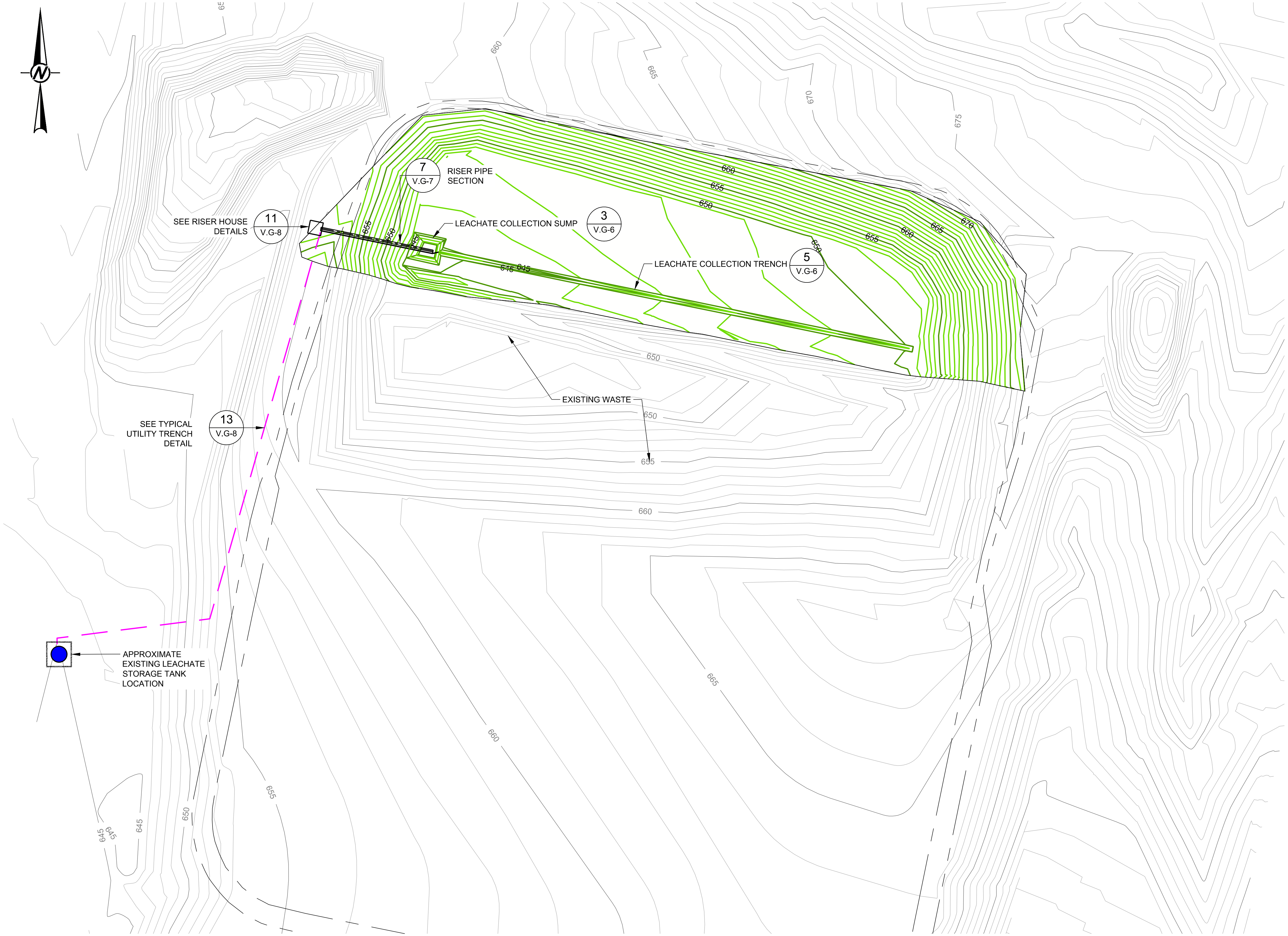
YYYY-MM-DD	2016-10-24
DESIGNED	MGC
PREPARED	MGC
REVIEWED	JBF
APPROVED	JBF

PROJECT
EXIDE TECHNOLOGIES
CAMU ENGINEERING REPORT, TCEQ PERMIT HW-50206
FRISCO, COLLIN COUNTY, TEXAS

TITLE
CELLS 1-12 LEACHATE COLLECTION SYSTEM *SUMPS AND RISERS*

PROJECT NO.	PHASE	REV.	FIGURE
1302086-02	V	0	V.G-4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND

- EXISTING GROUND 10 ft CONTOUR
- EXISTING GROUND 2 ft CONTOUR
- PROPOSED CLAY 10 ft CONTOUR
- PROPOSED CLAY 2 ft CONTOUR
- LEACHATE COLLECTION TRENCH AND SUMP GRADE BREAK LINE
- LEACHATE COLLECTION TRENCH CENTERLINE

NOTE(S)

1. EXISTING GROUND CONTOURS BASED ON COMBINED INFORMATION FROM REMEDIAL SERVICES, INC. DRAWING DATED SEPTEMBER 12, 2013 AND GROUND SURVEY INFORMATION DATED SEPTEMBER 15, 2016. DEPICTED EXISTING GROUND CONDITIONS MAY NOT REPRESENT ACTUAL FIELD CONDITIONS.
2. CLAY GRADES MUST BE FIELD VERIFIED TO DRAIN AT 1% MINIMUM TOWARDS THE LEACHATE COLLECTION TRENCH.

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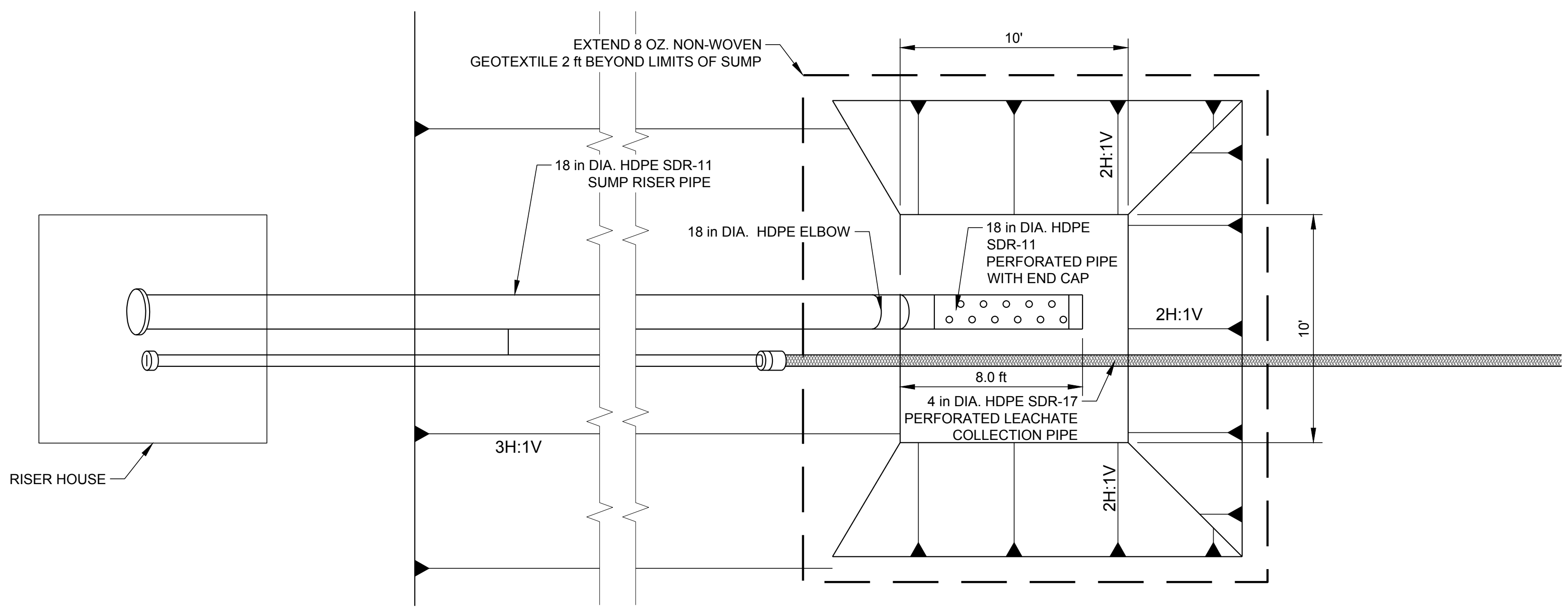
0 40 80
1" = 80' FEET

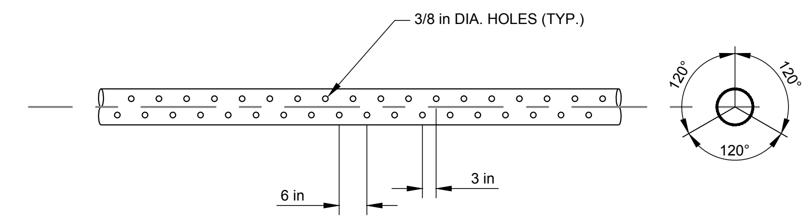
CLIENT: EXIDE TECHNOLOGIES		PROJECT	EXIDE TECHNOLOGIES CAMU ENGINEERING REPORT, TCEQ PERMIT HW-50206 FRISCO, COLLIN COUNTY, TEXAS
CONSULTANT: Golder Associates	YYYY-MM-DD	2016-10-24	TITLE
	DESIGNED	MGC	**CELLS 13-15 LEACHATE COLLECTION SYSTEM**
	PREPARED	MGC	
	REVIEWED	JBF	PROJECT NO. 1302086-02 · PHASE V · REV. 0 · FIGURE V.G-5
	APPROVED	JBF	

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

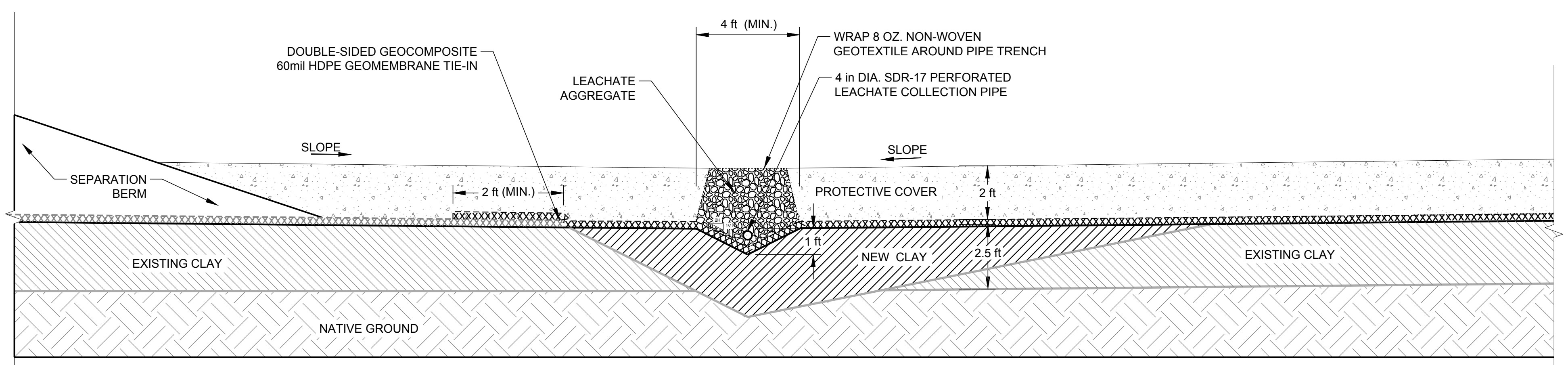
1 in



SCALE 1" = 8' 3 V.G-6 REVISED SUMP DETAIL



SCALE 1" = 5' 4 V.G-6 PIPE PERFORATIONS



SCALE 1" = 6' 5 V.G-6 LEACHATE COLLECTION TRENCH DETAIL

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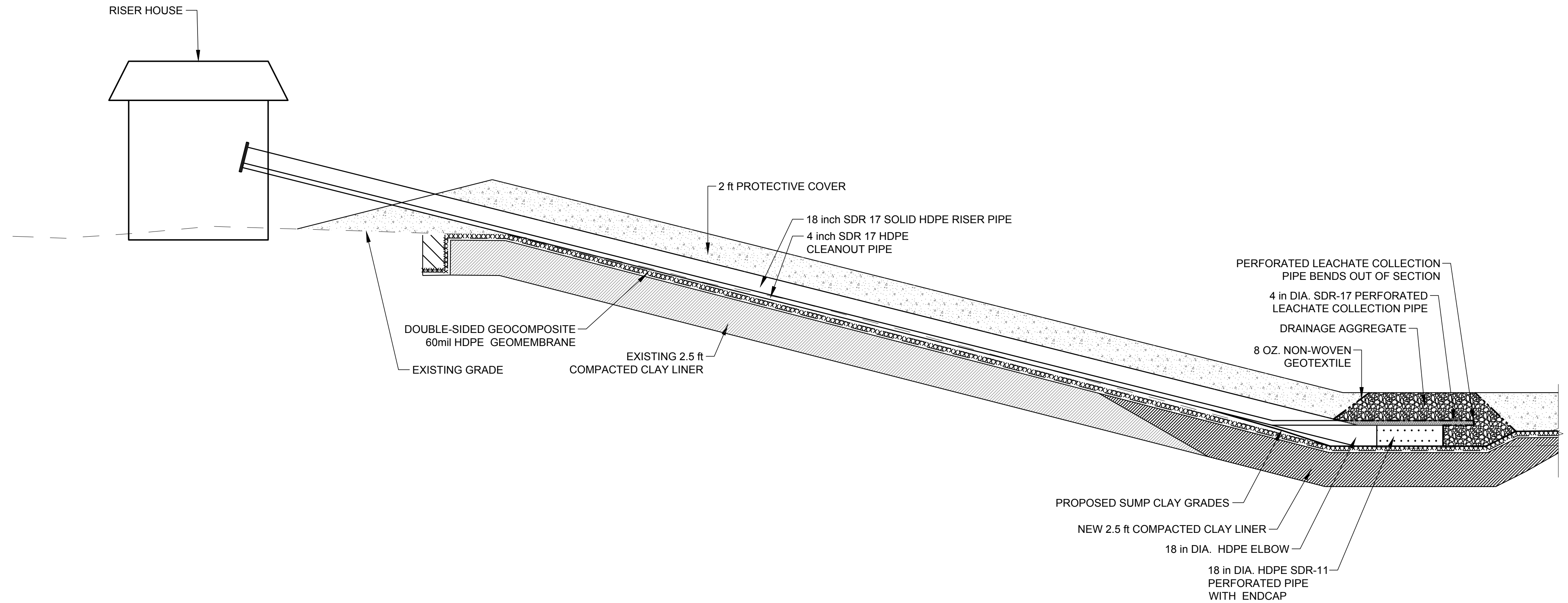
0 2.5 5
1" = 5' FEET
0 3 6
1" = 6' FEET
0 4 8
1" = 8' FEET

CLIENT	EXIDE TECHNOLOGIES
CONSULTANT	Golder Associates
YYYY-MM-DD	2016-10-24
DESIGNED	MGC
PREPARED	MGC
REVIEWED	JBF
APPROVED	JBF

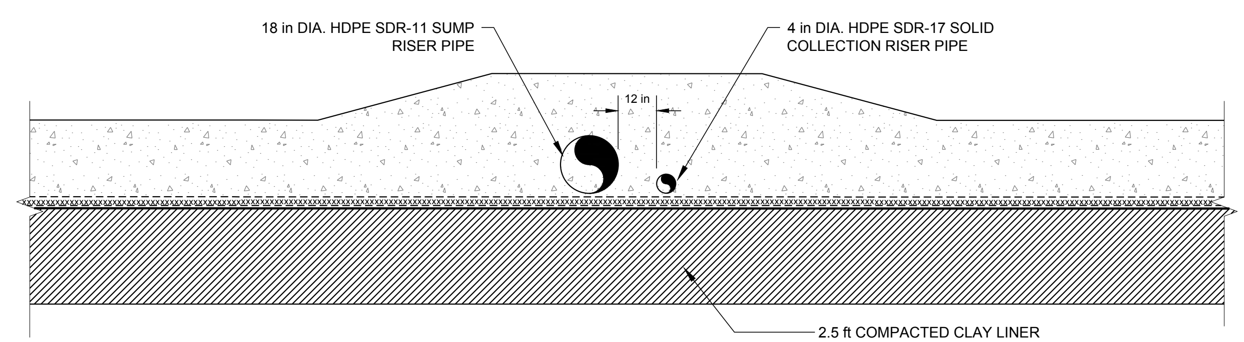
PROJECT
EXIDE TECHNOLOGIES
CAMU ENGINEERING REPORT, TCEQ PERMIT HW-50206
FRISCO, COLLIN COUNTY, TEXAS

TITLE
CELLS 13-15 LEACHATE COLLECTION DETAILS I

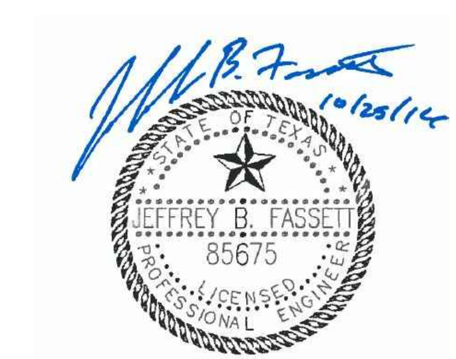
PROJECT NO.	PHASE	REV.	FIGURE
1302086-02	V	0	V.G-6



SCALE 1" = 10' 6 V.G-7 SUMP AND RISER PIPES



SCALE 1" = 5' 7 V.G-7 RISER PIPE BERM SECTION



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Registration Number F-2578

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0 2.5 5
1" = 5' FEET

0 5 10
1" = 10' FEET

CLIENT
EXIDE TECHNOLOGIES

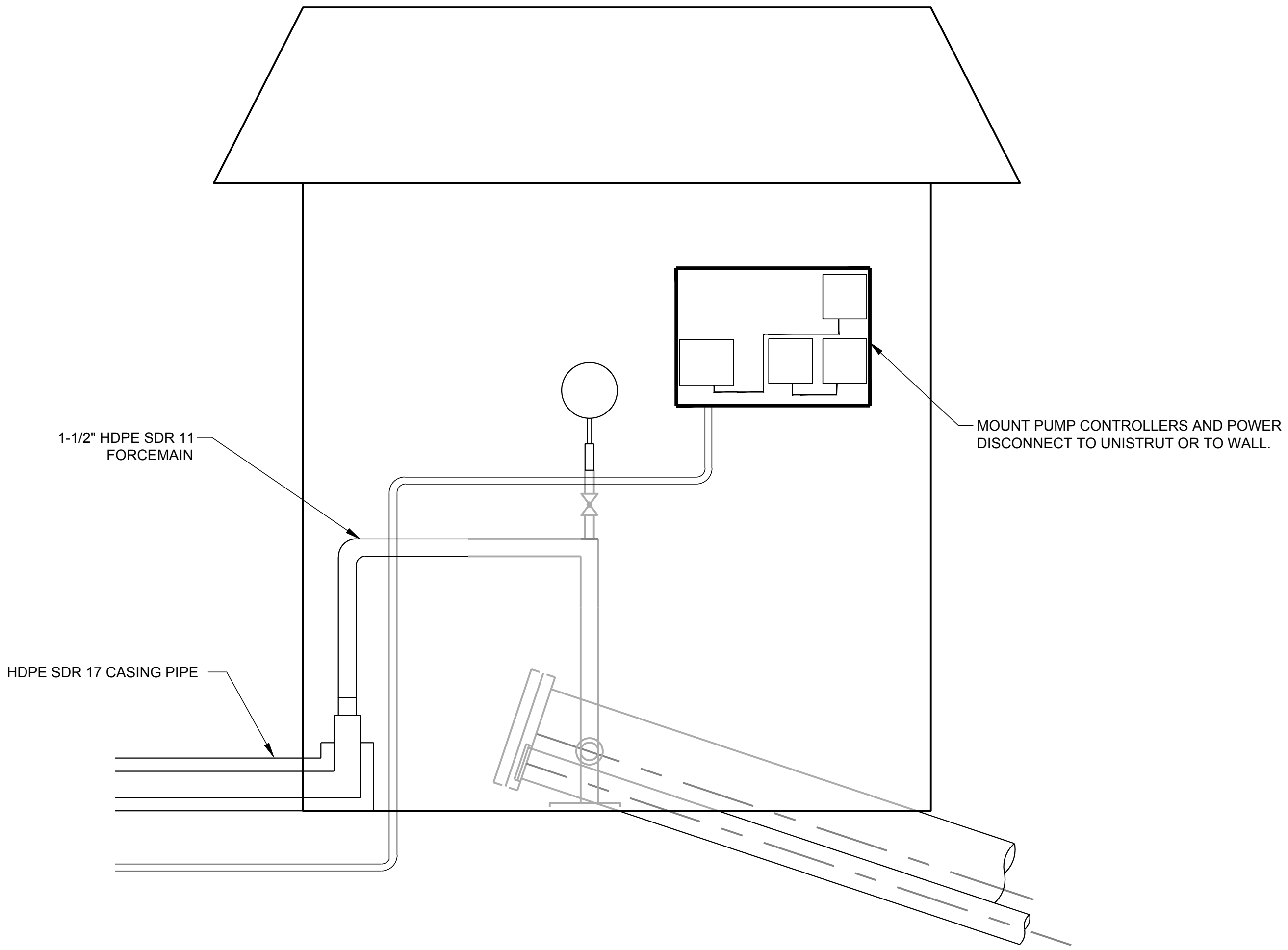
CONSULTANT
Golder Associates

YYYY-MM-DD	2016-10-24
DESIGNED	MGC
PREPARED	MGC
REVIEWED	JBF
APPROVED	JBF

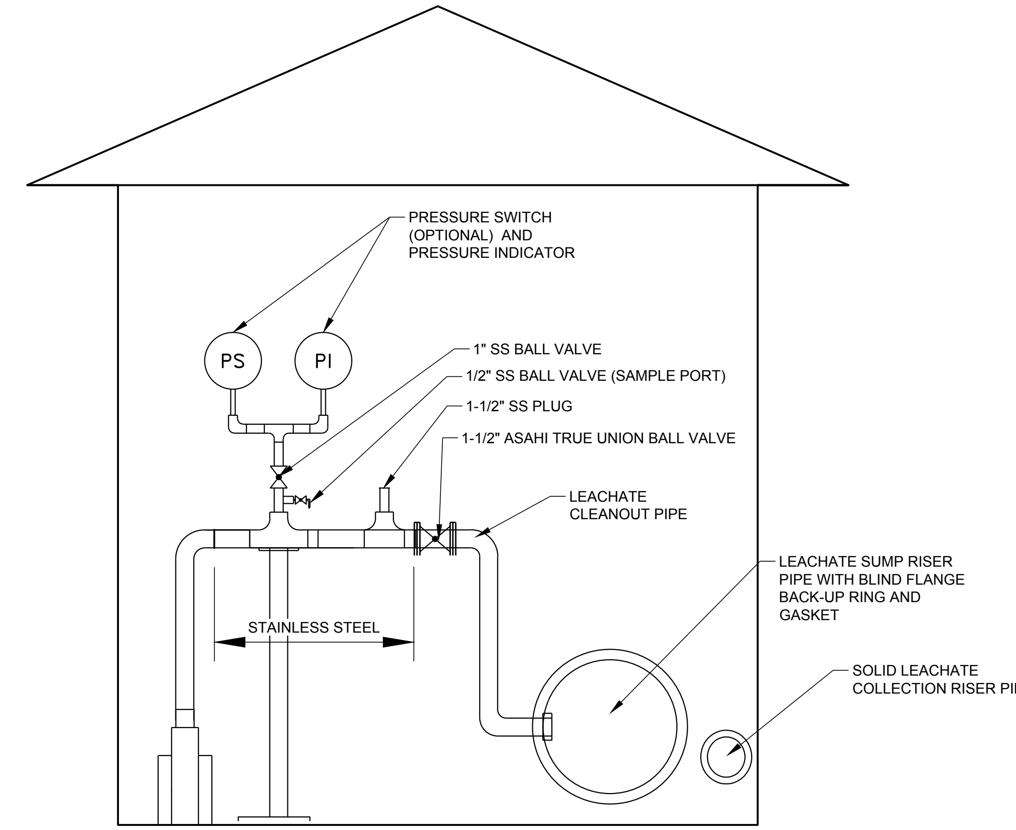
PROJECT
EXIDE TECHNOLOGIES
CAMU ENGINEERING REPORT, TCEQ PERMIT HW-50206
FRISCO, COLLIN COUNTY, TEXAS

TITLE
CELLS 13-15 LEACHATE COLLECTION DETAILS II

PROJECT NO.	PHASE	REV.	FIGURE
1302086-02	V	0	V.G-7



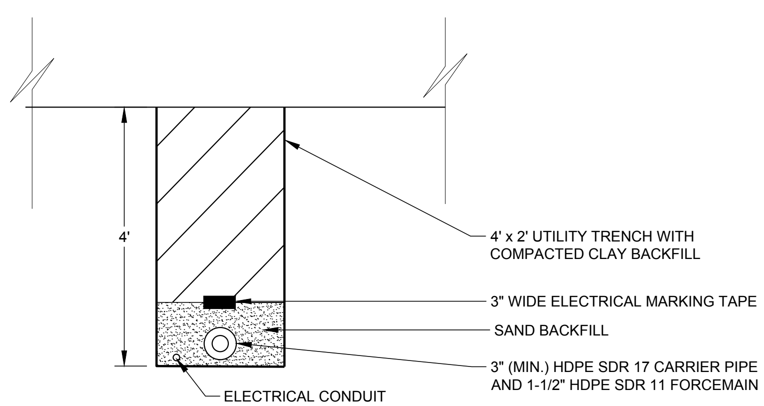
NTS 11 V.G-8 TYPICAL LEACHATE PIPING SCHEMATIC DETAIL



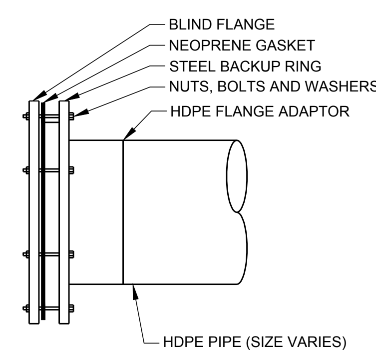
NTS 12 V.G-8 LEACHATE PIPING SCHEMATIC DETAIL

NOTES:

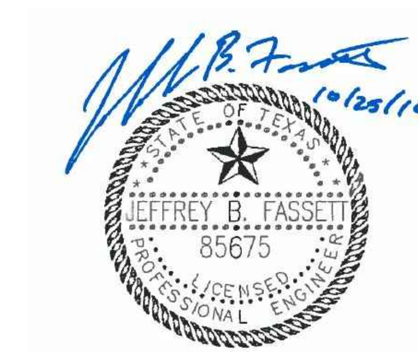
1. PROVIDE LONG RADIUS BENDS FOR ELECTRICAL CONDUITS.
2. PRESSURE GAUGE SHALL BE GLYCERIN FILLED WITH 100 PSI MAXIMUM PRESSURE.
3. CONNECT PUMP LEVEL CONTROLLER, PUMP ELECTRICAL, AND PUMP DISCHARGE TO SIDE OF LEACHATE RISER PIPE.



NTS 13 V.G-8 TYPICAL UTILITY TRENCH DETAIL



NTS 14 V.G-8 TYPICAL BLIND FLANGE DETAIL



Professional Engineering Firm
Registration Number F-2578

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CLIENT
EXIDE TECHNOLOGIES

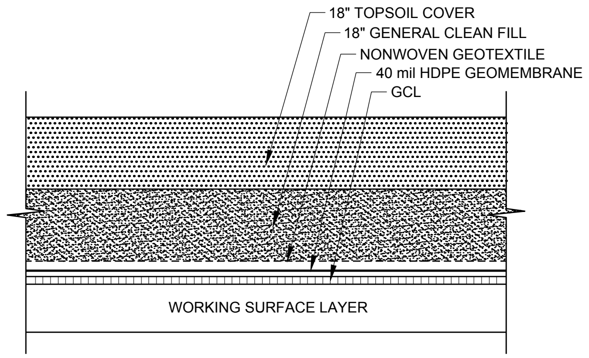
CONSULTANT
Golder Associates

YYYY-MM-DD	2016-10-24
DESIGNED	MGC
PREPARED	MGC
REVIEWED	JBF
APPROVED	JBF

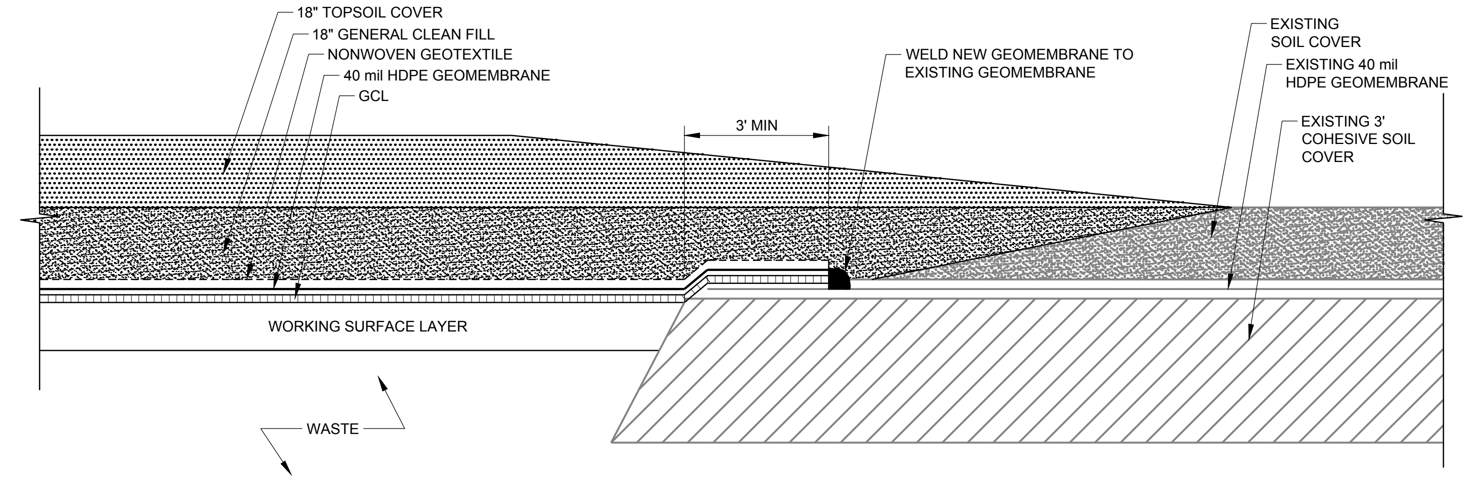
PROJECT
EXIDE TECHNOLOGIES
CAMU ENGINEERING REPORT, TCEQ PERMIT HW-50206
FRISCO, COLLIN COUNTY, TEXAS

TITLE
RISER HOUSE DETAILS

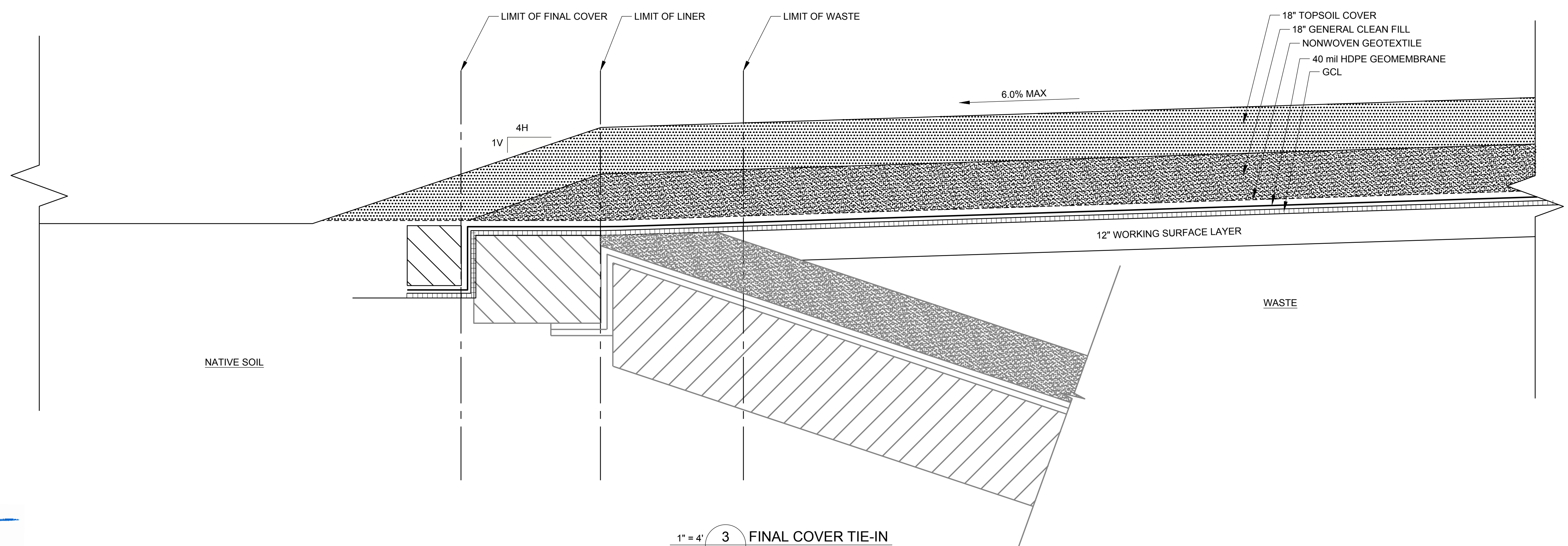
PROJECT NO.	PHASE	REV.	FIGURE
1302086-02	V	0	V.G-8



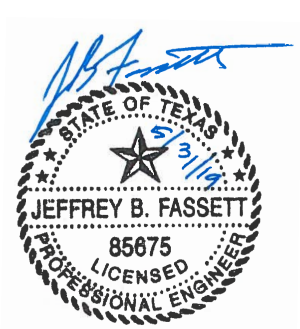
1" = 4' 1 / 1 FINAL COVER DETAIL



1" = 4' 2 / 1 FINAL COVER TIE-IN DETAIL



1" = 4' 3 / 1 FINAL COVER TIE-IN



GOLDER ASSOCIATES INC.
TEXAS REGISTRATION F-2578

CLIENT	EXIDE TECHNOLOGIES
CONSULTANT	GOLDER
YYYY-MM-DD	2015-08-17
DESIGNED	TNB
PREPARED	TNB
REVIEWED	JBF
APPROVED	JBF
PROJECT	EXIDE RECYCLING CENTER ON-SITE INDUSTRIAL CLASS 2 LANDFILL CAMU FINAL COVER SYSTEM
TITLE	**FINAL COVER DETAILS**
PROJECT NO.	1302086
REV.	0
FIGURE	V.G-9

ATTACHMENT A

NOTIFICATION OF AN ONSITE CLASS 2 INDUSTRIAL WASTE LANDFILL

NOTIFICATION OF AN ON-SITE CLASS II INDUSTRIAL WASTE LANDFILL

GNB Class II Industrial Landfill
Frisco, Texas

Volume 1 of 1

September 1995

GNB Technologies, Inc.

JONES & NEUSE

GULF COAST REGION OF RMT

RMT/JONES & NEUSE, INC. – AUSTIN, TX
912 CAPITAL OF TEXAS HIGHWAY SOUTH · SUITE 300 · 78746-5210
512/327-9840 · 512/327-6163 FAX

|G|N|B|
TECHNOLOGIES INC.
A Pacific Dunlop Company
7471 South Fifth Street
P.O.Box 250
Frisco, TX 75034
Telephone 214-335-2121
Facsimile 214-377-2707

RECEIVED
SEP 1 1995
Industrial & Hazardous Waste Division
PERMITS SECTION

August 30, 1995

Kerri Bourland, Acting Manager
Industrial & Hazardous Waste Permits Section
Texas Natural Resource Conservation Commission
P.O.Box 13087
Austin, TX 78711-3087

Re: Notification of On-Site Industrial Class II Landfill
GNB Frisco Facility
Solid Waste Registration No. 30516.

Dear Ms. Bourland:

Enclosed are four copies of the notification to the Texas Natural Resource Conservation Commission (TNRCC) of proposed on-site Class II industrial waste landfill at the GNB Frisco facility. The notification addresses those items required under 30 TAC 335.6(a) and has been coordinated with Mr. Tom Weirich of your staff.

GNB Technologies plans to put out bids for construction of the landfill in September, 1995 and begin construction of the landfill in November, 1995. Waste disposal activities will begin no sooner than 90 days from the date of this letter. GNB would appreciate any comments or concerns on major issues as soon as possible to avoid delays in construction.

Please contact me at (214) 335-2121 or Mary Adrian, P.E. of RMT/Jones and Neuse at (512) 327-9840 if you have any questions regarding the submittal.

Sincerely,

Larry G. Eagan

Larry G. Eagan
Director South Central Region

cc: Tom Weirich, Facility Team I
Mary Adrian, P.E., RMT/Jones and Neuse

NOTIFICATION OF
ON-SITE CLASS II
INDUSTRIAL WASTE LANDFILL

GNB TECHNOLOGIES
FRISCO, TEXAS

AUGUST 1995

JONES & NEUSE

GULF COAST REGION OF RMT

RMT/JONES & NEUSE, INC. – AUSTIN, TX
912 CAPITAL OF TEXAS HIGHWAY SOUTH - SUITE 300 - 78746-5210
512/327-9840 - 512/327-6163 FAX

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Section 1
INTRODUCTION

GNB Battery Technologies, Inc. (GNB), located in Frisco, Texas, is planning to construct a Class II industrial waste landfill at its facility, to be used for the on-site disposal of stabilized iron-silica slag generated from the pyrometallurgical operation of the blast furnace. Construction of the landfill will begin approximately 90 days after the submittal of this notification to the Texas Natural Resource Conservation Commission (TNRCC), and the landfill will begin accepting waste after construction of the first cell is completed.

This notification is being submitted to the TNRCC pursuant to 30 Texas Administrative Code (TAC) Section 335.6(a). The regulations require that the following information be included in the notification:

- Waste management methods;
- Waste composition;
- Engineering plans and specifications; and
- Site geology.

This notification was developed in accordance with 30 TAC 335.6(a) and the TNRCC's Draft Technical Guideline No. 3 and includes the following sections:

- General Site Information (Section 2),
- Waste Composition (Section 3),
- Waste Management Methods (Section 4),
- Site Geology (Section 5),
- Engineering Plans and Specifications (Section 6),
- Landfill Operations Plan (Section 7),
- Ground-Water Monitoring Plan (Section 8), and
- Closure and Post-Closure Plan.

Appendices to this report include, among other information, a Soils and Liner Quality Control Plan (Appendix 6-B), and the facility's Stormwater Management Plan (Appendix 7-B).

The proposed design and operation of the Class II industrial landfill complies with all regulatory requirements and TNRCC's technical design guidelines.

Section 2
GENERAL SITE INFORMATION

2.1 Site Location

The GNB facility is located at 7471 South Fifth Street in Frisco, Texas. A site location map is presented in Figure 2-1. The site is located in western Collin County about one mile south of the City of Frisco and 20 miles north of Dallas. Land use in the immediate area of the facility is primarily agricultural, with the nearest residence located approximately 1/2 mile north of the facility.

2.2 Site Topography and Drainage

The facility is located in the Black Prairie physiographic subdivision, which is characterized by gently rolling surfaces and few trees. A topographic map of the area is presented in Figure 2-2. Surface water drainage at the facility is towards Stewart Creek and its tributary, which flows westerly through the GNB facility property. A Federal Emergency Management Agency (FEMA) floodplain map is provided in Figure 2-4. A more detailed discussion of stormwater management is provided in Section 7 - Landfill Operations Plan and Appendix 7-B (Stormwater Management Plan).

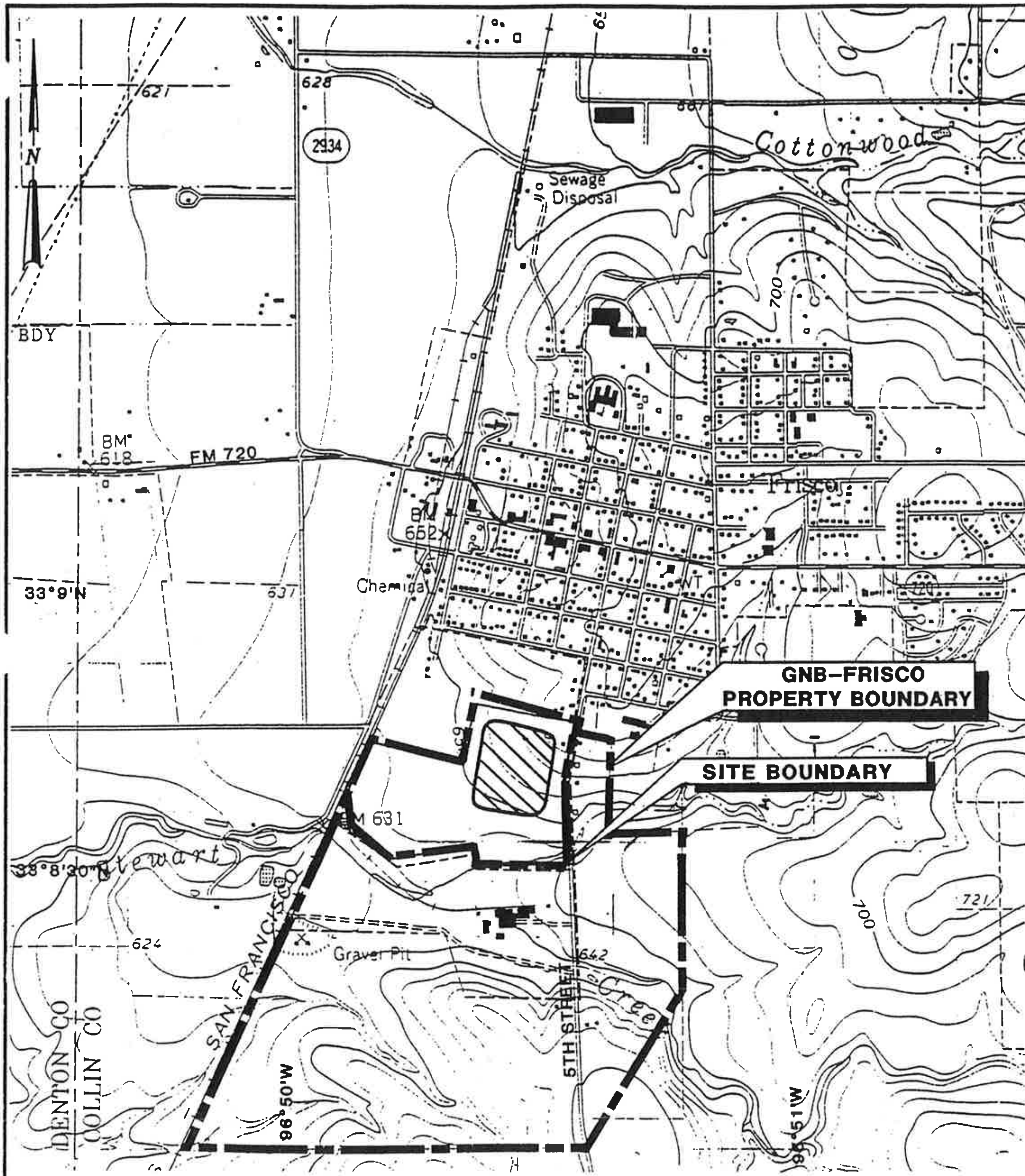
2.3 Facility Operations

GNB in Frisco is a battery reclamation facility. Spent automobile and industrial batteries are the primary source of fuel to the operation, GNB also receives quantities of scrap lead and other lead-bearing materials. The facility's operations yield three products: soft lead, hard lead (alloys), and lead oxide. A process flow diagram for the pyrometallurical/refining operations, which generate the slag to be disposed in the landfill, is presented in Figure 2-3. The facility has both reverberatory and blast furnaces. Iron-silica slag produced from the blast furnace is treated and disposed in an on-site Class II landfill.

The batteries received by GNB are crushed and the component parts separated by gravity in a water bath. The lead-bearing material from the batteries are rinsed and dewatered to remove residual sulfuric acid before being stored in the raw material storage area or the raw material storage building along with other lead-bearing scraps. Material to be fed to the reverberatory furnace is first mixed inside the raw material storage building and then dried in a natural gas fired dryer to remove moisture and residual sulfuric acid.

The material is taken from the storage areas and charged to either the blast furnace or the reverberatory furnace via a front end loader. Slag from the reverberatory furnace, drosses from refining operations, and stormwater/wastewater treatment sludge become feed for the reverb furnace. Slag from the blast furnace is taken by front end loader to the Slag Treatment Building, where it is crushed, screened, and mixed with cement, water, and a patented stabilization agent to chemically fix the remaining lead content in a non-leachable form. The slag treatment operations are conducted under a water mist for particulate emissions control. The slag stabilization operates 8 hours a day, 5 days a week, 49 weeks a year, and stabilizes approximately 8,700 tons of slag per year.

More information on the composition of the waste after stabilization and waste management practices relating to the landfill are presented in the following sections.



50-01518.10

07/28/95

SCALE IN FEET

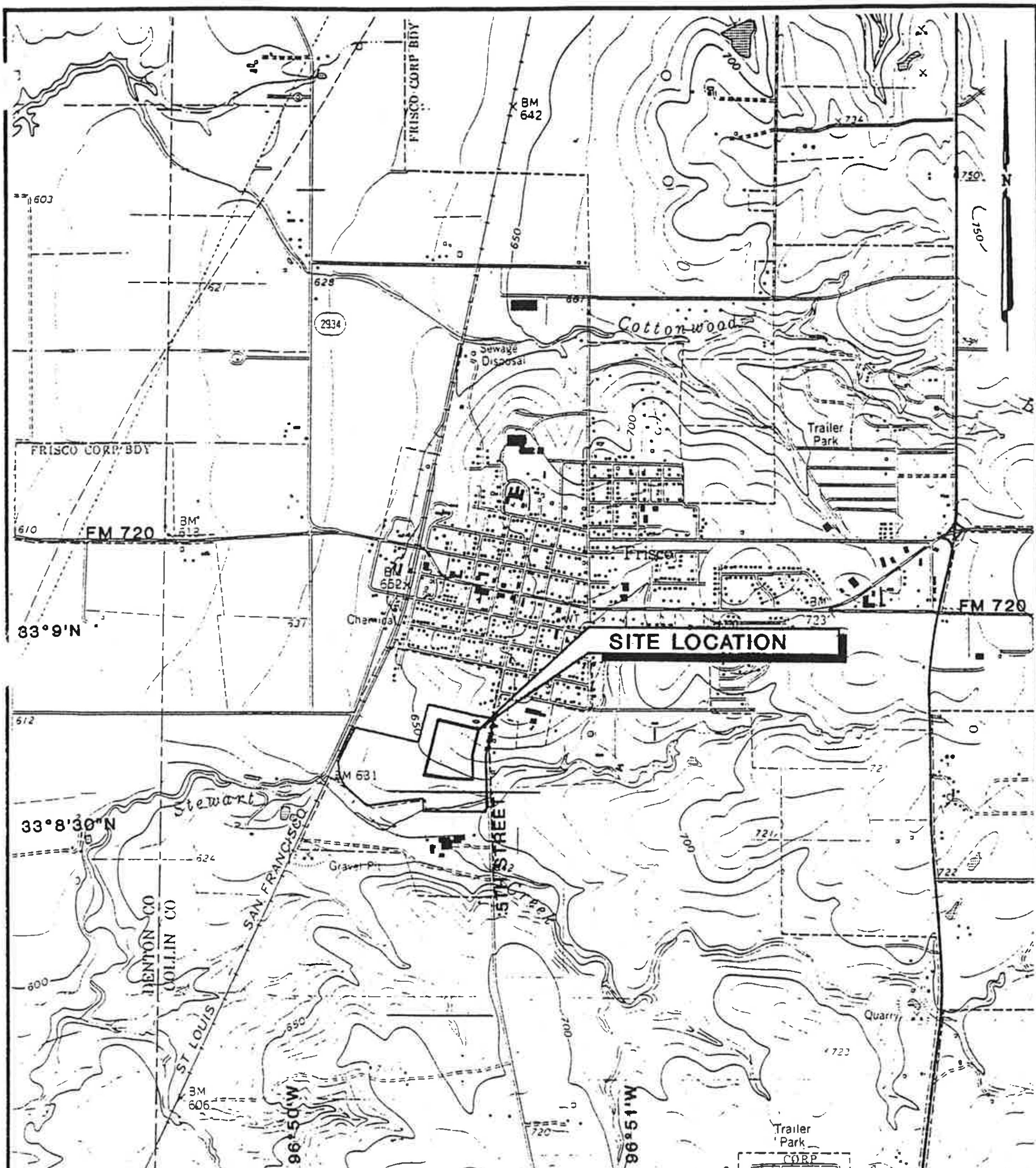
2000 1000 0 2000

FIGURE 2-1
SITE LOCATION MAP
GNB TECHNOLOGIES, INC.
PROPOSED CLASS II INDUSTRIAL LANDFILL

JONES & NEUSE
GULF COAST REGION OF RMT

BASE MAP TAKEN FROM USGS 7.5' FRISCO QUADRANGLE

TITLEBLK.DWG/AWM



50-01518.10

07/24/95

SCALE IN FEET

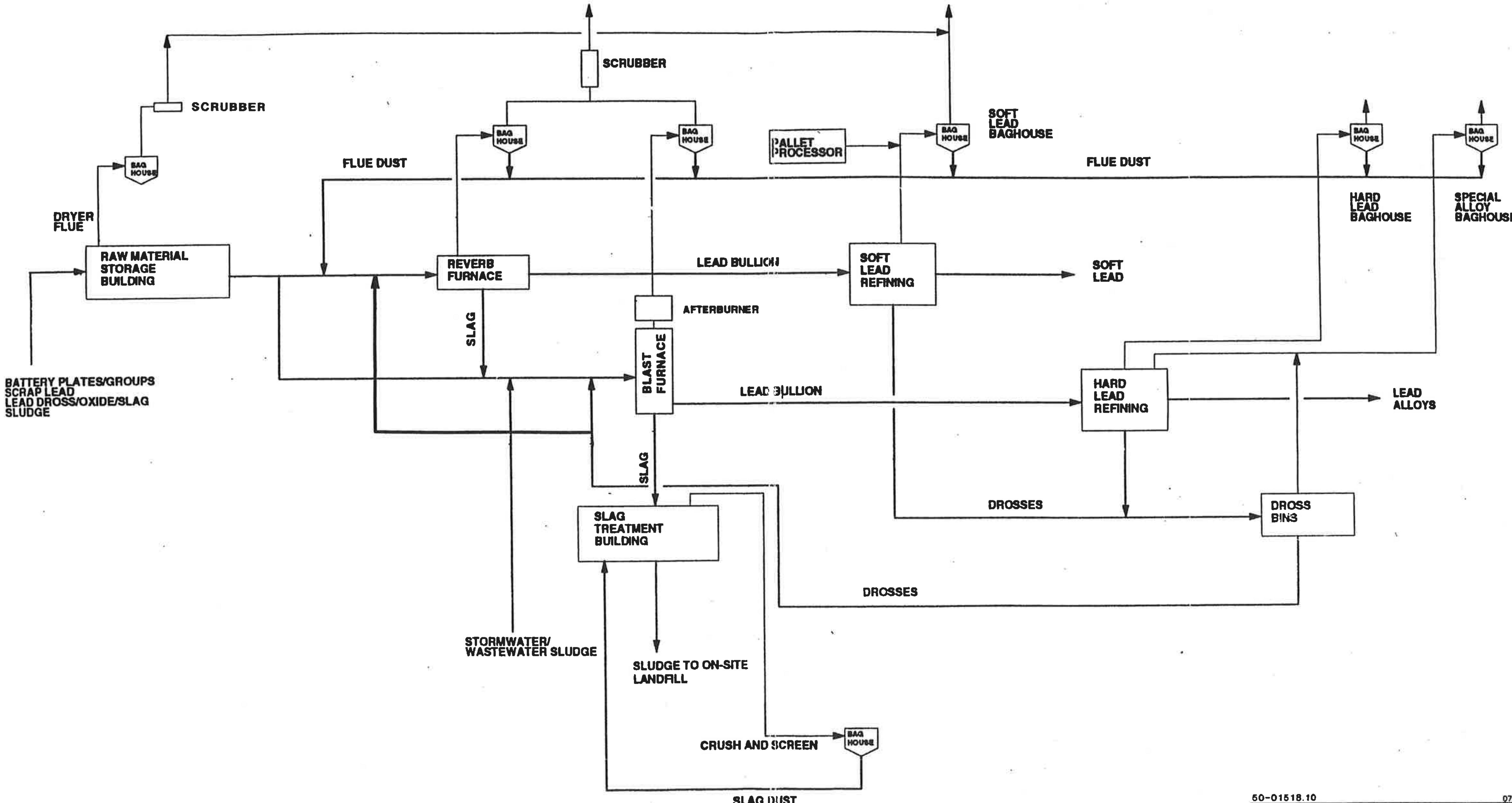
2000 1000 0 2000

SOURCE: USGS 7.5' FRISCO QUADRANGLE

C:\TITLEBLK.DWG/AW1

FIGURE 2-2
GENERAL TOPOGRAPHIC MAP
GNB TECHNOLOGIES, INC.
PROPOSED CLASS II INDUSTRIAL LANDFILL

JONES & NEUSE
GULF COAST REGION OF RMT



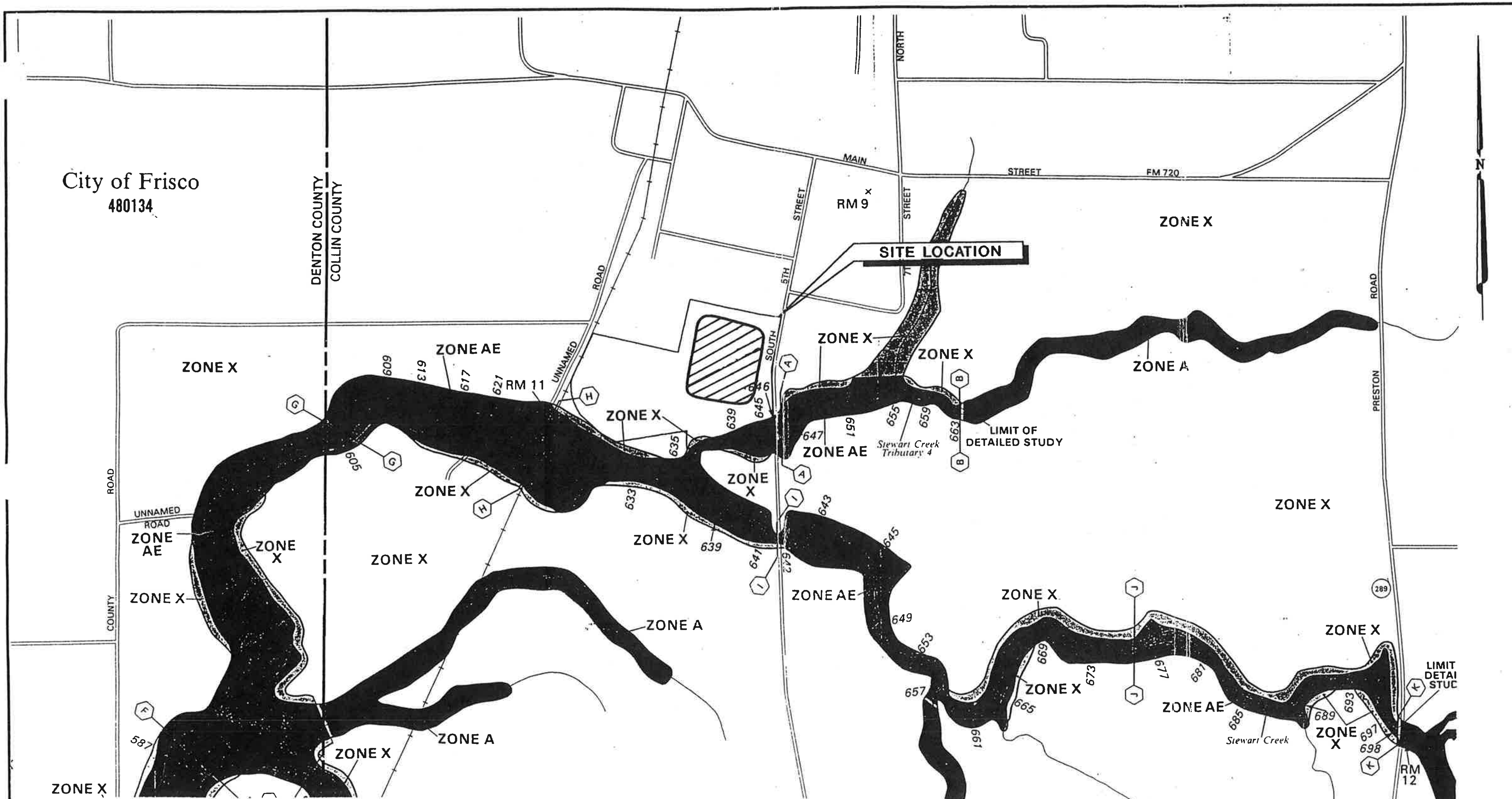
50-01518.10

07/20/95

FIGURE 2-3
PROCESS FLOW DIAGRAM
GNB TECHNOLOGIES, INC.
PROPOSED CLASS II INDUSTRIAL LANDFILL

JONES & NEUSE
GULF COAST REGION OF RMT

C:\TITLEBLK.DWG/AWJ



SCALE IN FEET

1000 500 0 1000

50-01584.13

07/27/95

FIGURE 2-4
FEMA FLOODPLAIN MAP
GNB TECHNOLOGIES, INC.
PROPOSED CLASS II INDUSTRIAL LANDFILL

JONES & NEUSE
GULF COAST REGION OF RMT

SOURCE: FLOOD INSURANCE RATE MAP PREPARED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY, NUMBER 480134-PANEL 245, 1991.

TITLEBLK.DWG/A

Section 3
WASTE COMPOSITION

The waste proposed for disposal is iron-silica slag generated from the operation of the facility's blast furnace. The slag is treated in the Slag Treatment Building.

Treated slag, which is described in detail in Section 4 (Waste Management Practices), the waste is classified as a Class II industrial waste. Treatment of the slag waste has been performed for a number of years at the facility. In July, 1995, the treatment process was changed to use the RMT Metals Technology Process, which is a patented process described in the next section. Analytical data from samples after fixation using 7 percent cement and 7 percent Enviro-Blend, which is a patented additive, are presented in Appendix 3-A and summarized in Table 3-1. TCLP concentrations for lead ranged from <0.1 mg/l to 0.8 mg/l. In accordance with 30 TAC Subchapter R, industrial wastes with leachable lead concentrations less than 1.5 mg/l are defined as Class II wastes. The data documents that the treated slag waste is appropriately classified as a Class II industrial waste.

Table 3-1

Analytical Results for Treated Slag Waste
(7% Cement and 7% Enviro-Blend)

Sample Number	TCLP Lead (mg/l)
EB1128101	<0.1
EB1128102	<0.1
EB1128103	0.4
EB1128104	0.5
EB1128105	0.5
EB1128106	0.5
EB1128107	0.6
EB1128108	0.5
EB1128109	0.6
EB1128110	<0.1
EB1129111	<0.1
EB1129112	0.4
EB122113	<0.1
EB122114	<0.1
EB122115	0.4
EB122116	<0.1
EB122117	0.3
EB122118	<0.1
EB122119	<0.1
EB120	<0.1
EB125121	<0.1
EB125122	<0.1
EB125123	<0.1
EB125124	0.2
EB125125	<0.1
EB125126	<0.1
EB125127	<0.1
EB125128	<0.1
EB125129	<0.1
EB125130	<0.1
EB125131	0.2
EB125132	<0.1
EB127133	<0.1

Table 3-1 (continued)

Analytical Results for Treated Slag Waste
(7% Cement and 7% Enviroblend)

Sample Number	TCLP Lead (mg/l)
EB127134	<0.1
EB127135	<0.1
EB127136	0.2
EB127137	0.2
EB127138	0.2
EB127139	0.3
EB127140	0.3
EB127142	0.3
EB128143	0.3
EB128144	0.2
EB128145	0.3
EB128146	<0.1
EB128147	<0.1
EB128148	<0.1
EB128149	<0.1
EB128150	<0.1
EB128151	<0.1
EB128152	<0.1
EB128153	0.8
EB128154	<0.1

Appendix 3-A

ANALYTICAL RESULTS FOR WASTE TREATED USING RMT TECHNOLOGY

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Project No. 02-7767.00

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,694 - Soil Grab EB1128101
Sample No. 204,695 - TCLP Extract of 204694

Client Sample I.D.	EB1128101	EB1128101
Sample Number	204,694	204,695
Date Collected	11/28/94	
Time Collected	0730	
Date Received	12/20/94	12/20/94
Lead		<0.1
CLP Extraction Begun	12/21/94	

All units are mg/l unless noted.

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Samples 101 - 154 run w/ 7% Enviroblend
7% Cement.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,696 - Soil Grab EB1128102
Sample No. 204,697 - TCLP Extract of 204696

Client Sample I.D.	EB1128102	EB1128102
Sample Number	204,696	204,697
Date Collected	11/28/94	
Time Collected	0730	
Date Received	12/20/94	12/20/94
Lead		<0.1
TCLP Extraction Begun	12/21/94	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,698 - Soil Grab EB1128103
Sample No. 204,699 - TCLP Extract of 204698

Client Sample I.D.	EB1128103	EB1128103
Sample Number	204,698	204,699
Date Collected	11/28/94	
Time Collected	0730	
Date Received	12/20/94	12/20/94
Lead		0.4
'CLP Extraction Begun	12/27/94	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,700 - Soil Grab EB1128104
Sample No. 204,701 - TCLP Extract of 204700

Client Sample I.D.	EB1128104	EB1128104
Sample Number	204,700	204,701
Date Collected	11/28/94	
Time Collected	0730	
Date Received	12/20/94	12/20/94
Lead		0.5
'CLP Extraction Begun	12/27/94	

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,702 - Soil Grab EB1129105
Sample No. 204,703 - TCLP Extract of 204702

Client Sample I.D.	EB1129105	EB1129105
Sample Number	204,702	204,703
Date Collected	11/29/94	
Time Collected	0730	
Date Received	12/20/94	12/20/94
Lead		0.5
TCLP Extraction Begun	12/27/94	

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,704 - Soil Grab EB1129106
Sample No. 204,705 - TCLP Extract of 204704

Client Sample I.D.	EB1128106	EB1128106
Sample Number	204,704	204,705
Date Collected	11/29/94	
Time Collected	0800	
Date Received	12/20/94	12/20/94
Lead		0.5
CLP Extraction Begun	12/27/94	

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,706 - Soil Grab EB1129107
Sample No. 204,707 - TCLP Extract of 204706

Client Sample I.D.	EB1128107	EB1128107
Sample Number	204,706	204,707
Date Collected	11/29/94	
Time Collected	0800	
Date Received	12/20/94	12/20/94
Lead		0.6
CLP Extraction Begun	12/27/94	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,708 - Soil Grab EB1129108
Sample No. 204,709 - TCLP Extract of 204708

Client Sample I.D.	EB1128108	EB1128108
Sample Number	204,708	204,709
Date Collected	11/29/94	
Time Collected	0800	
Date Received	12/20/94	12/20/94
Lead		0.5
CLP Extraction Begun	12/27/94	

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,710 - Soil Grab EB1129109
Sample No. 204,711 - TCLP Extract of 204710

Client Sample I.D.	EB1128109	EB1128109
Sample Number	204,710	204,711
Date Collected	11/29/94	
Time Collected	0800	
Date Received	12/20/94	12/20/94
Lead		0.6
TCLP Extraction Begun	12/27/94	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,730 - Soil Grab EB110
Sample No. 204,731 - TCLP Extract of 204730

Client Sample I.D.	EB110	EB110
Sample Number	204,730	204,731
Date Collected	11/29/94	
Time Collected	NR	
Date Received	12/20/94	12/20/94
Lead		<0.1
TCLP Extraction Begun	12/29/94	

All units are mg/l unless noted.
NR: Not reported.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,712 - Soil Grab EB1129111
Sample No. 204,713 - TCLP Extract of 204712

Client Sample I.D.	EB1129111	EB1129111
Sample Number	204,712	204,713
Date Collected	11/29/94	
Time Collected	0800	
Date Received	12/20/94	12/20/94
Lead		<0.1
TCLP Extraction Begun	12/27/94	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,714 - Soil Grab EB1129112
Sample No. 204,715 - TCLP Extract of 204714

Client Sample I.D.	EB1129112	EB1129112
Sample Number	204,714	204,715
Date Collected	11/29/00	
Time Collected	0800	
Date Received	12/20/94	12/20/94
Lead		0.4
TCLP Extraction Begun	12/27/94	

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,716 - Soil Grab EB122113
Sample No. 204,717 - TCLP Extract of 204716

Client Sample I.D.	EB122113	EB122113
Sample Number	204,716	204,717
Date Collected	12/02/94	
Time Collected	0900	
Date Received	12/20/94	12/20/94
Lead		<0.1
TCLP Extraction Begun	12/28/94	

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,718 - Soil Grab EB122114
Sample No. 204,719 - TCLP Extract of 204718

Client Sample I.D.	EB122114	EB122114
Sample Number	204,718	204,719
Date Collected	12/02/94	
Time Collected	0900	
Date Received	12/20/94	12/20/94
Lead		<0.1
TCLP Extraction Begun	12/28/94	

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,720 - Soil Grab EB122115
Sample No. 204,721 - TCLP Extract of 204720

Client Sample I.D.	EB122115	EB122115
Sample Number	204,720	204,721
Date Collected	12/02/94	
Time Collected	0900	
Date Received	12/20/94	12/20/94
Lead		0.4
TCLP Extraction Begun	12/28/94	

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,722 - Soil Grab EB122116
Sample No. 204,723 - TCLP Extract of 204722

Client Sample I.D.	EB122116	EB122116
Sample Number	204,722	204,723
Date Collected	12/02/94	
Time Collected	0900	
Date Received	12/20/94	12/20/94
Lead		<0.1
CLP Extraction Begun	12/28/94	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,724 - Soil Grab EB122117
Sample No. 204,725 - TCLP Extract of 204724

Client Sample I.D.	EB122117	EB122117
Sample Number	204,724	204,725
Date Collected	12/02/94	
Time Collected	0900	
Date Received	12/20/94	12/20/94
Lead		0.3
TCLP Extraction Begun	12/28/94	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,726 - Soil Grab EB122118
Sample No. 204,727 - TCLP Extract of 204726

Client Sample I.D.	EB122118	EB122118
Sample Number	204,726	204,727
Date Collected	12/02/94	
Time Collected	0900	
Date Received	12/20/94	12/20/94
Lead		<0.1
CLP Extraction Begun	12/29/94	

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,728 - Soil Grab EB122119
Sample No. 204,729 - TCLP Extract of 204728

Client Sample I.D.	EB122119	EB122119
Sample Number	204,728	204,729
Date Collected	12/02/94	
Time Collected	0900	
Date Received	12/20/94	12/20/94
Lead		<0.1
CLP Extraction Begun	12/29/94	

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,732 - Soil Grab EB120
Sample No. 204,733 - TCLP Extract of 204732

Client Sample I.D.	EB120	EB120
Sample Number	204,732	204,733
Date Collected	12/02/94	
Time Collected	NR	
Date Received	12/20/94	12/20/94
Lead		<0.1
TCLP Extraction Begun	12/29/94	

All units are mg/l unless noted.
NR: Not reported.

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January 9, 1995
Project No. 02-7767.00

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,901 - Soil Grab EB125121
Sample No. 204,902 - TCLP Extract of 204901

Client Sample I.D.	EB125121	EB125121
Sample Number	204,901	204,902
Date Collected	12/05/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
TCLP Extraction Begun	1/4/95	

All units are mg/l unless noted.

Mary Louise Lui

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,903 - Soil Grab EB125122
Sample No. 204,904 - TCLP Extract of 204903

Client Sample I.D.	EB125122	EB125122
Sample Number	204,903	204,904
Date Collected	12/05/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
CLP Extraction Begun	1/4/95	

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Mary Louise [illegible]

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,905 - Soil Grab EB125123
Sample No. 204,906 - TCLP Extract of 204905

Client Sample I.D.	EB125123	EB125123
Sample Number	204,905	204,906
Date Collected	12/05/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
TCLP Extraction Begun	1/4/95	

All units are mg/l unless noted.

Mary Louise Lewis

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,907 - Soil Grab EB125124
Sample No. 204,908 - TCLP Extract of 204907

Client Sample I.D.	EB125124	EB125124
Sample Number	204,907	204,908
Date Collected	12/05/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		0.2
CLP Extraction Begun	1/5/95	

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Mary Louise Levin

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,909 - Soil Grab EB125125
Sample No. 204,910 - TCLP Extract of 204909

Client Sample I.D.	EB125125	EB125125
Sample Number	204,909	204,910
Date Collected	12/05/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
TCLP Extraction Begun	1/5/95	

All units are mg/l unless noted.

Mary Louise [illegible]

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,891 - Soil Grab EB125126
Sample No. 204,892 - TCLP Extract of 204891

Client Sample I.D.	EB125126	EB125126
Sample Number	204,891	204,892
Date Collected	12/05/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
CLP Extraction Begun	1/4/95	

All units are mg/l unless noted.

Mary-Louise L...

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,893 - Soil Grab EB125127
Sample No. 204,894 - TCLP Extract of 204893

Client Sample I.D.	EB125127	EB125127
Sample Number	204,893	204,894
Date Collected	12/05/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
TCLP Extraction Begun	1/4/95	

All units are mg/l unless noted.

Mary Louise L...

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,895 - Soil Grab EB125128
Sample No. 204,896 - TCLP Extract of 204895

Client Sample I.D.	EB125128	EB125128
Sample Number	204,895	204,896
Date Collected	12/05/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
TCLP Extraction Begun	1/4/95	

All units are mg/l unless noted.

Mary Louise Lain

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,897 - Soil Grab EB125129
Sample No. 204,898 - TCLP Extract of 204897

Client Sample I.D.	EB125129	EB125129
Sample Number	204,897	204,898
Date Collected	12/05/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
CLP Extraction Begun	1/4/95	

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,899 - Soil Grab EB125130
Sample No. 204,900 - TCLP Extract of 204899

Client Sample I.D.	EB125130	EB125130
Sample Number	204,899	204,900
Date Collected	12/05/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
'CLP Extraction Begun	1/4/95	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,881 - Soil Grab EB125131
Sample No. 204,882 - TCLP Extract of 204881

Client Sample I.D.	EB125131	EB125131
Sample Number	204,881	204,882
Date Collected	12/05/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		0.2
CLP Extraction Begun	1/3/95	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,883 - Soil Grab EB125132
Sample No. 204,884 - TCLP Extract of 204883

Client Sample I.D.	EB125132	EB125132
Sample Number	204,883	204,884
Date Collected	12/05/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
CLP Extraction Begun	1/4/95	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,885 - Soil Grab EB127133
Sample No. 204,886 - TCLP Extract of 204885

Client Sample I.D.	EB127133	EB127133
Sample Number	204,885	204,886
Date Collected	12/07/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
'CLP Extraction Begun	1/4/95	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,887 - Soil Grab EB127134
Sample No. 204,888 - TCLP Extract of 204887

Client Sample I.D.	EB127134	EB127134
Sample Number	204,887	204,888
Date Collected	12/07/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
TCLP Extraction Begun	1/4/95	

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Mary Louise L—

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,889 - Soil Grab EB127135
Sample No. 204,890 - TCLP Extract of 204889

Client Sample I.D.	EB127135	EB127135
Sample Number	204,889	204,890
Date Collected	12/07/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
CLP Extraction Begun	1/4/95	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,871 - Soil Grab EB127136

Client Sample I.D.	EB127136
Sample Number	204,871
Date Collected	12/07/94
Time Collected	NR
Date Received	12/22/94
TCLP Extraction Begun	1/3/95

.ll units are mg/l unless noted.
NR: Not reported.

Mary Louise Levin

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,872 - TCLP Extract of 204871

Client Sample I.D.	EB127136
Sample Number	204,872
Date Collected	
Time Collected	
Date Received	12/22/94
Lead	0.2

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Mary Louise Lewis

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,873 - Soil Grab EB127137
Sample No. 204,874 - TCLP Extract of 204873

Client Sample I.D.	EB127137	EB127137
Sample Number	204,873	204,874
Date Collected	12/07/94	
Time Collected	NR	
Date Received	12/22/94	12/22/94
Lead		0.2
TCLP Extraction Begun	1/3/95	

All units are mg/l unless noted.
NR: Not reported.

Mary Louise [illegible]

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,875 - Soil Grab EB127138
Sample No. 204,876 - TCLP Extract of 204875

Client Sample I.D.	EB127138	EB127138
Sample Number	204,875	204,876
Date Collected	12/07/94	
Time Collected	NR	
Date Received	12/22/94	12/22/94
Lead		0.2
TCLP Extraction Begun	1/3/95	

All units are mg/l unless noted.
NR: Not reported.

Mary Louise ...

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,877 - Soil Grab EB127139
Sample No. 204,878 - TCLP Extract of 204877

Client Sample I.D.	EB127139	EB127139
Sample Number	204,877	204,878
Date Collected	12/07/94	
Time Collected	NR	
Date Received	12/22/94	12/22/94
Lead		0.3
TCLP Extraction Begun	1/3/95	

All units are mg/l unless noted.
NR: Not reported.

Mary Louise [illegible]

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,879 - Soil Grab EB127140
Sample No. 204,880 - TCLP Extract of 204879

Client Sample I.D.	EB127140	EB127140
Sample Number	204,879	204,880
Date Collected	12/07/94	
Time Collected	NR	
Date Received	12/22/94	12/22/94
Lead		0.3
CLP Extraction Begun	1/3/95	

All units are mg/l unless noted.
NR: Not reported.

Mary Louise ...

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January 5, 1995
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ANALYTICAL REPORT

Sample Description:
Sample No. 204,863 - Soil Grab EB127142
Sample No. 204,864 - TCLP Extract of 204863

Client Sample I.D.	EB127142	EB127142
Sample Number	204,863	204,864
Date Collected	12/07/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		0.3
TCLP Extraction Begun	1/3/95	

All units are mg/l unless noted.

Mary Louise [illegible]

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January 5, 1995
Project No. 02-7767.00

Mr. James Messer
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7471 South Fifth Street, P. O. Box 250
Frisco, TX 75034

ANALYTICAL REPORT

Sample Description:
Sample No. 204,865 - Soil Grab EB128143
Sample No. 204,866 - TCLP Extract of 204865

Client Sample I.D.	EB128143	EB128143
Sample Number	204,865	204,866
Date Collected	12/07/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		0.3
TCLP Extraction Begun	1/3/95	

All units are mg/l unless noted.

Mary Louise Lum

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,867 - Soil Grab EB128144
Sample No. 204,868 - TCLP Extract of 204867

Client Sample I.D.	EB128144	EB128144
Sample Number	204,867	204,868
Date Collected	12/07/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		0.2
TCLP Extraction Begun	1/3/95	

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,869 - Soil Grab EB128145
Sample No. 204,870 - TCLP Extract of 204869

Client Sample I.D.	EB128145	EB128145
Sample Number	204,869	204,870
Date Collected	12/07/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		0.3
CLP Extraction Begun	1/3/95	

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,851 - Soil Grab EB128146
Sample No. 204,852 - TCLP Extract of 204851

Client Sample I.D.	EB128146	EB128146
Sample Number	204,851	204,852
Date Collected	12/08/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
TCLP Extraction Begun	12/29/94	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,853 - Soil Grab EB128147
Sample No. 204,854 - TCLP Extract of 204853

Client Sample I.D.	EB128147	EB128147
Sample Number	204,853	204,854
Date Collected	12/08/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
TCLP Extraction Begun	12/29/94	

All units are mg/l unless noted.

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January 5, 1995
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ANALYTICAL REPORT

Sample Description:
Sample No. 204,855 - Soil Grab EB128148
Sample No. 204,856 - TCLP Extract of 204855

Client Sample I.D.	EB128148	EB128148
Sample Number	204,855	204,856
Date Collected	12/08/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
TCLP Extraction Begun	12/29/94	

All units are mg/l unless noted.

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January 5, 1995
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ANALYTICAL REPORT

Sample Description:
Sample No. 204,857 - Soil Grab EB128149
Sample No. 204,858 - TCLP Extract of 204857

Client Sample I.D.	EB128149	EB128149
Sample Number	204,857	204,858
Date Collected	12/08/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
TCLP Extraction Begun	12/29/94	

All units are mg/l unless noted.

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January 5, 1995
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Mr. James Messer
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ANALYTICAL REPORT

Sample Description:
Sample No. 204,859 - Soil Grab EB128150
Sample No. 204,860 - TCLP Extract of 204859

Client Sample I.D.	EB128150	EB128150
Sample Number	204,859	204,860
Date Collected	12/08/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
TCLP Extraction Begun	12/29/94	

All units are mg/l unless noted.

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January 9, 1995
Project No. 02-7767.00

Mr. James Messer
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Frisco, TX 75034

ANALYTICAL REPORT

Sample Description:
Sample No. 204,911 - Soil Grab EB128151
Sample No. 204,912 - TCLP Extract of 204911

Client Sample I.D.	EB128151	EB128151
Sample Number	204,911	204,912
Date Collected	12/08/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
TCLP Extraction Begun	1/5/95	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,913 - Soil Grab EB128152
Sample No. 204,914 - TCLP Extract of 204913

Client Sample I.D.	EB128152	EB128152
Sample Number	204,913	204,914
Date Collected	12/08/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
TCLP Extraction Begun	1/5/95	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,915 - Soil Grab EB128153
Sample No. 204,916 - TCLP Extract of 204915

Client Sample I.D.	EB128153	EB128153
Sample Number	204,915	204,916
Date Collected	12/08/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		0.8
CLP Extraction Begun	1/5/95	

All units are mg/l unless noted.

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ANALYTICAL REPORT

Sample Description:
Sample No. 204,917 - Soil Grab EB128154
Sample No. 204,918 - TCLP Extract of 204917

Client Sample I.D.	EB128154	EB128154
Sample Number	204,917	204,918
Date Collected	12/08/94	
Time Collected	0800	
Date Received	12/22/94	12/22/94
Lead		<0.1
CLP Extraction Begun	1/5/95	

All units are mg/l unless noted.

Mary Louise [illegible]

Section 4
WASTE MANAGEMENT PRACTICES

The iron-silica slag from the blast furnace is stabilized using cement and a patented fixation agent Enviro-Blend. This process renders the lead slag Class II non-hazardous, with resulting TCLP lead concentrations typically less than 0.5 mg/l (see Appendix 3-A). The treatment is performed within a tank in the Slag Treatment Building. The Class II waste is then placed into a truck for transport to the Class II landfill.

4.1 Past and Current Waste Management

The GNB Frisco facility generates several waste streams from normal plant operations. These waste streams include: 1) iron silica slag; 2) flue dust; and 3) sulfuric acid effluent. The iron silica slag is produced from operation of the blast furnace. The flue dust is generated from the baghouse collection system and is recycled back into the plant's reverberatory furnace. The sulfuric acid is generated from the breaking of batteries at the battery breaker building. The sulfuric acid effluent from this process is treated in the on-site wastewater pretreatment facility prior to discharge to the City of Frisco's Publically-Owned Treatment Works. Of the waste streams noted above, only the iron silica slag will be disposed into the proposed landfill.

Based on discussions with plant personnel, the GNB facility generated 6,900 tons of iron silica slag a year during the alter 1980's and early 1990's. In 1993, the amount of raw slag generated by the facility had increased to 8,676 tons. Plant production and consequently raw slag production are not expected to increase significantly above the 1993 production over the next few years. The bulk density of the slag prior to stabilization is approximately 271 pounds per cubic foot, resulting in a volume of slag of 4,414 cubic yards per year. It is estimated that stabilization using Enviro-Blend increases the volume by 20 percent, resulting in approximately 5,300 cubic yards of treated slag waste being placed in the landfill each year. To be conservative, it is assumed that 6,000 cubic yards of Class II waste will be disposed in the landfill each year.

Prior to 1990, the iron silica slag was classified as Class III nonhazardous waste based on testing results of the Extraction Procedure Toxicity (EP Tox) method. Implementation of the Toxicity Characteristic Leaching Procedure (TCLP) test method in 1990 resulted in the re-classification of the slag as hazardous waste. Process modifications to the slag stabilization in 1993 resulted in the generation of a Class II nonhazardous slag (TNRCC waste code of 00043042).

Modifications to the slag waste stabilization have recently occurred. A mixture of Enviro-Blend and cement is now added to the iron silica slag. Enviro-Blend is a mixture of EnviroPhos and EnviroMag. Based on full-scale testing at the Frisco plant, the use of Enviro-Blend results in a 20 percent increase in the volume of raw slag (compared to a 30 percent volume increase using the previous mixture). Test results of the slag material following addition of the Enviro-Blend/cement mixture have been conducted by GNB. The TCLP lead concentrations in more than 50 samples was less than the TNRCC's criteria for Class II nonhazardous waste (i.e., 1.5 mg/l). Use of Enviro-Blend began at the plant on July 7, 1995.

The slag waste produced by the plant (in the past and with Enviro-Blend) has the consistency of wet concrete. The slag waste is discharged directly from the treatment tank into a dump truck (approximate capacity of four cubic yards) dedicated for slag waste disposal. The dump truck has been modified to reduce spills. When full, the truck carries the slag waste to the north landfill located on GNB property just south of the north tributary of Stewart Creek. The dump truck typically makes three to five trips each working day (volume dependent on plant operations). The slag waste is dumped in the landfill area where it quickly hardens to a concrete-like solid.

4.2 Landfill Life

It is estimated that 6,000 cubic yards of Class II waste will be disposed in the landfill each year. The landfill capacity is approximately 190,000 cubic yards. The projected life of the landfill is therefore estimated to be 31 years.

Section 5
SITE GEOLOGY

5.1 Site Physiographic and Regional Geology

The GNB facility is located near the western border of Collin County, approximately one-half mile south of Frisco, Texas. The facility lies within the Black Prairie subdivision of the Gulf Coastal Plain Physiographic Province. The Black Prairie Physiographic Province subdivision of Texas is characterized by gently undulating surfaces, poor drainage, and few trees.

The Black Prairie subdivision occurs over bedrock of the Upper Cretaceous Eagle Ford Shale, Austin Chalk, Ozan Marl and the Woodbine Formations. Thick calcareous and clayey soils are predominant in this subdivision, and native vegetation is comprised of mixed grass prairies. The Austin Chalk is much more resistant to erosion than the shales and marls on either side. In the regional area near the facility, the Austin Chalk has eroded to form a table blanketed by deep of the Houston Black soil series. The Woodbine Formation, present beneath the Eagle Ford Shale, is the uppermost significant aquifer in the Dallas and Collin County area.

Topography at the facility is relatively flat, sloping gently to the west-southwest, with Stewart Creek located to the south of the facility. Surface water drainage at the facility is toward the south to Stewart Creek, which eventually drains into the Lewisville Lake, a reservoir built on the Elm Fork of the Trinity River.

5.2 Site Geology

Site geological information is available from eighteen soil borings drilled onsite. Ten of the soil borings (B-1 through B-10) were drilled during the first phase of the assessment in February 1995 and the remaining eight (SB-11 through SB-18) were drilled in July 1995 as a second phase of assessment to evaluate the extent of the sand and gravel present at the site. Locations of the soil borings are shown on Figure 5-1. Additional geologic information was obtained from the site Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) prepared by Lake Engineering, Inc. for GNB in May 1991. Subsurface soils collected from the soil borings were described by an onsite geologist. Based on field observations, soils from ground surface to a depth of approximately 20 feet are generally described as brown to gray clay with varying amounts of organic material and weathered chalk fragments.

In eight of the eighteen borings (B-1/LMW-1,2,3,5,8, SB-16, LMW-17, and SB-18), located in the south-southwest portion of the site, some alluvial deposits of sand and gravel were noted during drilling. The thickness of the sand and gravel varied from less than one foot to approximately 4 feet. Geologic cross-sections of the area of the new landfill are shown in Figure 5-2. As seen on this figure, the extent of the sand and gravel appears to be limited to the south and southwest portion of the area of the proposed landfill. The soil boring logs included in the RFI report indicated the presence of the sand and gravel in the soil borings near Stewart Creek, but not in the soil borings located south of the creek. The Eagle Ford shale is present beneath the unconsolidated soils at the site. The shale is described as a dense, hard, gray shale and dips gently to the southeast. The thickness of the shale was not determined during the drilling of the soil borings for the proposed landfill. The soil boring log for monitoring well MW-16, installed as a part of the RFI in 1990, indicated that the shale was present from 19 feet below grade to the total depth of the boring at 266 feet below grade. This data supports published geologic information (V.E. Barnes, 1988) indicating that the Eagle Ford shale is approximately 400 feet thick. The log of this boring is included in Appendix 5-A.

5.3 Site Hydrogeology

During the first phase of the assessment, piezometers were constructed in nine of the soil borings (B-1 through B-5 and B-7 through B-10) drilled at the site. Figure 5-1 shows the location of the wells. The wells were constructed of 2 inch inside diameter poly-vinyl chloride (PVC) with 15-foot long screens bracketing the observed water table with the exception of wells constructed in borings B-3, 4, and 10 which have screens 10 feet in length. Well construction diagrams are included on the boring logs located in Appendix 5-A. These wells were utilized to assess ground-water conditions at the site. The results of the Phase 1 assessment indicated that ground water was present under unconfined conditions within the unconsolidated soils. Slug tests were performed on a few of the wells in June 1995 to determine the hydraulic conductivity of the shallow formations. Results of the slug tests indicated that the hydraulic conductivity of the clay soils was approximately 2.2×10^{-8} centimeters per second (cm/sec) and the hydraulic conductivity of the gravel ranged from 3.4×10^{-2} cm/sec to 2.0×10^{-4} cm/sec. Slug test data are located in Appendix 5-B.

Water level measurements were collected on July 25 & 26, 1995. These measurements were used to prepare a potentiometric map shown as Figure 5-3. Table 5-1 summarizes the ground-water depths and elevations. Ground water at the site occurs within the unconsolidated soils at depths of approximately five feet to 10 feet below ground surface. The ground-water flow direction is generally southwesterly toward Stewart Creek. Two monitoring wells constructed as a part of the RFI in 1990 were constructed in soil borings that extended into the Eagle Ford Shale. Monitoring well B1-N was constructed to a total depth of 62 feet below grade with a screen length of 10 feet and well MW-16 was constructed to a total depth of 77 feet below grade. Historical ground-water sampling has indicated that these wells have typically not produced ground water. This indicates that the Eagle Ford Shale is not a water producing formation, but acts as a confining unit between the shallow unconfined aquifer and the deep aquifer of the Woodbine Formation.

During the second phase of the assessment, a test well (LMW-17) was constructed in soil boring SB-17 located along the south edge of the site. The test well was constructed of 4 inch inside diameter PVC with a screen length of 10 feet to bracket the sand and gravel. A well construction diagram and soil boring log are located in Appendix 5-A. Following construction and development of the well, a pumping test was performed to assess the aquifer characteristics of the sand and gravel zone.

A submersible pump in the test well was used to provide a constant flow rate throughout the test. Pressure transducers and a data logger were used to measure and record the drawdown in the test well and well LMW-8. Water-level measurements were also made manually in well LMW-5 through the duration of the pumping test. The flow rate for the pumping test was set at 8 gallons per minute which was just less than the maximum capacity of the pump. The duration of the pumping test was approximately 10 hours, at which time the pump was turned off and the recovery of the aquifer was recorded. Recovery data were recorded for approximately 12 hours to allow for static conditions to be reached in the aquifer. The data obtained during the pumping test was used to calculate the transmissitivity and hydraulic conductivity of the sand and gravel aquifer. Using the Jacob and Cooper modification of the Theis nonequilibrium method of test evaluation, the transmissivity was calculated to be approximately 11,000 gallons per day per feet with a hydraulic conductivity of approximately 2,500 gallons per day per square foot (1.2×10^{-1} cm/sec). The pumping test data and calculations are included in Appendix 5-C.

Table 5-1

Summary of Water Level Elevations
July 25 and 26, 1995
GNB Technologies, Inc., Frisco, Texas

Well #	Depth to Water (ft)	Top of Casing Elevation	Ground-Water Elevation
LMW-1	8.94	638.74	629.80
LMW-2	8.47	641.01	632.54
LMW-3	8.20	639.78	631.58
LMW-4	9.03	641.42	632.39
LMW-5	13.59	646.61	633.02
LMW-7	9.68	659.07	649.39
LMW-8	14.24	648.68	634.44
LMW-9	NM	663.72	NA
LMW-10	13.28	683.05	669.77
LMW-17	15.70	648.84	633.14
MW-16S	8.06	628.31	620.25
MW-17	8.82	629.14	620.32
MW-18	4.69	633.13	628.44
B-5N	10.58	631.21	620.63
B-7N	10.83	645.32	634.49
B-8N	9.70	627.43	617.73
B-9N	7.13	638.25	631.12

Notes:

Elevations are reported in feet above mean sea level.
NM - Not measured.
NA - Not applicable.

Table 5-2

Summary of Slug Test Data
June 26, 1995
GNB Technologies, Inc., Frisco, Texas

Well #	Analysis Method	Hydraulic Conductivity (gpd/ft^2)	Hydraulic Conductivity (cm/sec)	Transmissivity (gpd/ft)	Material
MW-5	Cooper	719.25	3.4×10^{-2}	2877.12	Sand and Gravel
MW-7	Bouwer & Rice	4.321	2.0×10^{-4}	17.28	Clayey Gravel and Clay
MW-8	Bouwer & Rice	9.633	4.5×10^{-4}	27.74	Clayey Gravel and Clay
MW-9	Bouwer & Rice	0.047	2.2×10^{-6}	0.56	Clay

Appendix 5-A

BORING LOGS

LOG OF TEST BORING

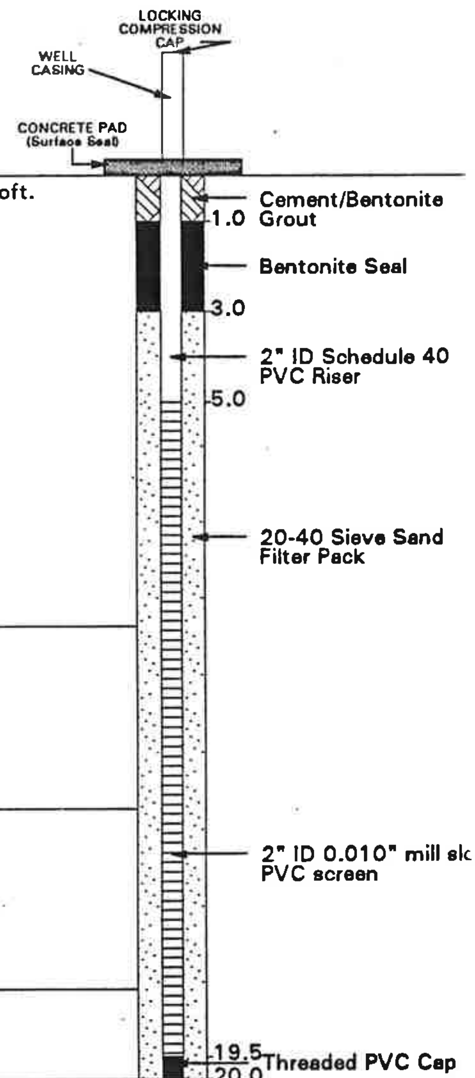
RMT JONES & NEUSE

BORING NO. B1/LMW-1

Client: GNB TECHNOLOGIES	Start Date: 2-3-95	End Date: 2-3-95	Page 1 of 1
Site: FRISCO, TEXAS	Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: BLAKE GILLESPIE / Driller: E.D.S.I./R. BROTHERS	Drill Rig Type: CME-750		Borehole Diameter: 6 inches
Site Coordinates: N: 1130.5500 E: 3406.1100 / Total Depth: 20.00	Surface Elevation (ft.): 635.90	TOC Elevation (ft.): 638.74	PAD Elevation (ft.): 635.90
Datum Description: Site Datum - Elevations ref. from MSL / Datum Elevation: NA	Water Level Depth (ft.): 6.10	Date: 7/26/95	Time: 0832

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Lithologic Description
	60			0–5	CLAY (CH) - dark brown, organic material, moist, soft.
	60	▼ (6.1)		5–7	CLAY (CH) - light brown to gray clay, firm.
				7–10	tan, plastic, moist with 10% angular chalk clasts.
	60			10–14	CLAYEY GRAVEL (GC) - tan clay, moist.
	60			14–18	CLAY (CH) - tan to gray, chalk clasts, saturated.
				18–20	SHALE - gray, massive, hard. (Eagle Ford Shale)

BORING TERMINATED AT 20 FEET



WELL 1584E 8/23/95

LOG OF TEST BORING

RMT JONES & NEUSE

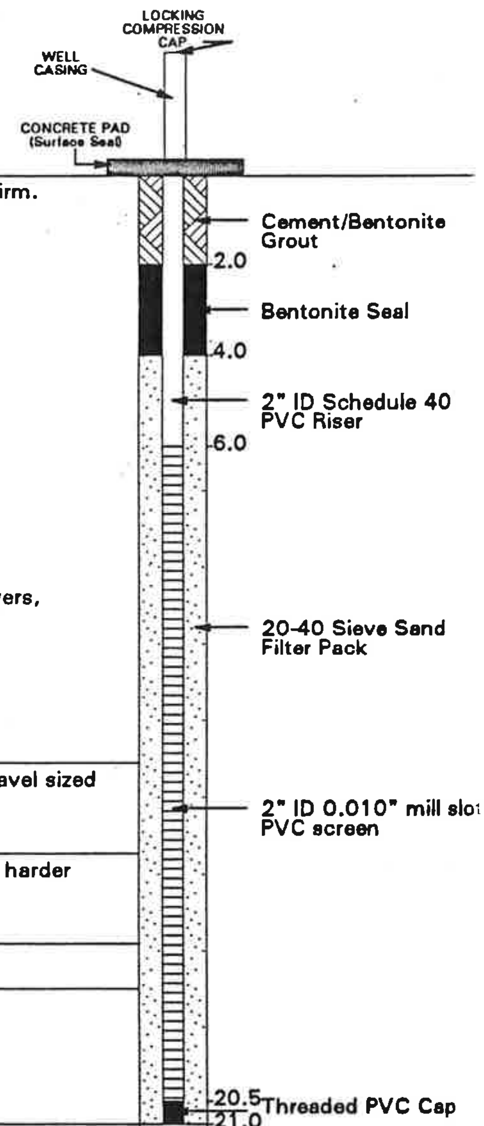
BORING NO. B2/LMW-2

Client: GNB TECHNOLOGIES	Start Date: 2-3-95	End Date: 2-3-95	Page 1 of 1
Site: FRISCO, TEXAS	Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: BLAKE GELLISPIE / Driller: RMT-JN/R.BROTHERS	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches

Site Coordinates:	Total Depth:	Surface Elevation (ft.):	TOC Elevation (ft.):	PAD Elevation (ft.):
N: 6183.6400 E: 3546.9700	30.00	638.72	641.01	638.72

Datum Description:	Datum Elevation:	Water Level Depth (ft.):	Date:	Time:
Site Datum - Elevations ref. from MSL	NA	6.18	7/26/95	1045

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	60			0–5		CLAY (CH) - dark brown, organic material, moist, firm.
	60			5		light brown and gray.
				7		plastic
	60			9		CLAY (CH) - light brown and gray, chalk pebble layers, saturated.
				13		CLAYEY GRAVEL (GC) -saturated, 20% angular gravel sized clasts.
	60			15		CLAY (CH) - tan with chalk clasts, grades down to harder gray clay.
				17		SAND (SP) - red, medium grained, saturated.
				18		SHALE - gray, massive, hard. (Eagle Ford Shale)
	12			21		BORING TERMINATED AT 21 FEET



WELL 1584E 8/23/95

F-204B Austin (8-95)

REV 8/95

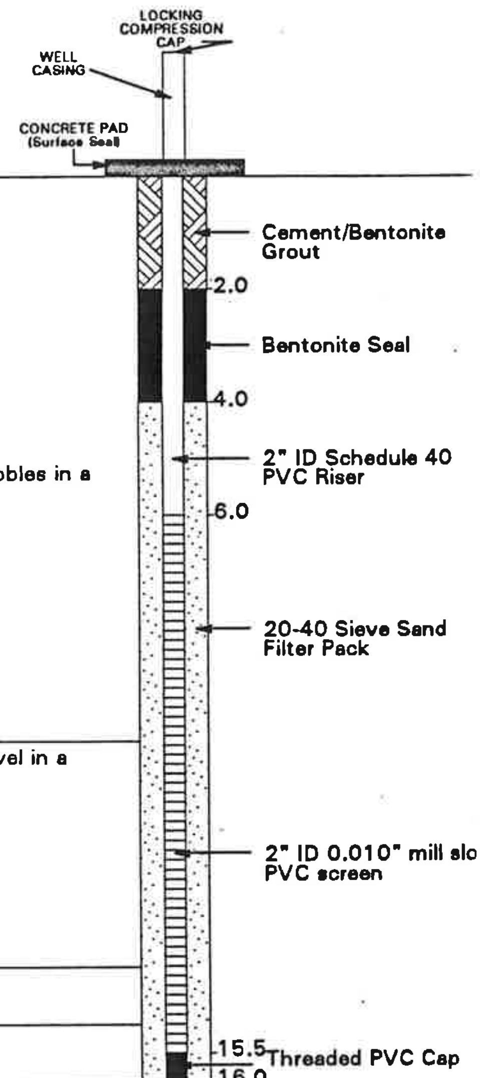
LOG OF TEST BORING

RMT JONES & NEUSE

BORING NO. B3/LMW-3

Client: GNB TECHNOLOGIES	Start Date: 2-3-95	End Date: 2-3-95	Page 1 of 1
Site: FRISCO, TEXAS	Drilling Method: HOLLOW STEM AUGERS		Project Number: 50-01584.13
Geologist: BLAKE GILLESPIE / Driller: RMT-JN/R.BROTHERS	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches
Site Coordinates: N: 5364.7800 E: 3928.4200 / Total Depth: 16.00	Surface Elevation (ft.): 637.76	TOC Elevation (ft.): 639.78	PAD Elevation (ft.): 637.76
Datum Description: Site Datum - Elevations ref. from MSL / Datum Elevation: NA	Water Level Depth (ft.): 6.18	Date: 7/26/95	Time: 0828

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	60			0–5		CLAY (CH) -dark brown, organic, moist, soft.
	60			5–10		CLAY (CH) - tan, plastic, hard, with 10% chalk pebbles in a clay matrix.
				9		gravelly clay, tan, plastic, moist.
	60			10–14		CLAYEY GRAVEL (GC) - saturated, suspended gravel in a tan clay matrix.
				14–15		CLAY (CH) - gray, iron stained.
	12			15–16		SHALE - gray, massive, hard. (Eagle Ford Shale)
				16		BORING TERMINATED AT 16 FEET



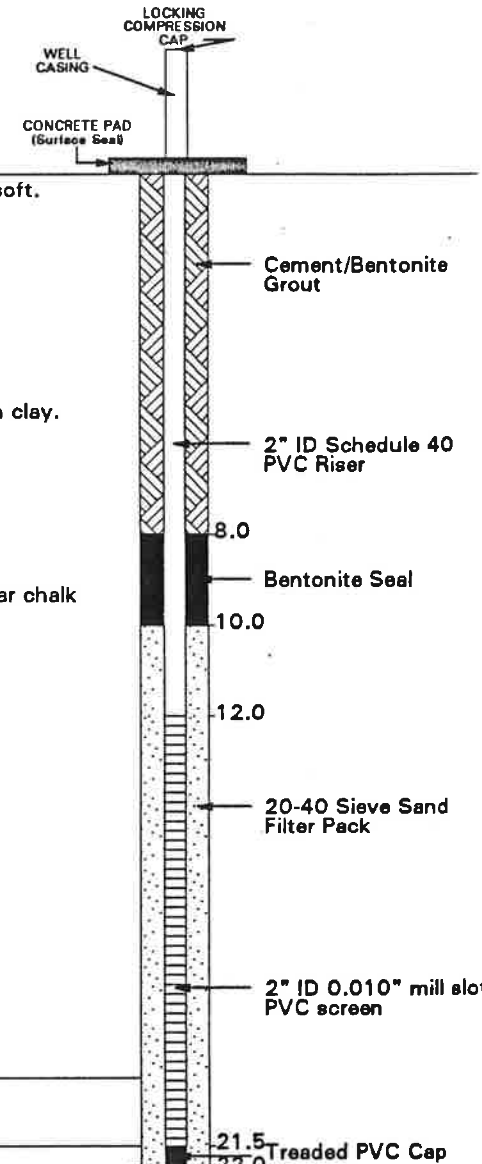
LOG OF TEST BORING

RMT JONES & NEUSE

BORING NO. B4/LMW-4

Client: GNB TECHNOLOGIES	Start Date: 2-3-95	End Date: 2-3-95	Page 1 of 1
Site: FRISCO, TEXAS	Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: BLAKE GILLESPIE / Driller: RMT-JN/R.BROTHERS	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches
Site Coordinates: N: 5735.6900 E: 3757.2000 / Total Depth: 22.00	Surface Elevation (ft.): 639.15	TOC Elevation (ft.): 641.42	PAD Elevation (ft.): 638.15
Datum Description: Site Datum - Elevations ref. from MSL / Datum Elevation: NA	Water Level Depth (ft.): 6.76	Date: 7/26/95	Time: 1030hrs.

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	60			0		CLAY (CH) - dark brown, organic material, moist, soft.
	60			5		light brown to gray, grades into a laminated brown clay.
	60			9		CLAY (CH) - tan, moderate plasticity, moist, angular chalk clasts.
				13		chalk clasts, saturated.
	60			15		tan, plastic, moist.
	24			20		SAND (SP) - 1.5 feet thick, red, soft, moist.
				21.5		SHALE - gray, massive, hard. (Eagle Ford Shale)
				22		BORING TERMINATED AT 22 FEET



WELL 1584E 8/23/95

LOG OF TEST BORING

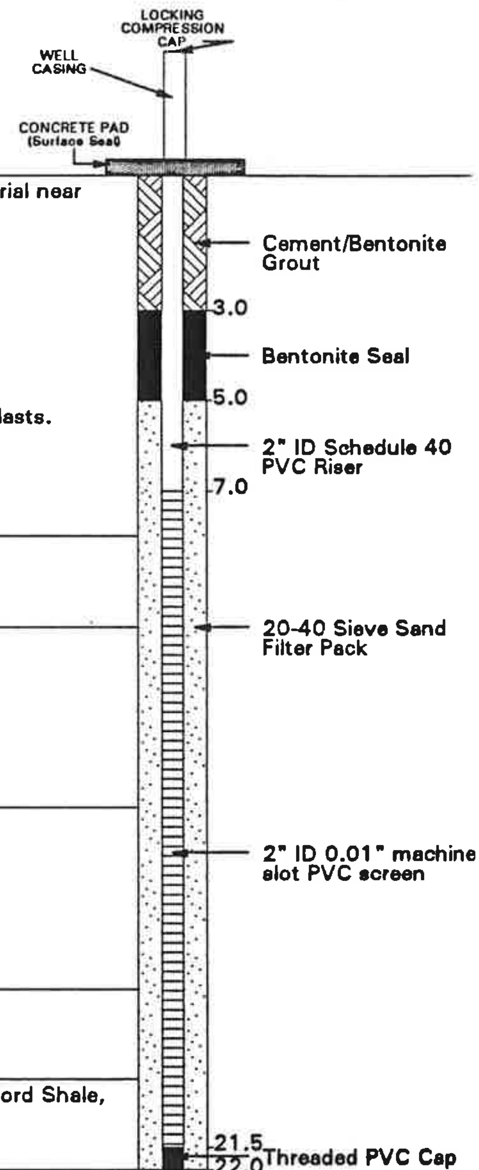
RMT JONES & NEUSE

BORING NO. B5/LMW-5

Client: GNB TECHNOLOGIES	Start Date: 2-3-95	End Date: 2-3-95	Page 1 of 1
Site: FRISCO, TEXAS	Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: BLAKE GILLESPIE / Driller: RMT-JN/R. BROTHERS	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches
Site Coordinates: N: 5706.3200 E: 4174.7100 / Total Depth: 22.00	Surface Elevation (ft.): 643.27	TOC Elevation (ft.): 646.61	PAD Elevation (ft.): 643.27
Datum Description: Site Datum - Elevations ref. from MSL / Datum Elevation: NA	Water Level Depth (ft.): 10.25	Date: 7/25/95	Time: 0647hrs.

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	60			0–5		CLAY (CH) - dark brown, moist, soft, organic material near surface.
	48			5–8		CLAY (CH) - dark tan to brown, hard, 10% chalk clasts.
	24			8–10		GRAVELLY CLAY (CL) - tan, moist.
	48			10–14		CLAY (CH) - tan, hard.
	24			14–18		CLAYEY GRAVEL (GC) - tan.
	24					
	24			18–20		CLAY (CH) - tan, massive soft.
	24			20–22		SHALE - gray, hard, iron stained fractures. (Eagle Ford Shale, weathered)
				22		SHALE - gray, massive, hard. (Eagle Ford Shale)

BORING TERMINATED AT 22 FEET



RMT JONES & NEUSE

LOG OF TEST BORING

BORING NO. SB-6

Client: GNB TECHNOLOGIES	Start Date: 2-4-95	End Date: 2-4-95	Page 1 of 1
Site: FRISCO, TEXAS	Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: BLAKE GILLESPIE / Driller: RMT-JN/R. BROTHERS	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches
Site Coordinates: N: 6171.1200 E: 4239.9600 / Total Depth: 21.00	Surface Elevation (ft.): 652.79	TOC Elevation (ft.): NA	PAD Elevation (ft.): NA
Datum Description: Site Datum - Elevations ref. from MSL / Datum Elevation: NA	Water Level Depth (ft.): NA	Date: NA	Time: NA

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	24			0		CLAY (CH) - brown , moderately organic, moist, firm.
	24			2		
	24			4		light brown and grey.
	24			6		tan to brown, very firm, massive.
	24			8		CLAY (CH) - tan, firm with horizontal jointing, 1-3" width, jointing coated with red and yellow staining.
	48			10		
	24			14		
	48			16		
				17		SILTY SAND (SM) - red, medium grained, friable, clay coating on graines.
	12			20		SHALE - gray, massive, hard. (Eagle Ford Shale)
				21		BORING TERMINATED AT 21 FEET

SOIL 1584E 8/23/95

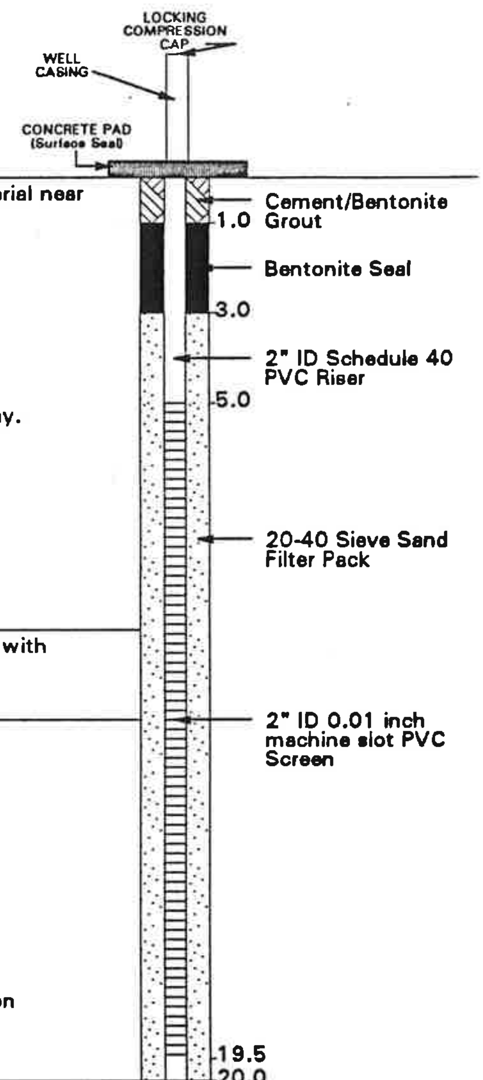
LOG OF TEST BORING

RMT JONES & NEUSE

BORING NO. B7/LMW-7

Client: GNB TECHNOLOGIES	Start Date: 2-2-95	End Date: 2-3-95	Page 1 of 1
Site: FRISCO, TEXAS	Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: BLAKE GILLESPIE / Driller: RMT-JN/R. BROTHERS	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches
Site Coordinates: N: 6574.6800 E: 4322.6900 / Total Depth: 20.00	Surface Elevation (ft.): 657.45	TOC Elevation (ft.): 659.07	PAD Elevation (ft.): 657.45
Datum Description: Site Datum - Elevations ref. from MSL / Datum Elevation: NA	Water Level Depth (ft.): 8.06	Date: 7/26/95	Time: 1050hrs.

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	60			0		CLAY (CH) - dark brown, soft, moist, organic material near surface.
	60			5		light brown to gray, grades to laminated brown clay.
				9		tan, moist with 10% angular chalk clasts.
	48			10		CLAYEY GRAVEL (GC) - tan, decreasing grain size with depth, saturated.
				12		CLAY (CH) - tan to gray, <5% chalk pebbles.
	36			14		
	36			17		
				18		weathered shale, fissile with horizontal jointing, iron staining.
				20		SHALE - gray, massive, hard. (Eagle Ford Shale) BORING TERMINATED AT 20 FEET



LOG OF TEST BORING

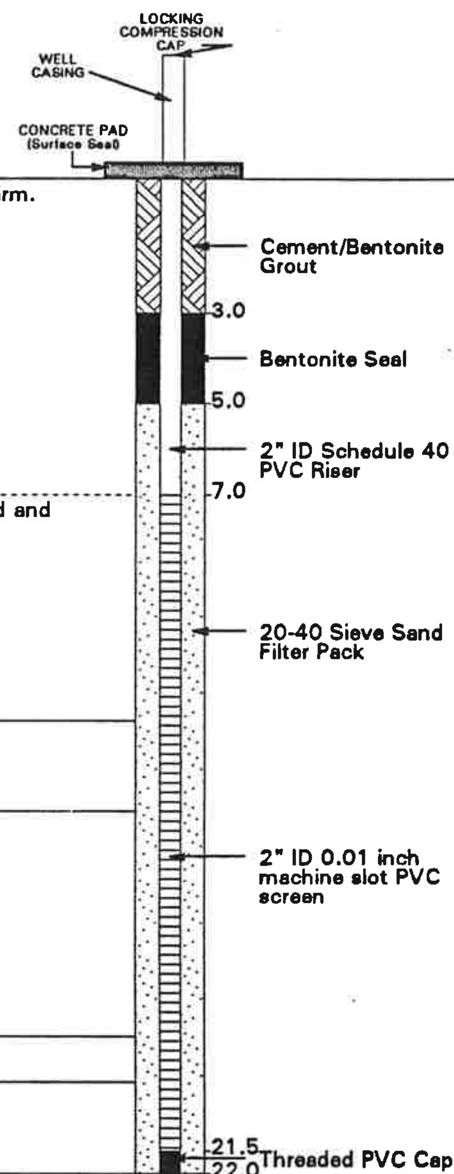
RMT JONES & NEUSE

BORING NO. B8/LMW-8

Client: GNB TECHNOLOGIES	Start Date: 2-4-95	End Date: 2-4-95	Page 1 of 1
Site: FRISCO, TEXAS	Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: BLAKE GILLESPIE / Driller: RMT-JN/R. BROTHERS	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches
Site Coordinates: N: 5539.0400 E: 4812.0100 / Total Depth: 22.00	Surface Elevation (ft.): 645.57	TOC Elevation (ft.): 648.68	PAD Elevation (ft.): 645.57
Datum Description: Site Datum - Elevations ref. from MSL / Datum Elevation: NA	Water Level Depth (ft.): 11.13	Date: 7/26/95	Time: 0630hrs.

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	24			0–7		CLAY (CH) - dark brown, organic material, moist, firm.
	24					
	60					
				7–12		SANDY CLAY (CL) - tan, firm, 10-20% course sand and pebbles size chalk clasts.
	12					
	48			12–14		CLAYEY GRAVEL (GC) - saturated.
	24			14–19		CLAY (CH) - brown, massive, very hard.
	24					no recovery
				19–20		SAND (SP) - gray and red, medium grained, moist.
	24			20–22		SHALE - gray, hard, massive. (Eagle Ford Shale)

BORING TERMINATED AT 22 FEET



WELL 1584E 8/23/95

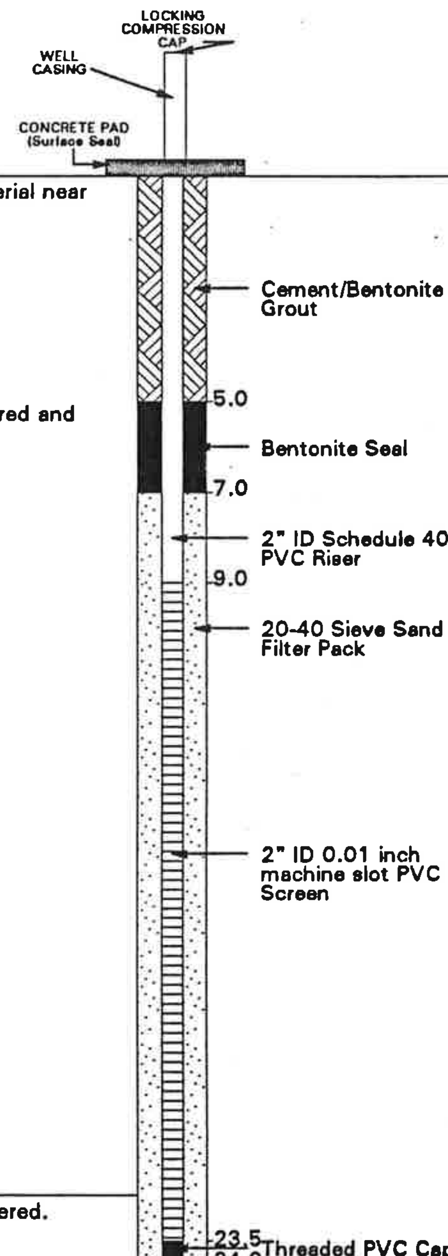
LOG OF TEST BORING

RMT JONES & NEUSE

BORING NO. B9/LMW-9

Client: GNB TECHNOLOGIES		Start Date: 2-4-95	End Date: 2-4-95	Page 1 of 1
Site: FRISCO, TEXAS		Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: BLAKE GILLESPIE	Driller: RMT-JN/R. BROTHERS	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches
Site Coordinates: N: 5888.8400 E: 4833.3600	Total Depth: 24.00	Surface Elevation (ft.): 660.48	TOC Elevation (ft.): 663.72	PAD Elevation (ft.): 660.48
Datum Description: Site Datum - Elevations ref. from MSL	Datum Elevation: NA	Water Level Depth (ft.): 18.74ft.	Date: 4/24/95	Time:

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
				1		CLAY (CH) - dark brown, soft, friable, organic material near surface, moist, moderately soft.
	12			2		
	12			3		
	24			4		
				5		gray, massive, hard, grading into jointed clay with red and yellow staining.
				6		
	24			7		
				8		
	24			9		
				10		
				11		
	24			12		
				13		
	24			14		tan to brown, jointed.
				15		
				16		
	24			17		gray, massive, jointed, dry.
				18		
				19		
	24			20		
				21		
	24			22		
				23		SHALE - gray, massive, hard. waxy texture, weathered. (Eagle Ford Shale)
				24		
						BORING TERMINATED AT 24 FEET



WELL 1584E 8/23/95

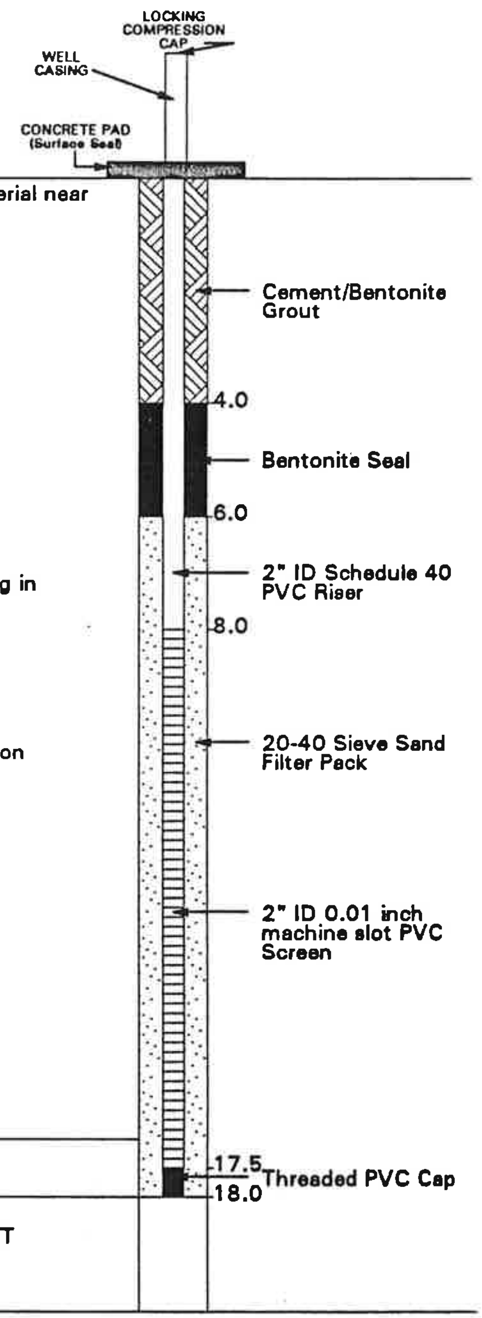
LOG OF TEST BORING

RMT JONES & NEUSE

BORING NO. LMW-10

Client: GNB TECHNOLOGIES	Start Date: 2-4-95	End Date: 2-4-95	Page 1 of 1
Site: FRISCO, TEXAS	Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: BLAKE GILLESPIE / Driller: RMT-JN/ R.BROTHERS	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches
Site Coordinates: N: 6390.7500 E: 4954.0700 / Total Depth: 18.00	Surface Elevation (ft.): 681.03	TOC Elevation (ft.): 683.05	PAD Elevation (ft.): 681.03
Datum Description: Site Datum - Elevations ref. from MSL / Datum Elevation: NA	Water Level Depth (ft.): 11.26	Date: 7/26/95	Time: 1053hrs.

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
				0		CLAY (CH) - dark brown, soft, friable, organic material near surface.
	12			1		
	12			2		
	24			3		
	24			5		tan, firm, massive clay, moist.
	36			7		fractures 1-3" width, moist, yellow and red staining in fractures
	24			10		gray, two 2" fractures observed filled with sand, iron stained.
		▼		11		
	36			12		
	24			15		
	12			17		SHALE - massive, very hard. (Eagle Ford Shale)
				18		BORING TERMINATED AT 18 FEET



RMT JONES & NEUSE

LOG OF TEST BORING

BORING NO. SB-11

Client: GNB TECHNOLOGIES		Start Date: 7-19-95	End Date: 7-19-95	Page 1 of 1
Site: FRISCO, TEXAS		Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: DAVID McQUADE	Driller: E.D.S.I./MIKE McNITT	Drill Rig Type: CME 750		Borehole Diameter: 6 Inches
Site Coordinates: N: 6380.1701 E: 4279.5396	Total Depth: 23.00	Surface Elevation (ft.): 655.15	TOC Elevation (ft.): NA	PAD Elevation (ft.): NA
Datum Description: Site Datum - Elevations ref. from MSL	Datum Elevation: NA	Water Level Depth (ft.): NA	Date: NA	Time: NA

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
☒	60			0	▨	CLAY (CH) - silty; stiff; plastic; olive with gray mottling; moist; color change from 1 ft to 3 ft to dark brown; some sand, fine grained, poorly graded, chalk matrix.
☒	60			5	▨	CLAY (CH) - silty; very stiff; slightly plastic; olive with gray, rust, and yellow mottling; changing to gray with rust and yellow mottling; slightly moist, laminated.
☒	60			10	▨	
☒	60			15	▨	trace weathered shale
				18	▨	silty sand seam, very fine grained; some laminated layers of soft, very plastic clay; tan.
☒	36			20	▨	
				22	▨	CLAY (CH) - sandy, very fine grained; plastic; stiff; yellowish brown with rust mottling; moist; some seams of weathered shale, gray, dense, hard.
				23	☰	SHALE - gray; dense; hard. (Eagle Ford Shale)
						BORING TERMINATED AT 23 FEET

SOIL 1584E 8/23/95

RMT JONES & NEUSE

LOG OF TEST BORING

BORING NO. SB-12

Client: GNB TECHNOLOGIES		Start Date: 7-19-95	End Date: 7-19-95	Page 1 of 1
Site: FRISCO, TEXAS		Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: DAVID McQUADE	Driller: E.D.S.I./MIKE McNITT	Drill Rig Type: CME 750		Borehole Diameter: 6 Inches
Site Coordinates: N: 6472.1875 E: 4300.0402	Total Depth: 25.00	Surface Elevation (ft.): 656.40	TOC Elevation (ft.): NA	PAD Elevation (ft.): NA
Datum Description: Site Datum - Elevations ref. from MSL	Datum Elevation: NA	Water Level Depth (ft.): NA	Date: NA	Time: NA

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	60			0–1		CLAY (CH) - some sand, fine to medium grained, subrounded, poorly graded, sand is chalk matrix; slightly plastic; hard; dark brown change to brown at 3 ft.; moist.
	60			5		
	60			10		CLAY (CH) - silty; stiff; plastic; gray with rust and yellow mottling; laminated; moist.
	60			15		some weathered shale lenses.
	60			20		
				22.5		SHALE - gray; dense; hard. (Eagle Ford Shale)
				25		BORING TERMINATED AT 25 FEET

Depth scale (feet): 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

SOIL 1584E 8/23/95

RMT JONES & NEUSE

LOG OF TEST BORING

BORING NO. SB-13

Client: GNB TECHNOLOGIES		Start Date: 7-19-95	End Date: 7-19-95	Page 1 of 1
Site: FRISCO, TEXAS		Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: DAVID McQUADE	Driller: E.D.S.I./MIKE McNITT	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches
Site Coordinates: N: 6459.5969 E: 4644.7713	Total Depth: 20.00	Surface Elevation (ft.): 669.41	TOC Elevation (ft.): NA	PAD Elevation (ft.): NA
Datum Description: Site Datum - Elevations ref. from MSL	Datum Elevation: NA	Water Level Depth (ft.): NA	Date: NA	Time: NA

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	60			0		CLAY (CH) - sandy, fine grained, poorly graded, subangular, sand is chalk matrix; silty; plastic; stiff; dark brown; moist.
				3		CLAY (CH) - silty; plastic; stiff; gray with rust and yellow mottling; laminated; slightly moist.
	60			5		
				8		very fine grained sand seam.
	60			10		some weathered shale, becoming more dense.
	60			15		SHALE - gray; dense; hard. (Eagle Ford Shale)
				20		BORING TERMINATED AT 20 FEET

SOIL 1584E 8/23/95

F-204B Austin (8-95)

REV 8/95

LOG OF TEST BORING

RMT JONES & NEUSE

BORING NO. SB-14

Client: GNB TECHNOLOGIES	Start Date: 7-19-95	End Date: 7-19-95	Page 1 of 1
Site: FRISCO, TEXAS	Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: DAVID McQUADE / Driller: E.D.S.I./MIKE McNITT	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches
Site Coordinates: N: 6414.7340 E: 4474.3169 / Total Depth: 14.00	Surface Elevation (ft.): 656.75	TOC Elevation (ft.): NA	PAD Elevation (ft.): NA
Datum Description: Site Datum - Elevations ref. from MSL / Datum Elevation: NA	Water Level Depth (ft.): NA	Date: NA	Time: NA

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	60			0–5		CLAY (CH) - silty; slightly plastic; stiff; gray with rust and yellow mottling; laminated; slightly moist.
	60			5–10		
	48			10–14		
				11–14		SHALE - gray; dense; hard. (Eagle Ford Shale)
				14		BORING TERMINATED AT 14 FEET

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

SOIL 1584E 8/23/95

LOG OF TEST BORING

RMT JONES & NEUSE

BORING NO. SB-15

Client: GNB TECHNOLOGIES	Start Date: 7-21-95	End Date: 7-21-95	Page 1 of 1
Site: FRISCO, TEXAS	Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: DAVID McQUADE / Driller: E.D.S.I./MIKE McNITT	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches
Site Coordinates: N: 5712.6367 E: 4852.8441 / Total Depth: 26.00	Surface Elevation (ft.): 650.92	TOC Elevation (ft.): NA	PAD Elevation (ft.): NA
Datum Description: Site Datum - Elevations ref. from MSL / Datum Elevation: NA	Water Level Depth (ft.): NA	Date: NA	Time: NA

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	24			0–2		CLAY (CH) - sandy, fine to medium grained, poorly graded, sand is chalk matrix; slightly plastic; stiff; brown; moist.
	24			2–4		
	24			4–6		
	36			6–9		CLAY (CH) - trace silt; some chalk fragments, subangular; plastic; hard; brown with yellowish brown mottling; moist at 7.5 feet; change color to gray with rust and yellow mottling; laminated.
	24			9–11		
	36			11–14		
	24			14–16		
	36			16–19		CLAY (CH) - silty; some sand seams, very fine grained; plastic; stiff; brown with gray mottling; increase sand content with depth.
	24			19–21		
	36			21–24		CLAY (CH) - silty; plastic; stiff; some weathered shale; brown with dark gray mottling; moist; laminated.
	24			24–26		SHALE - dark gray; dense; hard. (Eagle Ford Shale)
				26		BORING TERMINATED AT 26 FEET

SOIL 1584E 8/23/95

F-204B Austin (8-95) REV 8/95

RMT JONES & NEUSE

LOG OF TEST BORING

BORING NO. SB-16

Client: GNB TECHNOLOGIES		Start Date: 7-21-95	End Date: 7-21-95	Page 1 of 1
Site: FRISCO, TEXAS		Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: DAVID McQUADE	Driller: E.D.S.I./MIKE McNITT	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches
Site Coordinates: N: 5625.1147 E: 4828.9834	Total Depth: 24.00	Surface Elevation (ft.): 647.94	TOC Elevation (ft.): NA	PAD Elevation (ft.): NA
Datum Description: Site Datum - Elevations ref. from MSL	Datum Elevation: NA	Water Level Depth (ft.): NA	Date: NA	Time: NA

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	48			0–4		CLAY (CH) - silty; some sand, medium grained, subangular, poorly graded, sand is chalk matrix; plastic; hard; dark brown; moist; roots.
						CLAY (CH) - sandy, medium grained, subangular; slightly plastic; stiff; light brown; moist.
	60			4–9		CLAY (CH) - sandy, medium to coarse grained, poorly graded, sand is chalk matrix; trace gravel size grains; plastic; stiff; light brown; moist.
	60			9–14		CLAY (CH) - silty; trace sand, fine grained; very plastic; stiff; light brown with rust and gray mottling; moist; increase fine grained sand content with depth.
	60			14–19		SANDY CLAY with gravel (CH) - fine to medium grained, subrounded, poorly graded; plastic; stiff; tan with rust mottling; wet.
						CLAY (CH) - silty; some very fine grained sand; plastic; stiff; brown with rust and gray mottling; laminated; moist.
	60			19–24		CLAY (CH) - trace silt, laminated; slightly plastic; hard; gray with rust and yellow mottling; very fine grained sand seam at 19 feet, gray, wet.
						fine grained sand seam from 20.5 to 20.7 ft., wet.
						SHALE - dark; dense; hard.
				24		BORING TERMINATED AT 24 FEET

SOIL 1584E 8/23/95

F-204B Austin (8-95) REV 8/95

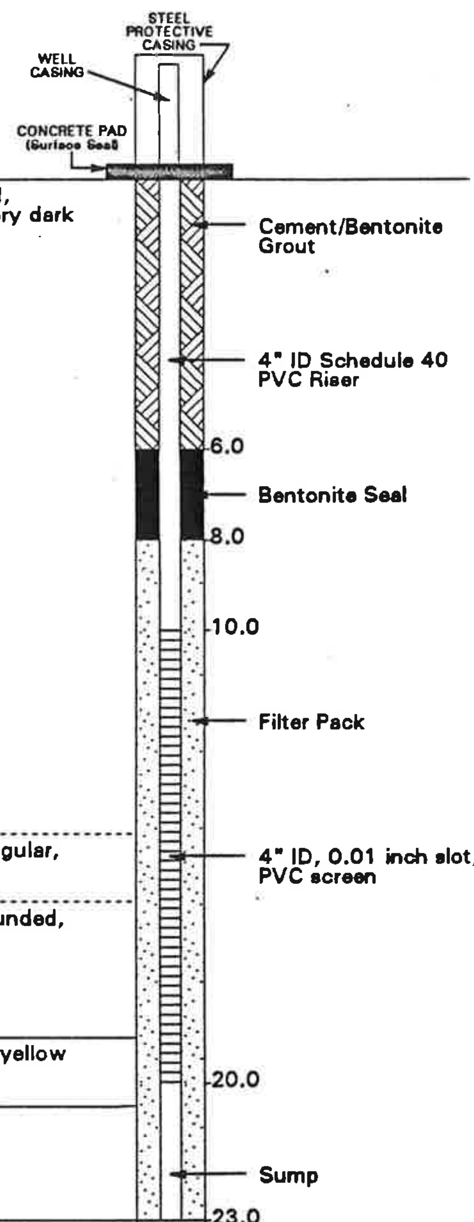
LOG OF TEST BORING

RMT JONES & NEUSE

BORING NO. LMW-17

Client: GNB TECHNOLOGIES	Start Date: 7-21-95	End Date: 7-24-95	Page 1 of 1
Site: FRISCO, TEXAS	Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: DAVID McQUADE / Driller: E.D.S.I./MIKE McNITT	Drill Rig Type: CME-750		Borehole Diameter: 8 Inches
Site Coordinates: N: 5626.1663 E: 4507.0130 / Total Depth: 23.00	Surface Elevation (ft.): 646.34	TOC Elevation (ft.): 648.84	PAD Elevation (ft.): 646.34
Datum Description: Site Datum - Elevations ref. from MSL / Datum Elevation: NA	Water Level Depth (ft.): 13.52	Date: 7/26/95	Time: 0643hrs.

Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	24			0		CLAY (CH) - trace sand, fine grained, poorly graded, subangular, sand is chalk matrix; plastic; hard; very dark brown; moist.
	24			2		
	24			4		
	36			6		
	60			9		
				10		increase sand content, fine to coarse grained; wet.
	24			14		silty sand seam. fine grained
				14.5		CLAYEY SAND (SC) - fine to coarse grained, subangular, poorly graded; no plasticity; loose; tan; wet.
	36			16		CLAYEY GRAVEL with sand (GC) - fine grained, rounded, poorly graded; loose; tan; wet.
	24			19		CLAY (CH) - silty; hard; plastic; gray with rust and yellow mottling; moist.
				20.5		sand seam, very fine grained.
	24			21		SHALE - gray; dense; hard. (Eagle Ford Shale)
				23		BORING TERMINATED AT 23 FEET



WELL 1584E 8/23/95

F-204B Austin (8-95)

REV 8/95

RMT JONES & NEUSE

LOG OF TEST BORING

BORING NO. SB-18

Client: GNB TECHNOLOGIES	Start Date: 7-25-95	End Date: 7-25-95	Page 1 of 1
Site: FRISCO, TEXAS	Drilling Method: HOLLOW STEM AUGER		Project Number: 50-01584.13
Geologist: DAVID McQUADE / Driller: E.D.S.I./MIKE McNITT	Drill Rig Type: CME-750		Borehole Diameter: 6 Inches
Site Coordinates: N: 5721.6077 E: 4494.9856 / Total Depth: 24.00	Surface Elevation (ft.): 647.30	TOC Elevation (ft.): NA	PAD Elevation (ft.): NA
Datum Description: Site Datum - Elevations ref. from MSL / Datum Elevation: NA	Water Level Depth (ft.): NA	Date: NA	Time: NA

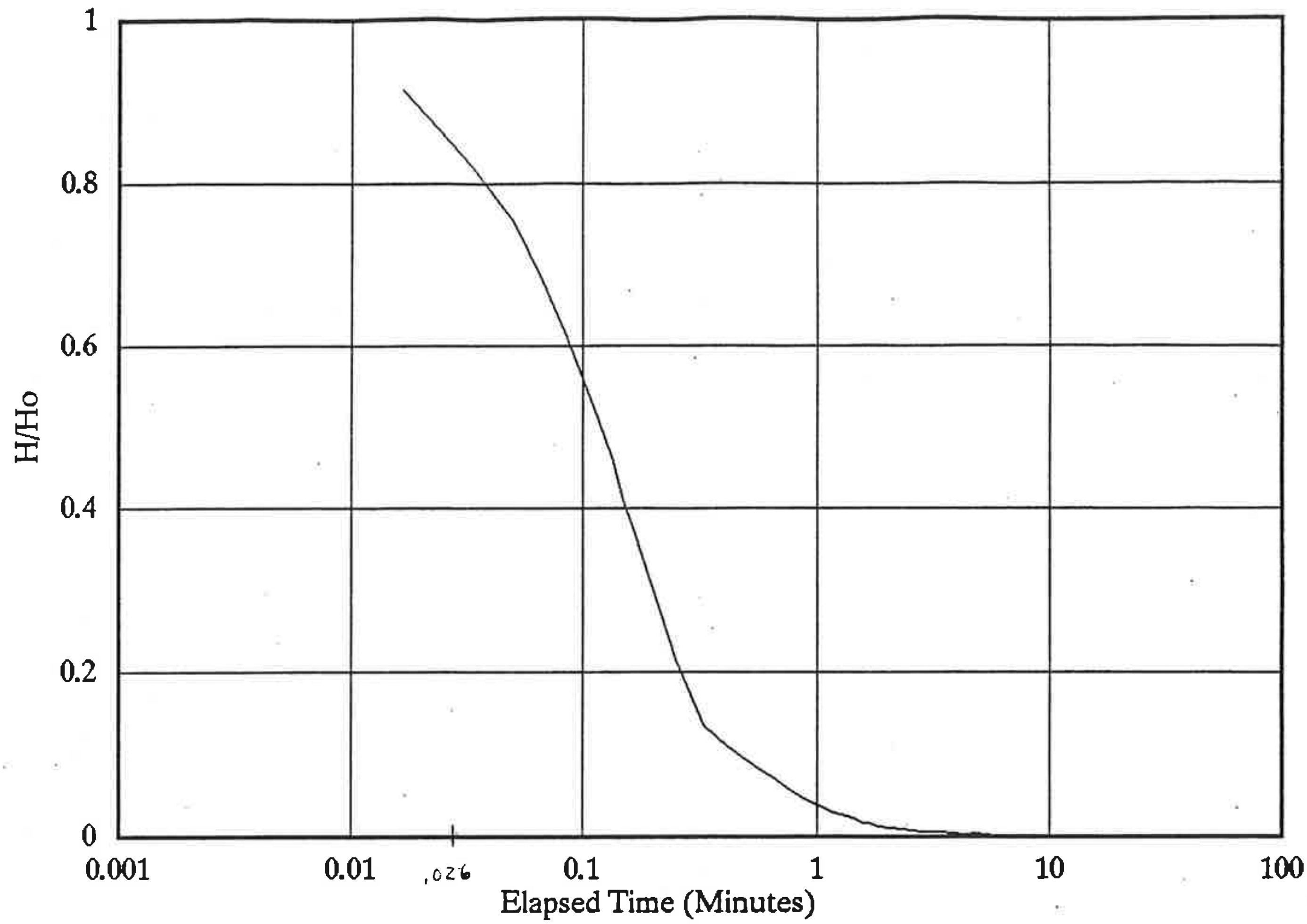
Sample Type	Recovery (Inches)	Saturation	OVM (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
X	48			0–5.5		CLAY (CH) - silty; plastic; stiff; dark brown; some sand at depth, fine grained, poorly graded, sand is chalk matrix; trace roots from 0-2 feet.
X	60			5.5–14		CLAY (CH) - trace silt; trace sand, fine grained, subangular, poorly graded, sand is chalk matrix; plastic; stiff; brown; moist; increase sand content with depth, grain size fine to medium; tan.
X	60					CLAY (CH) - silty; sandy, very fine grained; plastic; soft; tan; wet.
X	60			14–14.5		CLAYEY GRAVEL with sand (GC) - fine grained; poorly graded; rounded; loose; tan; wet.
				14.5–20.5		CLAY (CH) - silty; plastic; stiff; brown with gray and yellow mottling; laminated; increase silt with depth changing to gray with rust and yellow mottling.
X	60			20.5–24		SHALE - gray; dense; hard. (Eagle Ford Shale)
				24		BORING TERMINATED AT 24 FEET

SOIL 1584E 8/23/95

Appendix 5-B

SLUG TEST DATA

GNB MW–5



$y = 10^{-11}$

T = 2,877.12 GPD/FT   b = 4.0

K = 719.25 GPD/FT²

BOUWER & RICE ANALYSIS OF SLUG TEST

(Ted L. Harriger - Ver. 6.0 3/95)

WELL AND TEST IDENTIFICATION

Client:	GNB
Site:	Frisco, Texas
Well:	MW-7
Test:	1
Type of test:	Slug In
Date:	June 26, 1995
Start Time:	14:07

WELL CONSTRUCTION

Casing or screen radius (Rc):	1.00 in.
Well or borehole radius (Rw):	3.00 in.
Total length of screen (Lt):	15.00 ft.
Effective length of screen (L):	4.00 ft.
Column of water above effective base of screen (H):	6.35 ft.
Saturated aquifer total thickness (D):	4.00 ft.
Thickness of impermeable material in zone tested:	0.00 ft.
Porosity of well annulus (p):	0.25

SLUG TEST DRAWDOWN AND TIME VALUES

Static water level below datum :	7.65 ft.
Initial head change after slug (Yo):	5.80 ft.
Head chance at time 't' (Yt):	0.79 ft.
Time for the head change (t):	9.88 min.

CALCULATIONS

Saturated filter pack conditions were used in the calculations. Based on the well construction parameters of L/Rw, the following variables were selected: A = 2.06, B = 0.32, C = 1.55

Since D <= H :
ln(Re/Rw) = ((1.1/ln(H/Rw)) + (C/(L/Rw)))^-1

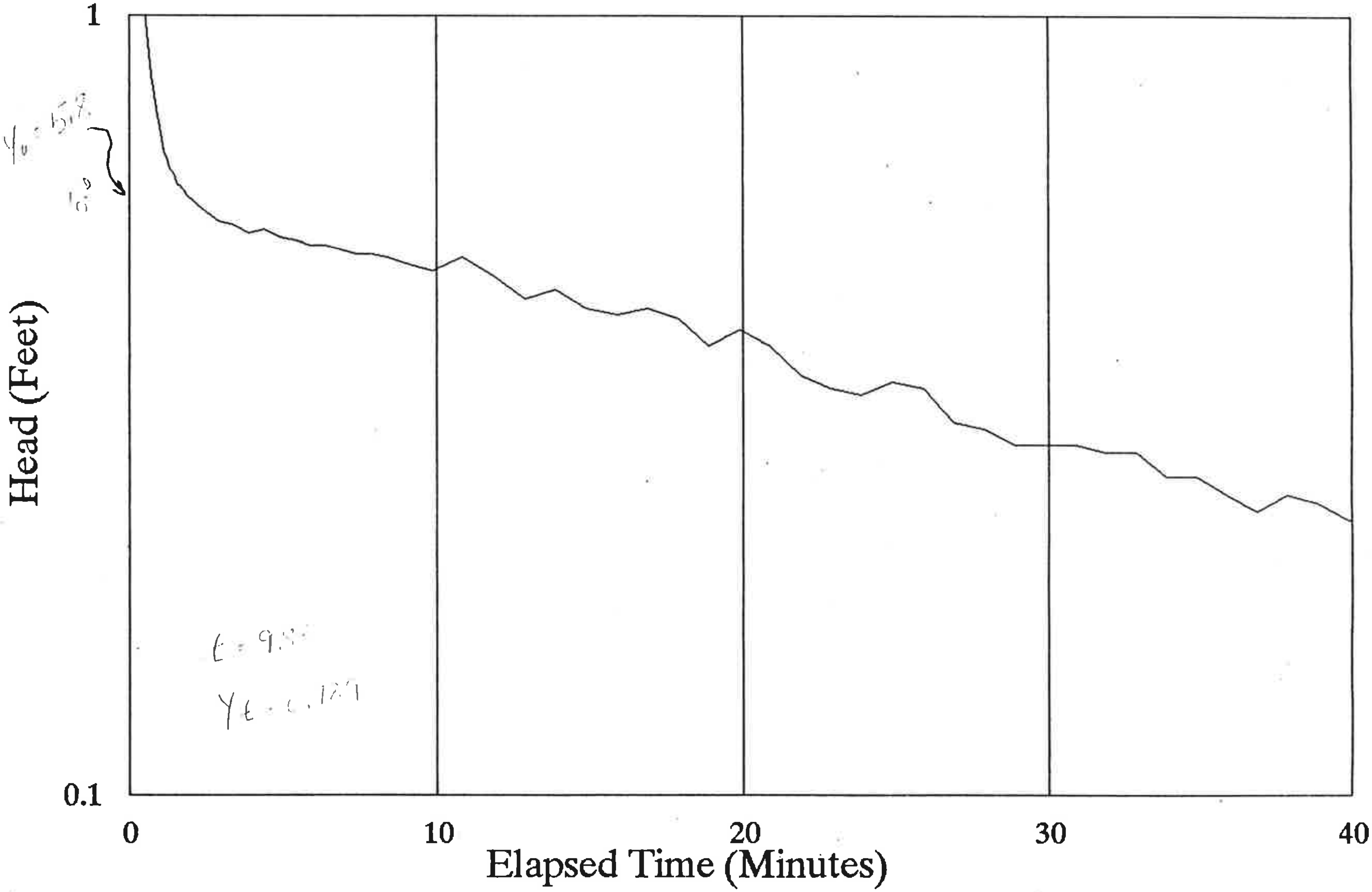
K = (Rc^2 * ln(Re/Rw)/2L) * 1/t * ln(YO/Yt)
T = K * D

RESULTS

Calculated effective well radius (Re) : 29.59 in.
(Radius over which effects of slug were felt)

Hydraulic Conductivity (K):	4.321 gpd/ft2
Transmissivity (T):	17.28 gpd/ft

GNB MW-7



BOUWER & RICE ANALYSIS OF SLUG TEST

(Ted L. Harriger - Ver. 6.0 3/95)

WELL AND TEST IDENTIFICATION

Client:	GNB
Site:	Frisco, Texas
Well:	MW-8
Test:	1
Type of test:	Slug In
Date:	June 26, 1995
Start Time:	16:47

WELL CONSTRUCTION

Casing or screen radius (Rc):	1.00 in.
Well or borehole radius (Rw):	3.00 in.
Total length of screen (Lt):	15.00 ft.
Effective length of screen (L):	2.88 ft.
Column of water above effective base of screen (H):	2.88 ft.
Saturated aquifer total thickness (D):	2.88 ft.
Thickness of impermeable material in zone tested:	0.00 ft.
Porosity of well annulus (p):	0.25

SLUG TEST DRAWDOWN AND TIME VALUES

Static water level below datum :	12.12 ft.
Initial head change after slug (Yo):	1.00 ft.
Head chance at time 't' (Yt):	0.25 ft.
Time for the head change (t):	9.81 min.

CALCULATIONS

Unsaturated filter pack conditions were used in the calculations.
The casing radius was adjusted according to the following equation:

Rc = (Rc^2 + p(Rw^2 - Rc^2))^.5

Based on the well construction parameters of L/Rw, the following variables were selected: A = 1.97, B = 0.30, C = 1.38

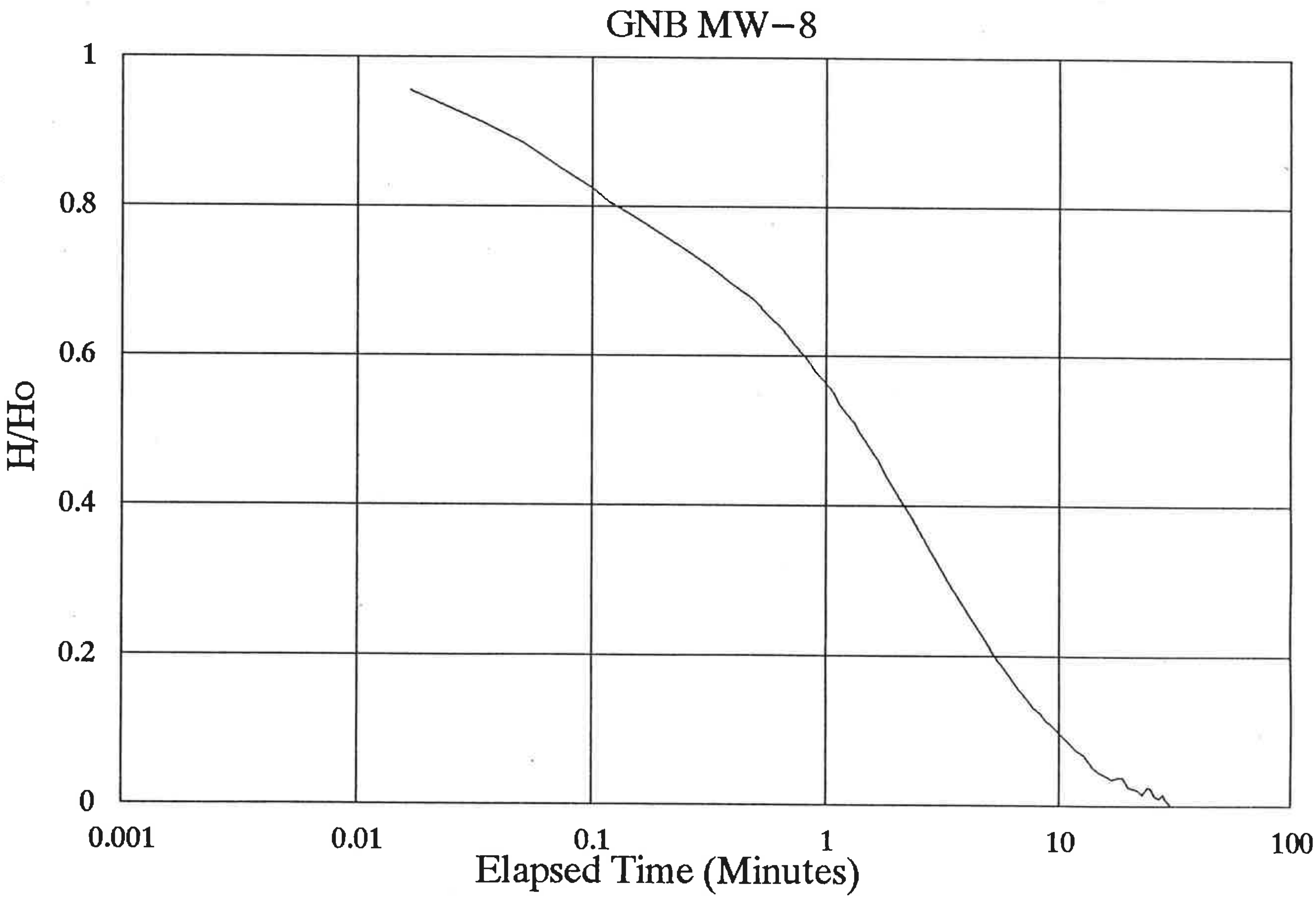
Since D <= H :
ln(Re/Rw) = ((1.1/ln(H/Rw)) + (C/(L/Rw)))^-1

K = (Rc^2 * ln(Re/Rw)/2L) * 1/t * ln(Y0/Yt)
T = K * D

RESULTS

Calculated effective well radius (Re) : 17.35 in.
(Radius over which effects of slug were felt)

Hydraulic Conductivity (K):	9.633 gpd/ft2
Transmissivity (T):	27.74 gpd/ft


GNB MW−8
H/Ho
1
0.8
0.6
0.4
0.2
0
0.001
0.01
0.1
1
10
100
Elapsed Time (Minutes)

BOUWER & RICE ANALYSIS OF SLUG TEST

(Ted L. Harriger - Ver. 6.0 3/95)

WELL AND TEST IDENTIFICATION

Client:	GNB
Site:	Frisco, Texas
Well:	MW-9
Test:	1
Type of test:	Slug In
Date:	June 26, 1995
Start Time:	

WELL CONSTRUCTION

Casing or screen radius (Rc):	1.00 in.
Well or borehole radius (Rw):	3.00 in.
Total length of screen (Lt):	15.00 ft.
Effective length of screen (L):	12.01 ft.
Column of water above effective base of screen (H):	12.01 ft.
Saturated aquifer total thickness (D):	12.01 ft.
Thickness of impermeable material in zone tested:	0.00 ft.
Porosity of well annulus (p):	0.25

SLUG TEST DRAWDOWN AND TIME VALUES

Static water level below datum :	10.49 ft.
Initial head change after slug (Yo):	7.18 ft.
Head chance at time 't' (Yt):	7.06 ft.
Time for the head change (t):	9.85 min.

CALCULATIONS

Unsaturated filter pack conditions were used in the calculations.
The casing radius was adjusted according to the following equation:

Rc = (Rc^2 + p(Rw^2 - Rc^2))^.5

Based on the well construction parameters of L/Rw, the following variables were selected: A = 3.05, B = 0.49, C = 2.70

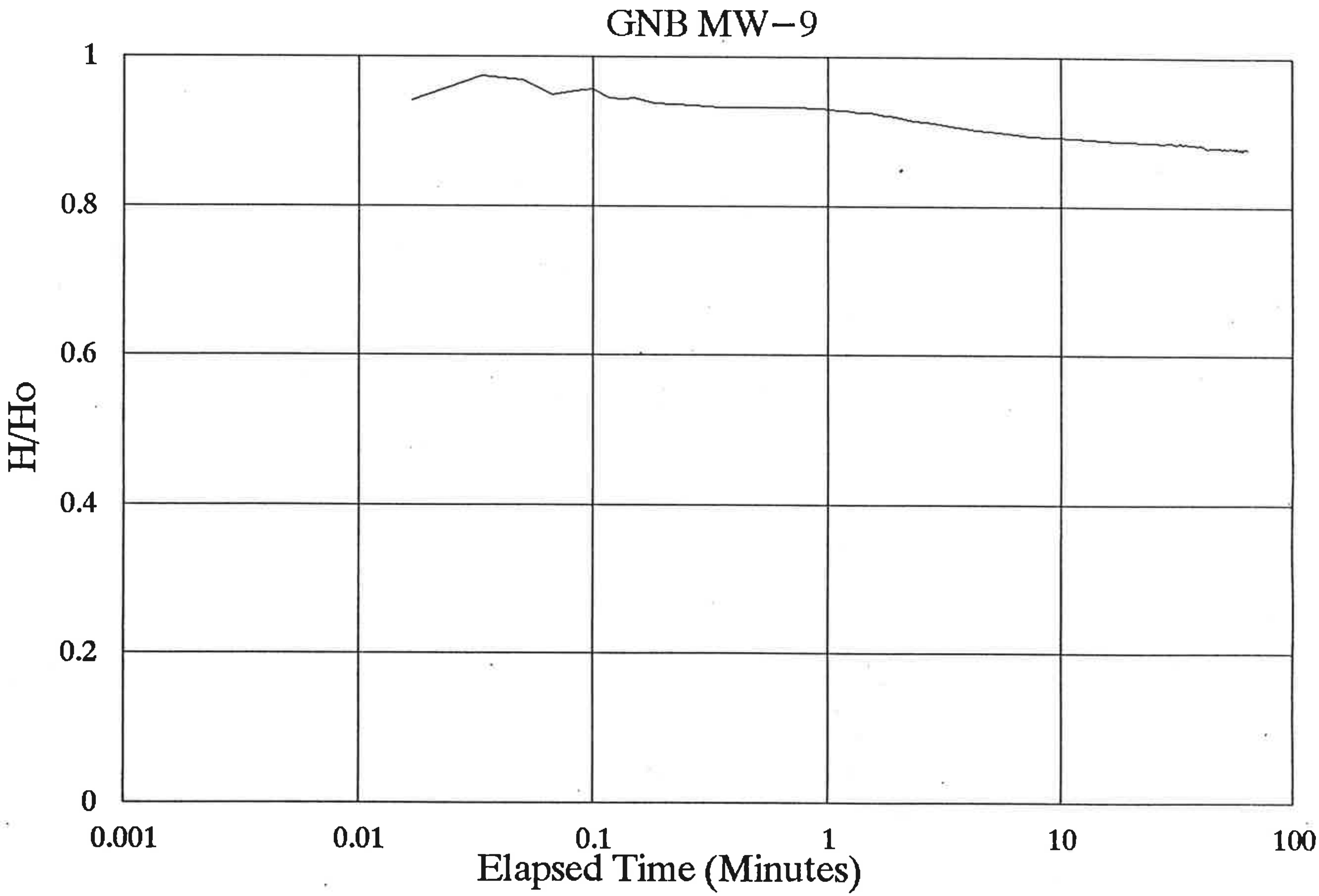
Since D <= H :
ln(Re/Rw) = ((1.1/ln(H/Rw)) + (C/(L/Rw)))^-1

K = (Rc^2 * ln(Re/Rw)/2L) * 1/t * ln(Y0/Yt)
T = K * D

RESULTS

Calculated effective well radius (Re) : 56.67 in.
(Radius over which effects of slug were felt)

Hydraulic Conductivity (K):	0.047 gpd/ft2
Transmissivity (T):	0.56 gpd/ft


GNB MW−9
1
0.8
0.6
0.4
0.2
0
H/Ho
0.001
0.01
0.1
1
10
100
Elapsed Time (Minutes)

Appendix 5-C

PUMP TEST DATA AND CALCULATIONS

GNB TECHNOLOGIES

Frisco, Texas

<u>Pumping Test Calculations LMW-17</u>

July 25 & 26, 1995

Transmissivity = T = 264 (Q) / delta s

where:

Q = Flow rate = 8 GPM

delta s = drawdown per log cycle = 0.19 foot

therefore:

T = 264 (8)/0.19

T = 11,116 gpd/ft

T = Km

where:

T= transmissivity = 11,116 gpd/ft

K = the hydraulic conductivity

m = the aquifer thickness = 4.5 feet

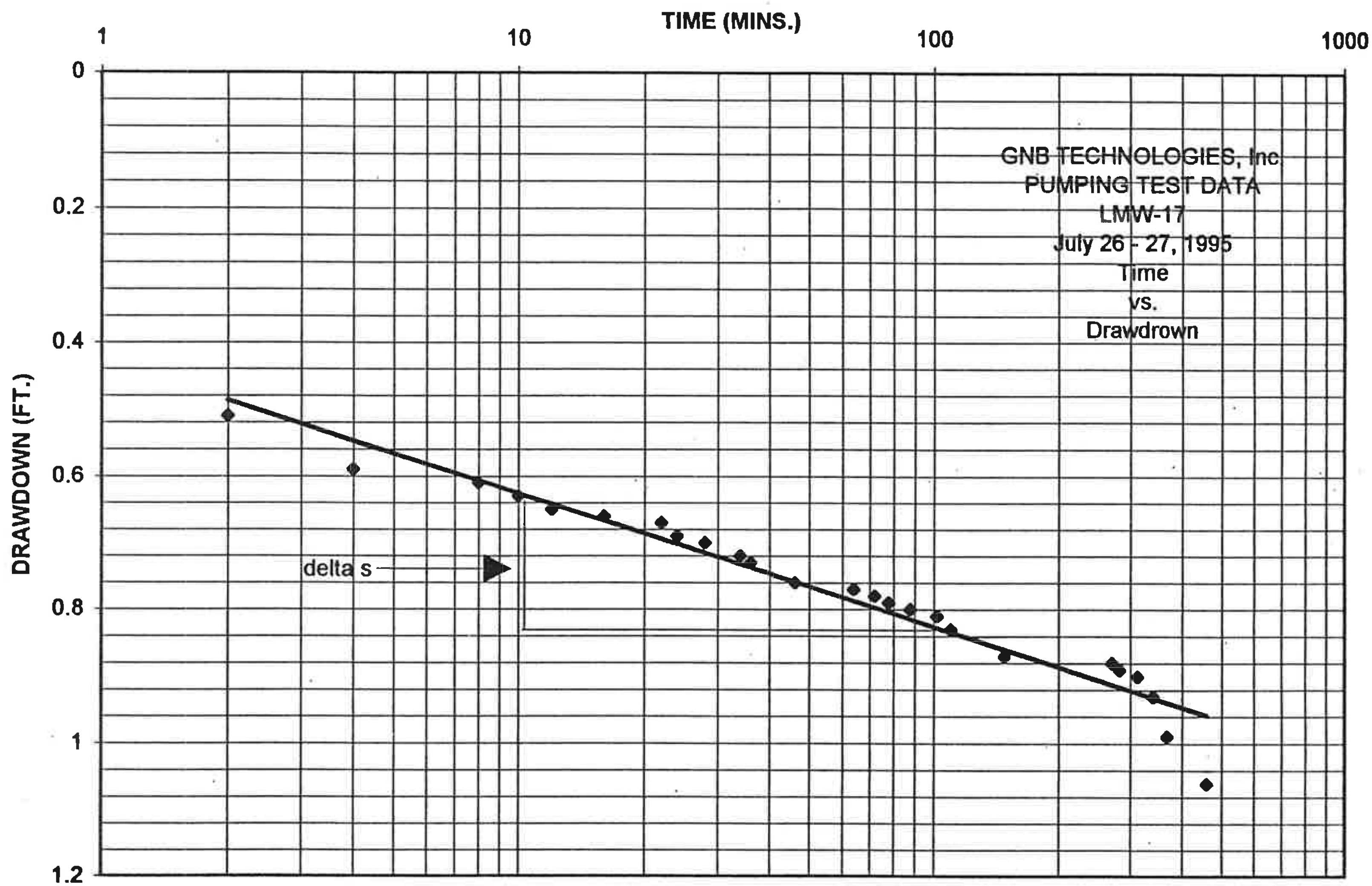
therefore:

K = T/m

K = 11,116/ 4.5

K = 2,470 gpd/ft = 0.1165 cm/sec

GNB PUMPING TEST LMW-17



Section 6
ENGINEERING PLANS

GNB intends to develop an onsite Class II non-hazardous industrial landfill for the disposal and containment of stabilized iron silica slag. The landfill will be approximately 11 acres in size and will have a waste disposal capacity of approximately 190,000 cubic yards. This will provide GNB with approximately 30 years of disposal life at current generation rates. The landfill was designed and will be operated in such a manner as to protect human health and the environment as presented in the TNRCC's Industrial and Hazardous Waste Division Technical Guideline Number 3.

A subsurface soils investigation including soil borings and laboratory tests of soil samples was performed to provide data on the engineering characteristics of the on-site soils and their suitability for landfill construction.. Results of the geotechnical evaluation are presented in Appendix 6-A - Geotechnical Report. The surficial soils at the site principally consist of fat clays underlain by shale. A thin gravel strata is present above the shale to the west and south of the proposed landfill.

6.1 Landfill Design

A perimeter containment dike will be constructed around the landfill. The interior side slopes of the containment dike will be at a 3:1 (horizontal:vertical) slope, and the exterior side slopes will be at a 4:1 slope. The top of the containment dike will be approximately 20 feet wide, and will slope north to south at 2.5 percent and east to west at 2.0 percent (see Attachment 1 - Overall Excavation Plan). The 20 foot top width provides sufficient area for termination of the liner system and the final cover system. The containment dike crest slope will assist in drainage off the final cover and containment dike. The perimeter containment dike will be constructed in phases following the sequence of cell construction. The portion of the perimeter containment dike which adjoins the cell under construction will be constructed simultaneously with the cell excavation to allow the installation of the liner, leachate collection system, and protective soil on the interior 3:1 slope of the containment dike.

The landfill will be constructed as a below and above grade landfill with the majority of the waste volume placed below grade. The area fill method will be used with the landfill divided into multiple cells as shown on Attachment 1. The size of the cells was based on the desire to provide an average cell life of approximately two years which equates to a waste volume of approximately 12,000 cubic yards.

Landfill excavation and construction will take place on a cell by cell basis. After construction of the first cell within the landfill unit, each subsequent cell will be excavated, lined, and prepared to receive waste prior to the time that the active cell becomes full. Attachment 2 - Cell 1 Construction Sequence Plan and Attachment 3 - Cell 2 Construction Sequence Plan provide "snapshots" of the sequencing landfill construction and filling. Access to the landfill and active cell will be provided by a paved, all-weather, 17-foot wide access road as shown on Attachment 9 - Miscellaneous Details.

The landfill will utilize a 1:1 moving waste fill slope. A slope stability analysis performed on the worst case condition for the moving waste fill slope yielded a factor of safety of 2.4 (see Appendix 6-A - Geotechnical Report). The individual cells within the landfill unit will be segregated by temporary separation berms which will separate the active waste disposal area from adjacent below-grade areas within the landfill. The height of the east-west separation berm located along the north side of the active cells(s) will be four feet (see Attachment 2). The height of the north-south berm located along the east side of the active cells(s) will vary from four feet high at the intersection with the east-west berm to 6.5 feet high at its termination at the containment dike (Cells 1 and 2) or the moving waste fill slope (remainder of cells). A minimum distance of ~~30~~ 10 feet between the toe of the north moving waste fill slope and the toe of the east-west separation berm slope, and a minimum of ~~ten~~ 30 feet between the toe of the east moving waste fill slope and the toe of the north-south separation berm, will be maintained to contain stormwater which has contacted waste. Stormwater which has contacted waste will be considered contaminated and kept separate from stormwater which has not contacted waste. The berm heights and 10 and 30 feet offsets are designed to provide storage for runoff associated with the 25-year, 24-hour storm. A 25-year, 24-hour storm event depth of 7.5 inches was obtained from the US Department of Agriculture Soil Conservation Service (SCS) Technical Paper No. 49.

Once waste within the active cell has reached its maximum height and can no longer be contained in the cell without violating the minimum distance between the berm and the toe of the waste slope, the next cell scheduled to receive waste will be ready for waste disposal operations to begin. The temporary berm separating the cell containing waste and the adjacent constructed cell will be removed prior to the commencement of waste placement within the new active cell.

Areas which have reached final waste grade will be covered with 12 inches (nominal) of intermediate cover (uncontaminated compacted soil) and graded to drain to the perimeter drainage channel where possible. GNB may also choose to cover areas which will not receive waste for an extended period of time with a minimum of six inches of compacted soil cover in order to minimize the generation of contaminated stormwater. Stormwater runoff from areas covered by at least six inches of soil cover will be considered to be uncontaminated. Water which has come in contact with the waste or leachate will be considered contaminated.

The southwest corner of the landfill is located within an area where a sand and gravel layer may be present beneath and near the landfill subgrade elevations. Because the sand and gravel layer has high hydraulic properties, two dewatering wells will be installed at the southwest corner to remove any hydraulic pressure which may exist on the landfill bottom and walls while Cell No.1 is being filled. The water from the wells will be discharged to the perimeter drainage channel, to the contaminated stormwater evaporation pond tank, or my alternately be used for process makeup water.

Based on the weight of the waste material being placed in the cell and the expected level of the potentiometric surface at the southwest corner of the landfill, the hydraulic pressure on the Cell No. 1 and bottom will effectively be removed once five feet of waste fill has been placed within the cell.

The two dewatering wells will be drilled by a State of Texas licensed driller using hollow-stem augers. As the augers are advanced, continuous soil samples will be obtained for lithologic description using a five-foot-long inner-auger core-barrel sampler. Soils will be logged in the field by a geologist using the Unified Soil Classification System. This description will be used to select the depth of well construction and material settings.

The dewatering wells will be constructed with four-inch I.D. schedule 40 poly vinyl chloride (PVC) casing with flush-threaded connections and will conform to the standards of 30 TAC Chapter 338 (Water Well Drillers Rules). No solvents or glue will be used for construction. The screen will consist of four-inch I.D. schedule 40 PVC wire wrapped screen with 0.020-inch wide, and will be equipped with a threaded bottom cap. A clean, rounded, silica sand filter pack material will be poured between the casing and the hollow stem auger as the auger is slowly removed from the borehole. The filter pack material will extend approximately two feet above the top of the screen.

and hydrated. After allowing sufficient time for the bentonite to hydrate, a bentonite and cement grout will be poured to within two to three feet of the ground surface. A steel protective casing, having minimum diameter of four inches, will be lowered into the borehole over the well casing and concrete will be poured around the protective casing to the ground surface. A concrete pad having minimum dimensions of five feet by five feet by six inches will be constructed at the surface around the protective casing. The well will also be protected with guard posts set approximately one foot beyond the corners of the concrete pad. A typical dewatering well construction diagram is presented in Figure 6-1.

Following construction, the dewatering wells will be developed by either bailing, swabbing, surging, or submersible pump until discharge is relatively clear and free of sediment. Well development will be documented in the field on development forms.

A submersible pump with a minimum capacity of 8 gpm will be installed in each well. A level control device will be provided to automatically start the pump when the water level within the well exceeds elevation 625. The level control device will shutoff the pump prior to cavitation occurring.

The protective casing will be equipped with a locking lid and lock to prevent tampering. The location of the well will be surveyed by a Registered Surveyor to within 0.1 foot horizontally and 0.01 foot vertically.

6.2 Landfill Excavation

Excavation will begin in the southwest corner of the proposed landfill site. The maximum depth of excavation for the landfill will be approximately 22 feet below existing ground. From a highpoint located near the northeastern corner of the landfill, the landfill bottom will slope north to south at 2.5 percent and east to west at 2.0 percent. A leachate collection sump will be constructed at the low point where the slopes converge in the southwestern corner of the bottom of the landfill.

Over the operating life of the landfill, approximately 155,500 cubic yards of soil will be generated during excavation. The volume of soil required for the perimeter containment dike will be approximately 26,000 cubic yards. The volume required for the containment system (liner and protective cover soil) and final cover system (intermediate soil, clay cap and topsoil) will be approximately 43,500 and 70,000 cubic yards, respectively. An eight-foot high landscape screening berm will be constructed between the landfill and north and east property lines. This berm will require an additional 18,000 cubic yards of fill material. It is estimated that approximately five percent of the gross landfill volume, or 9,500 cubic yards of soil will also be required for daily cover. The total quantity of fill required for the landfill is accordingly 167,000 cubic yards.

Approximately 3,800 cubic yards of soil will be generated during construction of the contaminated stormwater evaporation pond. The perimeter dike and clay liner for the pond will require about 1,500 cubic yards of this soil volume. Accordingly, an additional 9,200 cubic yards of soil will need to be brought in from an alternate source, in order to balance the cut/fill volumes for the project. This soil deficit could be taken from an on-site borrow pit or removed from the landscape berm as areas of the landfill are closed and vegetative cover established. Borrow soil however, should not be required until near the end of the landfill life since any potential soil deficit which might occur during cells construction could be handled by excavating, as required, the next cell or cell planned for development.

6.3 Ground-Water Protection

Ground-water is protected through the use of a containment system consisting of three feet of compacted clay which will be overlain by a 60-mil, high density polyethylene (HDPE), flexible membrane liner (FML), a drainage geocomposite leachate collection system (LCS), and two feet of protective soil. Material and construction specifications for various components of the containment system are provided in Appendix 6-B - Soil Liner Quality Control Plan. Onsite soils collected from excavation of the landfill are to be used for the compacted clay liner and protective cover soil. The drainage geocomposite on the bottom of the landfill will consist of a HDPE geonet with a geotextile filter fabric bonded to the top surface of the geonet. The drainage geocomposite on the 3:1 side slopes of the landfill will consist of a HDPE geonet with geotextile fabrics bonded to both sides of the geonet. The LCS will convey leachate to the gravel-filled leachate sump located in the southwestern corner of the landfill. Details of the containment system are provided on Attachment 6 - Leachate Collection System and Final Cover Details.

The leachate collection sump will be four feet deep with bottom dimensions of 10 feet by 10 feet. The side slopes of the sump will be 3:1, which yields a leachate storage capacity of approximately 3,700 gallons, assuming a nominal gravel porosity of 0.23. The sump bottom will slope at 2.0 percent toward the southwest corner of the sump where a sump pump will be located. The sump will be backfilled with stone or gravel free of shale, clay, friable materials and debris (material specifications are provided in Appendix 6-B - Soil Liner Quality Control Plan or SLQCP). The gravel filled sump will be overlain by a geotextile filter fabric to prevent the intrusion of fines into the gravel backfill. Material specifications for the geotextile filter fabric and overlying material are provided in the SLQCP. Details of the sump are provided on Attachment 6.

Access to the sump will be provided through two 12-inch diameter HDPE leachate sump access riser pipes. The riser will be installed along the 3:1 sideslope adjacent to the sump and will extend from the top of the containment dike to the bottom of the sump. The bottom three feet of riser pipe will extend along the bottom of the sump and will be perforated to allow leachate to flow into the submersible pump intake (see details on Attachment 6). One access riser pipe will house a submersible sump pump, recovery cable, electrical wiring and discharge pipe. The remaining riser will function as a spare. A determination of the depth of leachate in the sump will be possible using a pressure transducer installed with the sump pump. A monitoring panel will be placed on an outside wall of a precast concrete equipment vault which will have the above grade end of the risers and associated piping and accessories (see Attachment 6). The pressure transducer will be calibrated to display on the monitoring panel the depth of leachate over the transducer (i.e., the bottom of the sump) in terms of height of liquid. The sump pump, transducer monitoring panel will be powered by permanently installed electrical wiring. The collected leachate will be pumped up the riser through the discharge line and to the contaminated water storage tank via a forcemain with secondary containment.

The sump pump will be operated to maintain a leachate head of less than 12 inches on top of the liner outside of the sump. Prior to the depth of leachate in the sump reaching a depth of five feet, the pump will be manually turned on to empty the sump. The pressure transducer will monitor the depth of the leachate and will automatically turn the pump off when the sump has been emptied to a level that will prevent pump cavitation. A high level switch in the leachate tank will also turn off the pump automatically if the leachate tank becomes full prior to the sump being pumped empty.

A primary requirement of the sump pump is compatibility with the leachate. The pump should be classified as an "environmental pump", will be constructed of corrosion resistant materials and intended for use with corrosive liquids. EPG Companies TSP stainless steel pumps meet these requirements.

The total dynamic head from the sump to the contaminated water storage tank was calculated to be approximately 50 feet. The selected EPG model TSP12-2 will provide a discharge rate of approximately 40 gallons per minute (gpm) at this head. At this discharge rate, the pump will require approximately one and a half hours to empty the sump when it is full.

From the sump, the leachate will be pumped via a forcemain to a 5,000 gallon leachate storage tank located to the west of the sump equipment vault (see Attachment 10 and 11). The tank will be installed on a 18 by 18 feet reinforced concrete slab with secondary containment. A slightly raised 10 foot diameter level pad will be provided for the tank to rest on. The remainder of the slab will slope at 1 percent to the south and west to a 2 feet x 2 feet x 2 feet deep sump. Secondary containment of the tank will be provided by a 36-inch high concrete wall around the perimeter of the slab. The volume of the containment area equals 110 percent of the volume of the storage tank, or approximately 5,500 gallons.

Two three-inch PVC drain lines will be provided for draining liquid from the secondary containment area (see Attachment 12). One drain will discharge into the contaminated storm water evaporation pond located just to the south. The other will drain to natural grade to the west. The inlet end of each drain line will be provided with a three-inch plug valve. The plug valves will typically be kept in the closed position.

After a rainfall event, or other event resulting in an accumulation of liquid within the secondary containment area, a determination will be made whether or not the liquid is contaminated. If it is determined the liquid is contaminated, the liquid will be allowed to drain to the contaminated stormwater evaporation pond. If it is determined the liquid is uncontaminated, as is expected to typically be the case, then the water will be allowed to drain to natural grade. Prior to discharging liquid from the secondary containment area to natural drainage, the liquid will be sampled and tested to determine that it is uncontaminated based on GNB's NPDES permit. Alternately, if process water is needed, liquid within the secondary containment area may be drained to the contaminated water evaporation pond or, with the use of a portable pump(s), discharged into the leachate storage tank without a prior determination of whether it is contaminated or uncontaminated.

The leachate storage tank will be equipped with low level and high water level switches. A Hydromatic Model 30 MPD-30 self-priming pump with direct drive motor will be installed to pump the leachate from the tank to a tanker truck for disposal at an approved location. A two-inch discharge line terminating at the eastern border of the containment area will be supplied with a quick connect coupling for connection to flexible hosing for pumping into the tanker truck. The pump will be manually turned on and will be manually shut off or, if the low-level switch is activated, it will be shutoff automatically.

6.4 Final Cover System

The final cover system (FCS) will be installed over the waste fill once the waste has reached final grade. The FCS will include 12-inches of intermediate cover, three feet of compacted clay, a 40-mil FML, and 18 inches of vegetated topsoil. The FCS will slope up from the top of the perimeter containment dike at 5 percent. The maximum height of the FCS, and subsequently the landfill, is approximately 12 feet above existing ground (elevation 679.75). A contour plan of the FCS is provided on Attachment 4 - Final Cover Plan. Cross sections through the completed landfill are provided on Attachment 5 - Fill Cross Sections.

6.5 Surface Water Protection and Drainage

Management of stormwater will be a primary concern in the construction and operation of the landfill with the main goal being minimization of the amount of water which comes in contact with the waste. The water streams that will be controlled include uncontaminated stormwater runoff and contaminated water.

Sources of uncontaminated stormwater runoff include runoff from landfill areas which have at least six inches of soil in place over the waste, runoff off the final cover system, and runoff from landfill areas not subject to waste management operations. Contaminated water includes landfill leachate and stormwater runoff that has come in contact with waste or leachate.

Above-grade, uncontaminated stormwater will, to the greatest extent possible, be diverted by gravity flow to the perimeter drainage channel system where it will be directed toward the south into a tributary of Stewart Creek located south of the landfill. Stormwater from the final cover will be diverted to a drainage flume in the southwest corner of the landfill via diversion berms located on the final cover on top of the perimeter containment dike. The diversion berms will direct stormwater to the drainage flume which will carry the stormwater down the exterior 4:1 slope of the containment dike and into the perimeter drainage channel. Below-grade uncontaminated stormwater will be collected and pumped with a portable pump(s) into the perimeter drainage channel system.

Contaminated stormwater will be pumped from the active cell to the contaminated water evaporation pond with a portable pump(s). Stormwater which percolates into the waste will be collected as leachate in the LCS where it will flow to the leachate sump.

The contaminated stormwater evaporation pond was designed to contain the volume of contaminated stormwater that accumulates within the active disposal area between the moving waste fill slope and temporary separation berms. Stormwater accumulating on top of the protective soil within the active disposal area will be pumped with a portable pump(s) to the contaminated stormwater evaporation pond. The maximum surface area generating contaminated stormwater during landfill operation was estimated to be approximately 51,000 ft^2. This drainage area included the northern waste fill slope along the two westernmost cells of an east-west row of three cells, the eastern waste fill slope immediately to the west of the active cell, the 3:1 lines side slopes of the perimeter containment dike that borders the active cell, and the lined floor of the cell that has just begun to receive waste the top of the waste fill within the western two cells will be considered drainage off to be uncontaminated as it will be covered with daily or intermediate cover and will be sloped to drain away from the waste fill slope and the active cell. The evaporation pond was sized to contain stormwater runoff associated with the peak average monthly rainfall amount and the 25-year, 24-hour storm event (5.7 and 7.5 inches, respectively). A runoff coefficient of 0.88 was used to estimate the quantity of runoff generated by the total rainfall depth. A reduction in volume of contaminated stormwater due to surface evaporation off the pond was also considered in the pond sizing calculations. Based on analysis, the required pond volume was calculated to be approximately 54,000 cubic feet, or 407,000 gallons.

The evaporation pond will be lined with two feet of compacted clay overlain by a 40-mil FML. The top of the pond will have dimensions of 190 feet by 80 feet. The bottom of the pond will slope at one percent to the south and west with a resulting low point in the southwest corner. The sides of the pond slope will be constructed at a 3:1 slope. The volume of the evaporation pond will be approximately 55,000 ft^3 not including one-foot of freeboard.

The perimeter of the pond will be formed with a perimeter dike which will be a minimum of 18 inches above the existing ground and have a top width of 12 feet prior to placement of the clay liner. The drain line from the leachate storage tank containment area will discharge into the pond approximately twelve inches below the dike crest. An optional eight-inch HDPE access riser pipe may be installed to assist in emptying and filling the pond (see Attachment 9).

6.6 Site Drainage Calculations

The Rational Method was used to calculate the flowrates to be carried by the landfill cap berms and the drainage flume. Runoff values were calculated for the case in which the entire FCS is in place and vegetated, as this is the case in which runoff will be the greatest. In conjunction with Rational Method calculations, the Mannings Equation was used to estimate channel flow characteristics along the perimeter diversion berms and in the drainage flume. The location of drainage structures are shown on Attachment 4. A detail of the perimeter diversion berm is shown on Attachment 6. Details of the drainage flume are shown on Attachment 7 - Top of Drainage Flume. Details and Attachment 8 - Bottom of Drainage Flume Details.

The Rational Method is based on the equation:

$$Q = CIA$$

where	Q	=	peak discharge rate (cubic feet / sec)
	C	=	runoff coefficient
	I	=	uniform rate of rainfall intensity (in / hour)
	A	=	contributing drainage area (acres)

The runoff coefficient, C, is a factor which relates rainfall to runoff. Some percentage of all rainfall is lost to evaporation, infiltration, local depressions, and other environmental factors. C is a simple multiplication factor which describes what portion of rainfall results in storm runoff. The C factor used to calculate the peak flowrate off the final cover is for a cover slope of 2 percent to 7 percent with good grass coverage and equals 0.39.

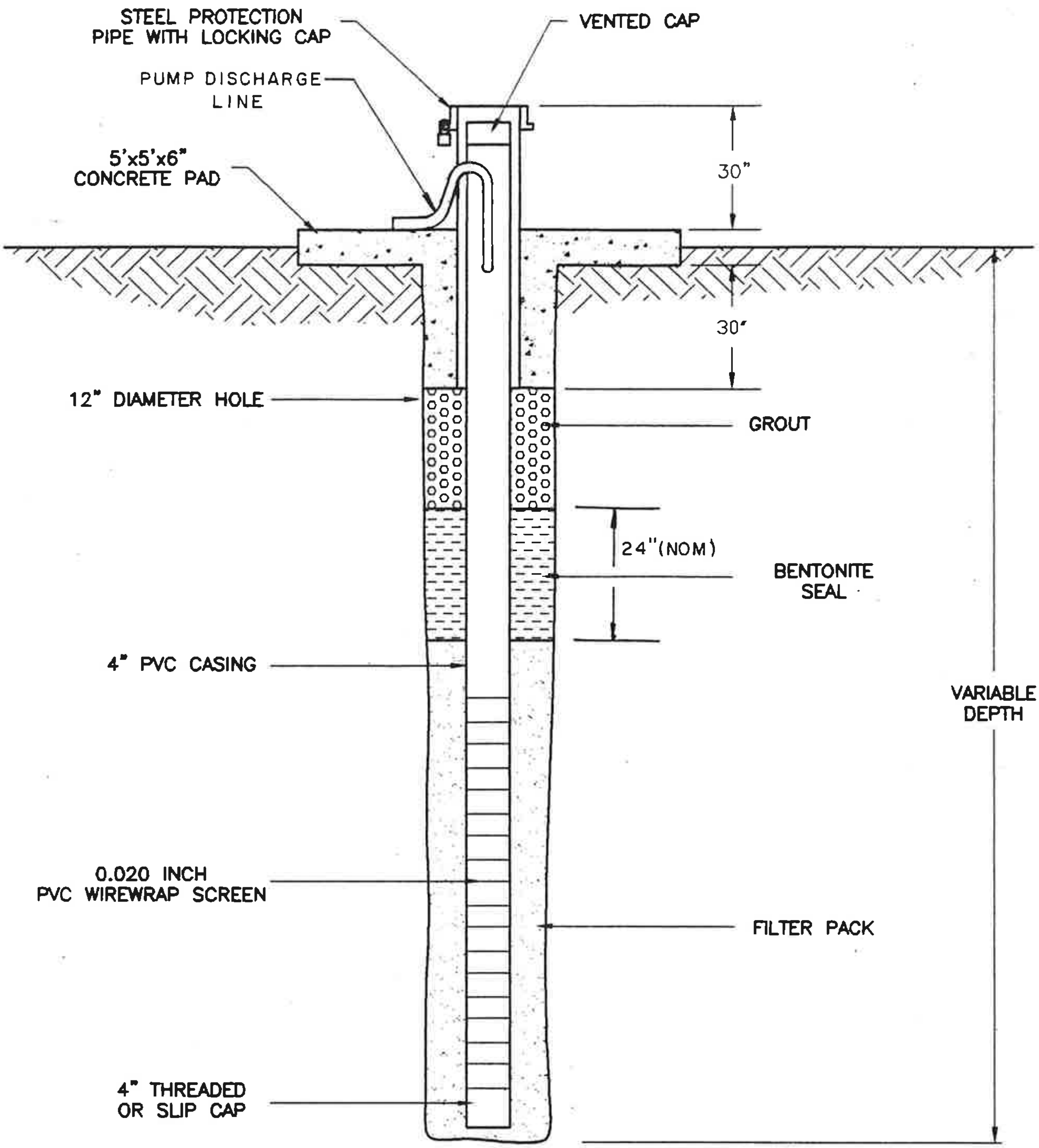
The rate of rainfall intensity, I, is based on the time of concentration, Tc, which is defined as the time required for the surface runoff to flow from the most remote part of the drainage area to the point of interest. Tc includes the combined travel times required for overland flow, shallow concentrated flow, and channelized flow. The equations used to calculate travel times for sheet flow and overland flow were obtained from Technical Release No. 55 - Urban Hydrology for Small

Watersheds, June 1986. Overland flow is sheet flow over land surfaces and occurs for up to 300 feet, after which point the flow becomes shallow concentrated flow. Channelized flow will occur alongside the diversion berms and within the drainage flume. Travel time for channel flow was calculated using Manning's equation.

Calculations for the peak flowrate off the final cover system were based on the 25-year, 24-hour storm event. Because overland flow and shallow concentrated flow exist in conjunction with channelized flow, the total flow volume was determined on an iterative basis. The peak flowrate was initially estimated based on travel times for overland and shallow concentrated flow only. Manning's formula was then used to determine channelized flow velocity. The length of the channelized flow path was then divided by the calculated velocity to determine a time of flow in the channel. This time was then combined with the travel times for the overland and shallow concentrated flow to determine a new Tc. The new Tc was used to calculate a new I and thus a new Q. This iteration continued until the calculated Q approximately equalled the estimated Q. The results of these calculations yielded a flow of 24 cubic feet/second (cfs) into the drainage flume and a flow depth of 0.5 feet in the flume.

The drainage flume will terminate at the bottom of the containment dike side slope at a stilling basin. The stilling basin is designed to dissipate the energy of stormwater in the flume and thereby prevent erosion damage in the drainage channel downstream of the flume. The basin was sized for the hydraulic jump associated with the 25 year discharge flow of 24 cfs which was calculated to be approximately three feet above the bottom of the basin. The length of the basin was sized to contain the length of the hydraulic jump, a distance of approximately 17 feet.

The design of the sump and the energy dissipation blocks used to convert drainage flume discharge from supercritical to subcritical flow was performed using the United States Bureau of Reclamation standards for dissipator proportions. Attachment 8 shows the bottom drainage flume and stilling basin details and includes the dimensions for the dissipation blocks.



GNB Technologies, Inc.
FRISCO, TEXAS

50–01518.10 | 8/31/95 | D950353

FIGURE 6–1

TYPICAL SHALLOW AQUIFER DEWATERING WELL CONSTRUCTION

JONES & NEUSE
GULF COAST REGION OF RMT

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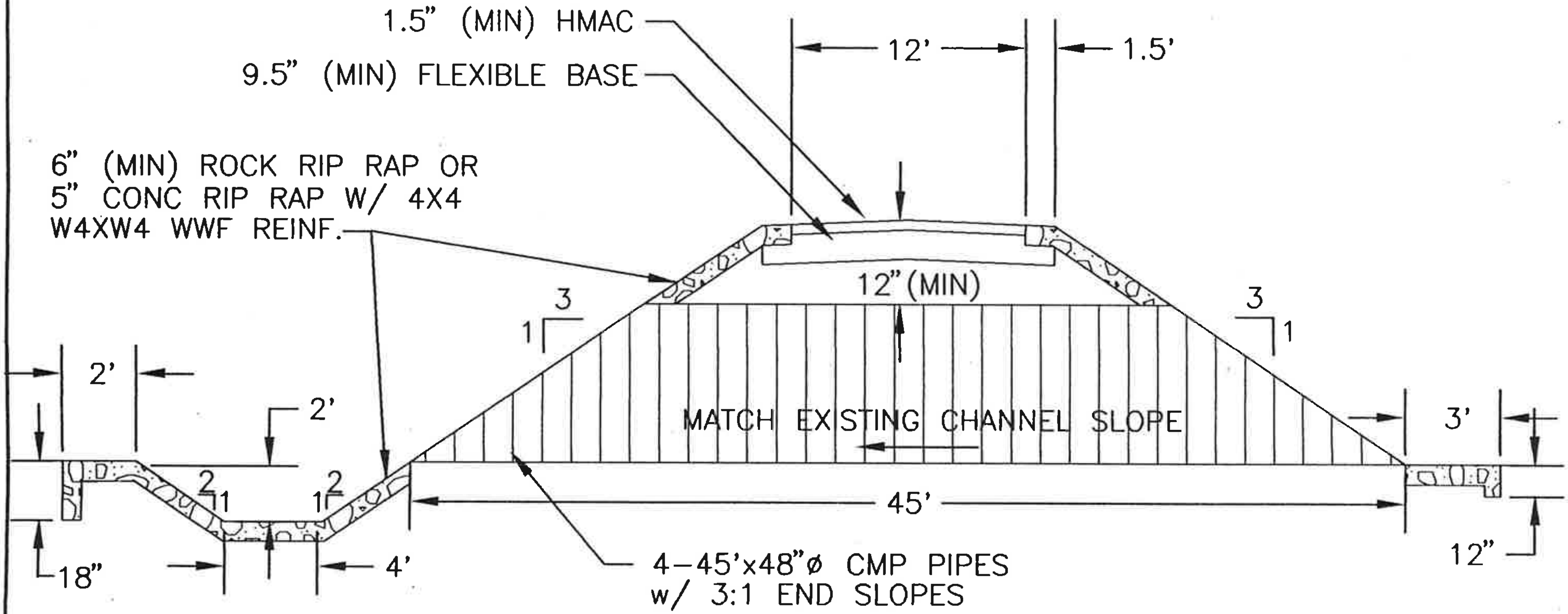


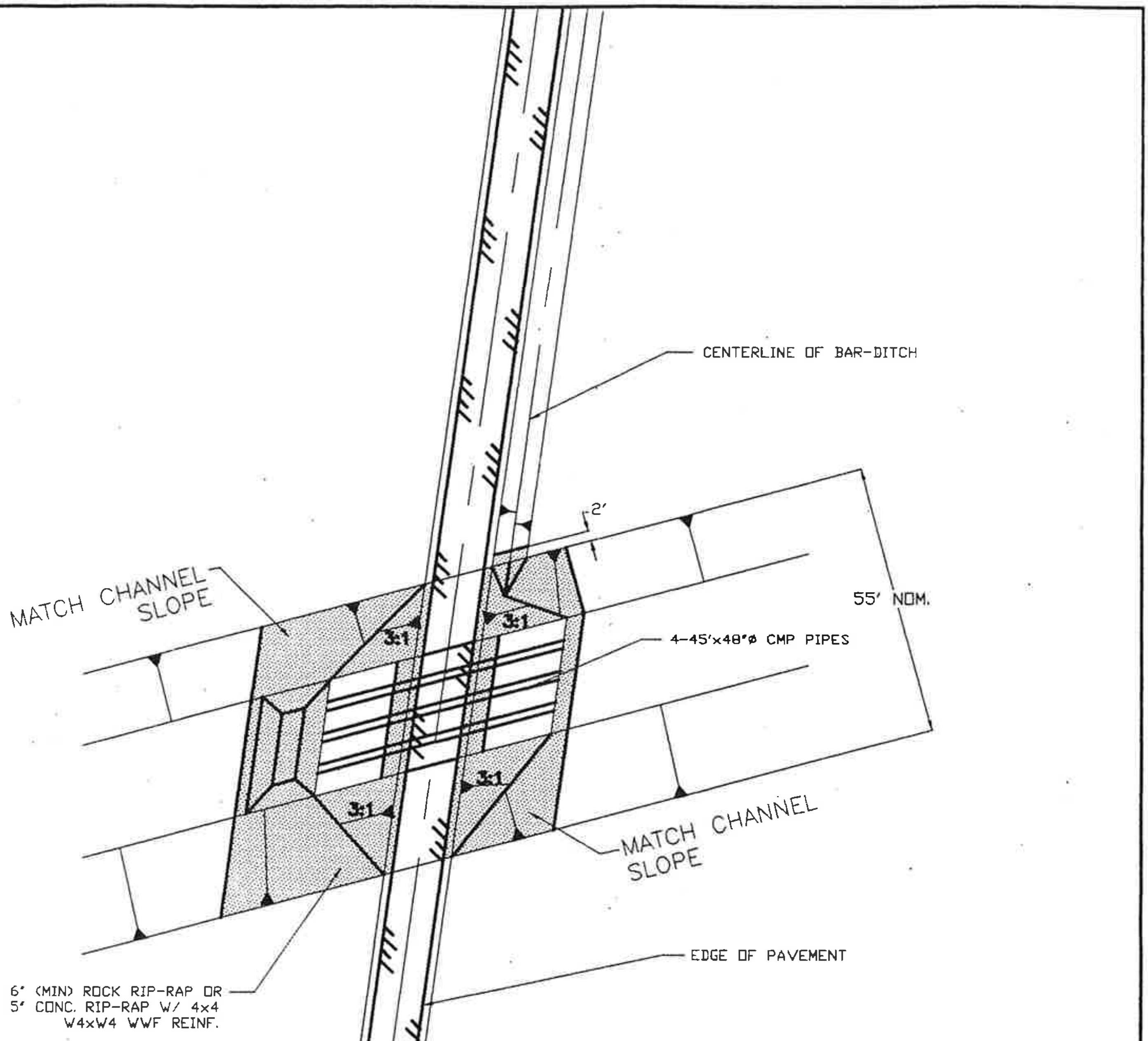
NOT TO SCALE

50-01584.88 4/30/96 D000000

FIGURE 1
SECTION VIEW
ACCESS ROAD CHANNEL CROSSING

GNB TECHNOLOGES – FRISCO, TEXAS

RMT/JONES & NEUSE, INC.



NOTE: PROVIDE 12" MIN. SEPERATION BETWEEN OUTSIDE DIAMETER OF PIPES.
SEE FIGURE 1 FOR RIP-RAP DIMENSIONS.

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FIGURE 2
PLAN VIEW
ACCESS ROAD CHANNEL CROSSING

GNB TECHNOLOGIES – FRISCO, TEXAS

RMT/JONES & NEUSE, INC.

DETAIL2.DWG

Appendix 6-A

GEOTECHNICAL REPORT

APPENDIX 6-A
GEOTECHNICAL REPORT
CLASS 2 NON-HAZARDOUS INDUSTRIAL WASTE LANDFILL

GNB TECHNOLOGIES, INC.
FRISCO, TEXAS

AUGUST 1995

STATE OF TEXAS
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List of Attachments

Section 1
INTRODUCTION

GNB Technologies, Inc. (GNB) intends to construct a class 2 non-hazardous industrial waste landfill at its battery recycling\production facility in Frisco, Texas. The 11-acre landfill will be used to dispose of treated waste materials from the GNB battery recycling process which produces an iron silica slag containing lead.

The following report presents the field exploration and laboratory test data obtained during two site geotechnical investigations for the new landfill, a description of the proposed facility, and a characterization of existing site and subsurface conditions. This report also contains geotechnical engineering recommendations for design/construction of the landfill components, and contains the results of slope stability, bearing capacity, and settlement analyses. Further, laboratory test data were reviewed to develop recommendations regarding the suitability of on-site soils for the construction of landfill liner and cover systems. Recommendations for general site earthwork, including clay liner/cap construction, and control of ground water are also included.

Section 2
PROJECT DESCRIPTION

The proposed 11-acre landfill will be a mono-fill designed to receive Class 2 non-hazardous waste materials. The waste will consist of a slag produced from a battery recycling process. The slag, which contains lead, will be treated in a process that binds the lead and stabilizes the slag. The treated waste will be placed as a low viscosity liquid into the landfill where it will harden into a coherent, high strength mass.

The landfill will be an above ground-below ground unit located in the northeast portion of the GNB facility property in Frisco, Texas. The landfill will be rectangular in shape and is designed to accommodate mass-filling operations. Bottom-of-excavation elevations will typically range from about 15 to 20 feet below the existing ground surface. Two to 12-foot high perimeter containment dikes will surround the landfill. Exterior 4:1 (horizontal:vertical) berm slopes are planned and interior berm/cut slopes will be constructed on 3:1 inclinations. The bottom of the landfill will slope downward toward the southwest corner. Two percent east-west slopes and 2½ percent north-south slopes are planned for drainage of the Leachate Collection System (LCS). The thickest waste will be placed the near the northeastern corner of the landfill where the waste and cover system will rise approximately 33 feet above bottom of the landfill excavation. The top of the finished cap will be constructed to slope at a 5% inclination toward the perimeter containment dike. During landfill filling, 1:1 waste fill slopes of the hardened waste are planned.

Composite liners and covers will be installed in the landfill. The bottom liner system will consist of three feet of compacted clay with a minimum permeability of 1×10^{-7} cm/s, a High Density Polyethylene (HDPE) Flexible Membrane Liner (FML), a Leachate Collection System (LCS), and a two-foot thick layer of protective cover soil. A textured FML will be used for the sideslope liner and a smooth FML will be used for the bottom liner. The LCS will be a drainage layer consisting of a geocomposite composed of a geonet with a non-woven geotextile filter fabric fused to its upper surface. A similar LCS will be used on the sideslopes, however, the sideslope geocomposite LCS will consist of a geonet with filter fabric fused to both sides.

The composite cover of the landfill will consist of three feet of compacted soils with a maximum permeability of 1.0×10^{-7} cm/sec overlain with a 40-mil smooth HDPE FML. The FML will be covered with 18 inches of vegetated topsoil.

Section 3
FIELD EXPLORATION PROCEDURES

A total of eighteen 16-to 25-foot deep test borings were drilled on the GNB property in the vicinity of the planned landfill. Ten of the test borings were drilled as part of an initial exploration in February, 1995 and the remaining borings were drilled in July, 1995. Fourteen of the borings where positioned within or directly adjacent to the planned unit and the remaining four borings (SB-1 through B-4) where located southwest of the landfill. All the test borings were extended into shales of the Eagle Ford Formation and ten of the borings were converted to temporary piezometers to gather data used primarily for the hydrogeologic site assessment.

Hollow stem augers were used to advance the borings. The top ten feet of the borings were sampled continuously and undisturbed samples of cohesive soils were obtained with thin walled tube samplers. Samples from select borings were returned to the RMT\JN geotechnical laboratory in Austin, Texas for geotechnical testing.

An RMT/Jones and Neuse, Inc. (RMT/JN) field geologist was on site to log all boreholes and to oversee the construction of the temporary piezometers. Horizontal and vertical surveying was also performed to locate the borings and piezometers.

Detailed boring logs and a Boring Location Plan are contained in Section 5 (Geology report).

Section 4
LABORATORY TESTING PROGRAM

Select soil samples obtained during the field exploration were subjected to geotechnical testing. The testing program was designed to help characterize subsurface conditions, to determine the engineering characteristic of in-situ materials, and to determine the engineering characteristics of remolded samples of potential fill and clay liner/cover soils.

Selected undisturbed samples of in-situ soils were subject to the following tests to help evaluate their engineering characteristics:

- Consolidated-Undrained (C-U) triaxial compression strength tests with pore water pressure measurements,
- Unconsolidated-Undrained (U-U) triaxial compression strength tests,
- Unconfined compression strength tests,
- Falling head hydraulic conductivity tests,
- Consolidation tests, and
- Unit weight determinations.

Selected samples were also subject to the following tests for classification/characterization purposes:

- Atterberg limits determinations,
- Grain size analyses, and
- Moisture content determinations.

Selected bulk samples and remolded specimens of potential fill and clay liner soils were subjected to the following tests:

- Standard Proctor tests,
- Unconfined compression strength tests,
- Grain size analysis, and
- Atterberg limits determinations.

Section 5
SITE AND SUBSURFACE CONDITIONS

5.1 Site Conditions

The landfill site is located in the northeastern portion of the GNB facility property approximately one-half mile south of town of Frisco in Collin County, Texas. The site is bounded to the north and east by Eubank Street and Fifth Street, respectively. Most of the site is presently cultivated and some wooded areas area located near Stewart Creek which runs along the southern site boundary. Further, a previously evacuated and leveled area with thick grasses and brush located in the northwestern portion of the site is separated from the remainder of the site by a shallow cut slope. Topographically, the remainder of the site slopes gently downward toward Stewart Creek. Site elevations range from about 680 feet above mean sea level (MSL) near the northeast corner to about 644 feet MSL approaching the creek.

5.2 Subsurface Conditions

The project site is located in the Black Prairie subdivision of the Gulf Coastal Plain and is underlain by shales associated with the Eagle Ford Formation. The Eagle Ford formation is a 300- to 400-foot thick formation composed of shales with thin sandstone beds. Test borings at the site encountered Eagle Ford shales from 11 to 23 feet below existing ground surface.

Fat clays (CH's), clayey gravels, and occasional lean clays (CL's) and clean sands (SP's) were encountered by the test borings above the Eagle Ford shales. The uppermost soils consisted of dark colored clays of moderate plasticity that extend to depths of about five to nine feet. The near surface portion of these soils appeared to have been cultivated materials and contained some organics.

A deeper layer of moderately to highly plastic clay was then encountered beneath the dark upper clays. Layers of clayey gravel, typically two to four feet thick, were present within the deeper clay stratum at many of the boring locations. The clayey gravel layers appear to pinch out approaching the actual landfill footprint, although it is possible these materials may be present in the extreme southwest corner of the landfill. The deeper clays extended to the top of the Eagle Ford shales although they were separated from the shales by a thin layer of sand at several boring locations.

Piezometer data indicate that ground water is present in some of the transmissive clayey gravel layers. Measurements shows that the piezometric surface seasonally extends to within 5 to 10 feet of the existing ground surface. The occurrence of ground water will likely fluctuate with seasonal and rainfall variations and the recorded levels may differ from the levels at the time of construction.

Section 6
GEOTECHNICAL LABORATORY TEST RESULTS

Geotechnical testing indicated the dark soils from the upper, near-surface clay stratum to be fat clays with Liquid Limits (LL's) ranging from 55 to 75 and Plasticity Indices (PI's) ranging 31 to 47. Moisture contents of tested soils from the upper stratum varied from about 16% to 36%. Testing of soils from the upper cohesive stratum also indicated unconfined compressive strengths of 1.8 ksf to 9.6 ksf at their in-situ moisture contents. The results of a C-U triaxial compression test on a similar soil were interpreted to indicate an effective angle of internal friction (ϕ angle) of 6.8° and an effective cohesion of 331 psf. Consolidation testing of a sample of the upper soils indicated the materials to be moderately compressible with a modified compression index of 0.11.

Testing indicated soils from the deeper clay stratum to be fat clays and lean clays with LL's of 39 to 81 and PI's of 22 to 54. Moisture contents of tested soils from this stratum varied from about 18% to 32% and unconfined compressive strengths of 3.0 ksf to 4.8 ksf were recorded at the samples in-situ moisture contents. The results of C-U triaxial compression tests on these soils were interpreted to indicate effective angles of internal friction (ϕ angles) of 22.8° to 27.1° and effective cohesions of 216 psf to 460 psf. Consolidation testing of a sample of the deeper clays indicated the materials to be moderately compressible with a modified compression index of 0.17. Additionally, permeability tests performed on undisturbed samples of these clayey soils indicated hydraulic conductivities of 2.7×10^{-9} cm/s to 1.0×10^{-7} cm/s.

One sample of the Eagle Ford shale was subjected to geotechnical testing. A PI of 31, a LL of 55, a moisture content of 16.5% and an unconfined compressive strength of 11.9 ksf were recorded.

Standard proctor tests were performed on soils from bulk samples obtained from the upper clay and deeper clay strata. The results indicated maximum dry densities of 89.4 pcf to 103.6 pcf with optimum moisture contents of 24.5% to 17.5%, respectively.

Geotechnical testing was also performed on bulk samples of the upper and deeper clays which were remolded to approximately 95 percent of their maximum dry densities near their optimum moisture contents. The results indicated unconfined compressive strengths of 4.8 ksf to 5.7 ksf, PI's of 27 to 52, LL's of 50 to 78, and 83% to 95% fines passing the number 200 sieve. Permeability testing of the remolded samples indicated hydraulic conductivities of 3.6×10^{-8} cm/s to 7.9×10^{-8} cm/s.

Detailed results of the laboratory testing are included on the attached laboratory test data sheets and testing summary sheets included as Attachment 6-A.1.

Section 7

CONCLUSION AND RECOMMENDATIONS

7.1 Slope Stability Analyses

7.1.1 General

Slope stability analyses were performed using the PC STABL 5M computer program developed by Stanford University. Bishops method was used in the program to calculate minimum factors of safety of potential circular failure planes, and a sliding block analysis was used to evaluate potential failure planes within liner systems. Both total and effective stress conditions were typically modeled.

The stabilities of various critical slope configurations of the landfill were analyzed. These included the following:

- The perimeter berm cut/fill slopes;
- The highest waste face slopes during filling; and
- The global stability of the landfill units after closure.

Maximum depths of the subsurface clays were assessed to be the worst case subgrade conditions and these conditions were assumed for the slope stability analyses. Strength values for the subsurface clays were based on a low average of test results. The strength values of tested remolded samples were used to model the structural fill, protective cover, and compacted clay liner and cover soils.

For analysis of failure along the liner systems, the strength of the weakest liner interface was used for the liner system strength. The values of the interface friction angles and adhesions values of the various geosynthetic components of the liner system were based on relative research and testing by the Geosynthetic Research Institute (G.R.I.) and on past experience in the testing of geosynthetics. The most critical interface within the liner system was assumed to the be clay liner\FML interface.

Soil strengths for effective stress conditions were typically based on the effective stress results of the C-U triaxial tests. For soils where cu-test results were not available, effective stress strength parameters were estimated based on typical values cited in literature. Strengths for total stress conditions were based on the results of the unconfined compression tests. The unconfined compression tests were assessed to model actual construction more accurately than the total stress conditions of the C-U triaxial tests.

The waste slag will be stabilized be mixing it with cement and other patented admixtures. Approximately 300 pounds of cement will be added to the mixture and water will be added to make the mixture workable and hydrate the cement. Although no specific compressive strength data is currently available for the hardened mixture, the mixture will have a water\cement ratio (by weight) approaching 1.0. Therefore, it is assumed that the hardened mix will have a compressive strength similar to very lean, low strength concrete. To be conservative, a very low strength compressive strength of 56 psi has been assumed for the stabilized waste in the landfill. A low value was used to ensure that the assumed design values will be exceeded by the actual hardened waste material. Confirmation bench testing of compressive strength should be performed on samples of hardened sludge prior to its placement in the proposed landfill.

7.1.2 Perimeter Berm Slopes

The most critical perimeter berm slopes of the landfill were assessed to be the highest berm interior fill\cut slopes and highest dike located along the northern edge of the landfill. The modeled interior berm\cut slope is about 19 feet high and the dike itself is about 12.5 feet high. The analyzed configuration and results are contained on figures in Attachment 6-A.2 of this report.

Circular failure analyses were performed using total and effective stress conditions. The total and effective soils strength parameters and minimum factors of safety for the perimeter dike cuts\fill slopes analyzed are summarized below:

Critical Perimeter Dike Cut\Fill Slopes				
	Total		Effective	
	C (PSF)	φ (Deg)	C' (PSF)	φ'(deg)
Clay Liner Soils	1800	0	200	20
Dike Fill	2000	0	200	20
Upper Clays	1000	0	300	6
Lower Clays	1500	0	250	22
Shale	4000	0	500	34
FACTOR OF SAFETY	3.1		2.1	

The results of the PC STABL 5M computer slope stability analysis indicated minimum factors of safety in excess of 1.5 for both total and effective stress conditions. Therefore, it appears the planned 3:1 perimeter berm slopes of both units will be stable for both short-term (undrained) and long-term (drained) conditions.

7.1.3 Waste Face Slopes

The treated waste mixture will be placed in the landfill in a fluid state as a slurry. As the mixture hydrates it will harden into a cohesive mass. The waste will be placed in the landfill at such a slow rate that each lift of waste should have the opportunity to complete much of its hydration and hardening prior to placement of additional waste above it.

Although no strength data is available for the hardened waste mixture, it should behave as a weak concrete. Therefore, a very low compressive strength value of 56 psi has been assumed for the waste. For the stability analysis, the hardened waste mixture has been modeled as a soil with a cohesion of one-half the compressive strength. Therefore, a cohesion of 4,000 psf has been used for the waste. Further, it is assumed that there will be no difference between the effective and total strength parameters of the hardened waste.

The highest working face (22.5 feet of waste) anticipated during the life of the unit was modeled for the waste face slope stability analyses. This configuration was then analyzed for a circular failure which could potentially extend through the subgrade soils and for a block analysis simulating a failure though the liner system. The analyzed configuration and results are contained on figures in Attachment 6-A.2 of this report.

The strength parameters used in the analyses and the minimum factors of safety calculated are presented below.

Working Faces-Circular Failure Analysis				
	Total		Effective	
	C (PSF)	ϕ (Deg)	C′ (PSF)	ϕ' (Deg)
Treated Waste	4000	0	4000	0
Smooth FML\Clay Liner	0	11	0	11
Subgrade Clay	1000	0	300	6
FACTOR OF SAFETY	2.2		2.4	

Working Faces-Block Failure Analysis				
	Total		Effective	
	C (PSF)	ϕ (Deg)	C′ (PSF)	ϕ' (Deg)
Treated Waste	4000	0	4000	0
Smooth FML\Liner	0	11	0	11
FACTOR OF SAFETY	2.9		2.7	

The results of the PC STABL 5M computer slope stability analyses indicate minimum factors of safety well in excess of 1.5 for both total and effective stress conditions. Therefore, it appears the waste working faces will be stable for both short-term (undrained) and long-term (drained) conditions.

7.1.4 Global Stability of The Completed Landfill

The global stability of the final slopes of the completed landfill were analyzed for total and effective stress conditions. The unit was considered to contain approximately 28 feet of waste and cover soils. The analyzed section is illustrated on a figure in Attachment 6-A.2 of this report.

Total and effective strength parameters used in the analysis and the resulting minimum factors of safety are summarized below:

Global Stability of Completed Landfill				
	Total		Effective	
	C (PSF)	ϕ (Deg)	C' (PSF)	ϕ' (Deg)
Treated Waste	4000	0	4000	0
Dike Fill	2000	0	200	20
Upper Clays	1000	0	300	6
Lower Clays	1500	0	250	22
Shales	4000	0	500	34
FACTOR OF SAFETY	5.6		2.7	

The factors of safety against failure were well above 1.5 for both effective and total stress conditions. Therefore, it appears that the final landfill unit configurations will be stable for both short-term and long-term conditions.

4.F.7.2 Bearing Capacity

Bearing capacity analyses were performed to evaluate the foundation support characteristics of subgrade soils underlying the bottom of the landfill and the perimeter dikes. The potential for a shear failure through the lower clays beneath the landfill and the deeper shales were analyzed for the completed landfill. The results of the analysis and the strength parameters used are presented below. Detailed calculation sheets are attached in Attachment 6-A.3 of this report.

Bearing Capacity-Sand Layer		
	Bearing Pressure	Factor of Safety
Landfill Subgrade-Clays	5,400 psf	2.0
Landfill Subgrade-Shale	5,400 psf	4.7
Perimeter Dikes	1,400 psf	4.1

The calculated factors of safety against bearing failure indicate that the subgrade soils should not experience bearing failure under the maximum landfill unit loads.

7.4 Settlement Estimates

Potential consolidation settlements of the landfill were estimated based on the results of laboratory consolidation testing of subsurface clays. Estimates of settlement due to the deeper shales were based on the elastic method using typical values for shales cited in literature. Settlement of the hardened treated waste was assumed to be negligible, however, some minor consolidation of the soil components of the landfill liner are expected.

Potential total settlements of the subgrade at various points within the landfill were estimated and these values were used to predict potential differential settlement of the landfill liner system. Anticipated waste settlements were added to these values to evaluate total and differential settlement of the landfill cap.

Consolidation testing was performed on undisturbed samples of subsurface soils. The tests indicated that the clayey soils are only moderately compressible, however, they will tend to consolidate much more than the deeper shales. Therefore, maximum landfill settlements can be expected where the deepest deposits of the clay are present beneath the landfill loads. For the settlement analysis, it was assumed that as much as ten feet of clay may be present below the bottom of the landfill. Maximum landfill loads of 5,400 psf and minimum loads of 4450 psf were used in the analyses.

Perimeter berm settlements were also analyzed for a 12-foot high section of perimeter dike. Settlement estimates are summarized below.

	Total Settlement (FT)
Perimeter Dike	¾ to 1
Landfill Bottom (Maximum)	1 to 2
Landfill Bottom (Minimum)	½ to 1
Top of Cap (center)	1½ to 2½
Top of Cap (Edge)	¾ to 1¼

The landfill bottom estimates represent subgrade settlement which will affect the bottom liner. Top of cap settlements represent long term total settlements which are the accumulated subgrade settlements and cap settlements. Differential settlement of the landfill floor should approach 0.3%. Therefore, the design slope of the landfill bottom can be expected to be reduced by about 0.3% after the completion of long term settlement.

7.5 Soil Materials Suitability

7.5.1 General

Details specifications for compacted clay liner and cover soils, protective cover soils, structural fill and topsoil materials are presented in the Attachment 6-B - Soil Liner Quality Control Plan (SLQCP). The SLQCP was developed based on Texas Natural Resource Conservation Commission (TNRCC) guidelines for compacted clay liner and FML construction. Compacted clay liner and cover soils installed will meet state guidelines for plasticity and gradation and will possess a maximum compacted in-place permeability of 1×10^{-7} cm/s.

Clayey soils obtained on site were tested to evaluate their suitability for use as compacted clay liner and cover materials. The test results indicate that the clay soils are relatively uniform consisting of fat clays and lean clays of moderate to relatively high plasticity. It appears that most all the clayey soils excavated during construction of the landfill units will be satisfactory for use as compacted clay liner and cover materials.

Specifications for protective cover soils overlying the Leachate Collection System (LCS) are based on design calculations for grain size distribution which will help prevent clogging of the a geotextile component of the LCS and drainage systems. The cover system topsoil component will have to support vegetative root growth.

7.5.2 Compacted Clay Liner and Cover Soils

Soils used for compacted clay liner and cover construction will possess a minimum PI of 15 , a minimum LL of 30, have at least 30% fines passing the number 200 sieve, and be capable of achieving a compacted in-place hydraulic conductivity of 1 x 10^{-7} cm/s or less. A total of 15 samples of on-site clays were tested and all samples met the plasticity requirements. Four permeability tests were performed on remolded samples of similar materials and the results indicated that all four samples possessed hydraulic conductivities below those required for compacted clay liner and cover construction.

The samples were all remolded approximately at their optimum moisture contents. However, it is recommended that the compacted clay liner and cover soils be placed and compacted at moisture contents over optimum to help ensure that they meet the specified permeability requirements when placed. Further, the upper dark clays do tend to contain some organic materials, but these soils should typically be suitable for compacted clay liner and cover construction.

Any clayey gravels encountered during construction may not meet the materials requirements for compacted clay liner and cover construction and should typically not be considered for compacted clay liner or cover construction. Additional testing is needed if such soils must be considered for use as compacted clay liner or cover material. Isolated sands encountered during excavation for the landfill units will not be suitable for use as compacted clay liner and cover materials.

Generally, the tested soils possessed in-situ moisture contents close to their standard Proctor optimum moisture contents. Although some soils were still significantly dry or wet of their optimum moisture, in general, it appears that the need for adding water to, or drying soils prior to placement will be limited.

7.5.3 Structural Fill, Topsoil Cover and Protective Cover

Protective cover soils must meet gradation requirements to help prevent clogging of the geosynthetic component of the LCS or cover drainage systems. It appears that subsurface clays will typically not meet the gradation requirements. Clayey gravels may possibly meet these requirements and any sands encountered should be satisfactory for this use.

The upper clays have been used for agricultural purposes and the nearer surface materials tend to contain some organics. Therefore, it is likely that these soil may be used as topsoil materials. Further, it appears that these soils, as well as most other materials excavated for landfill construction, may be used as structural fill..

7.6 Construction Recommendations

7.6.1 Subgrade Preparation

Any areas to receive clay liner or fill should be stripped of vegetation and other deleterious organic materials and any obviously unstable subgrade soils should be removed. After stripping and the removal of any obviously unstable soils, the exposed subgrade should be proof-rolled with a heavy piece of rubber-tired construction equipment such as a loaded scraper or tandem axle dump truck. Areas which pump or rut excessively under the proof-rolling load, or are otherwise unstable, should be undercut to firmer materials or stabilized with large diameter stone or geosynthetics prior to fill placement or liner construction.

7.6.2 Structural Fill

Structural fill should typically be compacted to 95% of its standard Proctor maximum dry density. Fill should be placed in relatively thin lifts for compaction. No significant processing is expected for the general fill.

7.6.3 Compacted Clay Liner and Cover Construction

Compacted clay liner and cover soils should be compacted to at least 95% of their standard Proctor maximum dry density. To help ensure that the in-place compacted clay liner and cover soils will meet hydraulic conductivity requirements, clay moisture content should be maintained from 0% to 4% over its optimum moisture when placed.

Before placement, clay liner\cover soils should be processed to break up any large clods and to evenly distribute moisture if wetting is required. Specialty processing equipment, mechanical pulverizers, disk harrows or similar equipment should be used to process the clay.

The clay liner should be placed in maximum 8-to 9-inch thick loose lifts and be compacted with a heavy sheeps-foot roller or tamp-foot roller. The clay should be rolled sufficiently to thoroughly mix the soil and break-down any large soil clods. After compaction the clay lifts should be scarified prior to placement and compaction of subsequent lifts to aid in bonding the lifts together.

More detailed recommendation regarding clay liner/cover construction will be contained in the SLQCP. Recommendations contained in the SLQCP should supersede any recommendations contained in this report.

7.6.4 Ground-Water Control

It is possible that excavation for the landfill units will penetrate transmissive layers of saturated clayey gravels or sands. Isolated seeps due to these layers may require that the flow of ground water into the landfill excavation be controlled. Several options are available to control ground water depending upon the intensity of its flow and its hydrostatic head.

Small seeps may drain over a period of time and require no treatment. It may also be possible to seal off near surface seeps by excavating soil near the seep and replacing it with compacted clay. This procedure will likely only work for very small seeps with very low hydrostatic head. Larger seeps and those which do not seal satisfactorily will require more extensive remedial procedures.

Dewatering wells may be installed into the transmissive soil layers to prevent the flow of water into the excavation. Optionally, seeps may be covered with a geotextile drainage composite which is extended to the toe of the cut slope. The drainage geocomposite should be drained into a gravel filled toe drain cut at the toe slope. The gravel drain should be constructed such that it may flow by gravity to a sump where the water may be pumped.

Seeps in the floor of the excavation may also require treatment. This should typically involve installing a graveled trench through the affected area. The graveled trench should extend from the seeps to an area where it can be conveniently pumped. Stabilization of the area of the seep may also be required prior to liner construction. Typically, undercutting the unstable soils to a depth of about 18-inches and backfilling with a large diameter crushed stone should satisfactorily stabilize the area for continued construction. Geotextile stabilization fabrics or placement of initial fill lifts with light tracked equipment may also prove beneficial in such areas.

Portions of the landfill which penetrate transmissive zones will require ballast to resist hydrostatic pressure. Ballast may consist of liner soils, additional fill or waste. The weight of the ballast should be designed to resist the hydrostatic uplift pressure of the water by a factor of safety of at least 1.2.

Section 8
LIMITATIONS

This report has been prepared for the exclusive use of the GNB Technologies, Inc. and their design professionals for specific application to the project described herein. This report has been prepared in accordance with generally accepted standards of geotechnical engineering practice. No other warranty is expressed or implied.

The recommendations contained in this report do not reflect variations in subsurface conditions from those encountered by the borings. RMT\Jones and Neuse, Inc. retains the right to review and modify this report if unanticipated subsurface conditions are encountered during construction or changes are made to the present design of the proposed project.

Attachment 6-A.1

GEOTECHNICAL LABORATORY TEST RESULTS

DATE: 8-18-95

TO: GNB TECHNOLOGIES, INC.

REPORT NUMBER: 01518-11-1

PROJECT: CLASS 2 NON-HAZARDOUS WASTE LANDFILL
FRISCO, TEXAS

PROJECT NUMBER: 50-01518.12

SUMMARY OF GEOTECHNICAL TEST RESULTS

BORING NUMBER	SAMPLE DEPTH (FT)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	UNIT DRY WEIGHT (PCF)	PASSING THE No. 200 SIEVE	UNCONFINED COMPRESSIVE STRENGTH (KSF)	HYDRAULIC CONDUCTIVITY (CM/S)
SB-1	19-20	16.5	55	31			11.92	
SB-3	8-9	17.6	39	22		34.2		
SB-3	14-15	28.0	78	52	93.2		4.34	
SB-4	20-21	14.1	27	10		29.6		
SB-5	14-16	20.2				32.3		
SB-5	18-19	29.9	80	48	91.5		4.41	
SB-6	3-4	26.3	67	45	96.5	88.1	2.82	
SB-6	20-21	29.2	70	43	92.5		3.83	
SB-8	4.5-6	24.5	67	44	97.5		6.92	
SB-9	1-2	36.0	75	47	79.6		1.82	
SB-9	15-16	25.7	69	46			4.64	
SB-10	3-4	21.4	41	25	104.4		4.76	1.5×10^{-8}
SB-10	10-11	24.4	68	40	99.0	97.0	4.25	2.7×10^{-9}
SB-15	0-2	18.9	69	42			4.96	
SB-15	4-6	18.7	39	21		54.4		
SB-15	9-11	31.6					3.23	
SB-15	14-16	21.1	60	42				
SB-15	19-21	30.8	81	54			3.67	
SB-15	24-26						3.03	
SB-17	0-2	26.3	70	46		96.7		
SB-17	4-6	29.3					4.92	
SB-17	9-11	26.7						
SB-17	14-16	19.9				24.8		
SB-17	19-21	28.8						

SAMPLE NUMBER	SOIL DESCRIPTION	LIQUID LIMIT	PLASTICITY INDEX	PASSING THE No. 200 SIEVE	REMOLDED PROPERTIES UNCONFINED COMPRESSIVE STRENGTH (KSF)	REMOLDED PROPERTIES HYDRAULIC CONDUCTIVITY (CM/S)
1	yellow brown FAT CLAY	54	37	95.1	4.77	7.9×10^{-8}
2	Dark Gray FAT CLAY (CH)	74	46	93.2	5.49	6.7×10^{-8}
3	Olive-Gray FAT CLAY (CH)	78	52	87.5	5.56	3.6×10^{-8}
4	reddish brown FAT CLAY WITH GRAVEL	50	27	82.9	5.67	

NOTES: SPECIMENS REMOLDED TO 95% OF THEIR MAXIMUM DRY DENSITY NEAR THEIR OPTIMUM MOISTURE CONTENT.

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912 CAPITAL OF TEXAS HIGHWAY SOUTH - SUITE 300 - 78746-5210
512/327-9840 - 512/327-6163 FAX

DATE: 8-18-95

TO: GNB TECHNOLOGIES, INC.

REPORT NUMBER: 01518-11-1

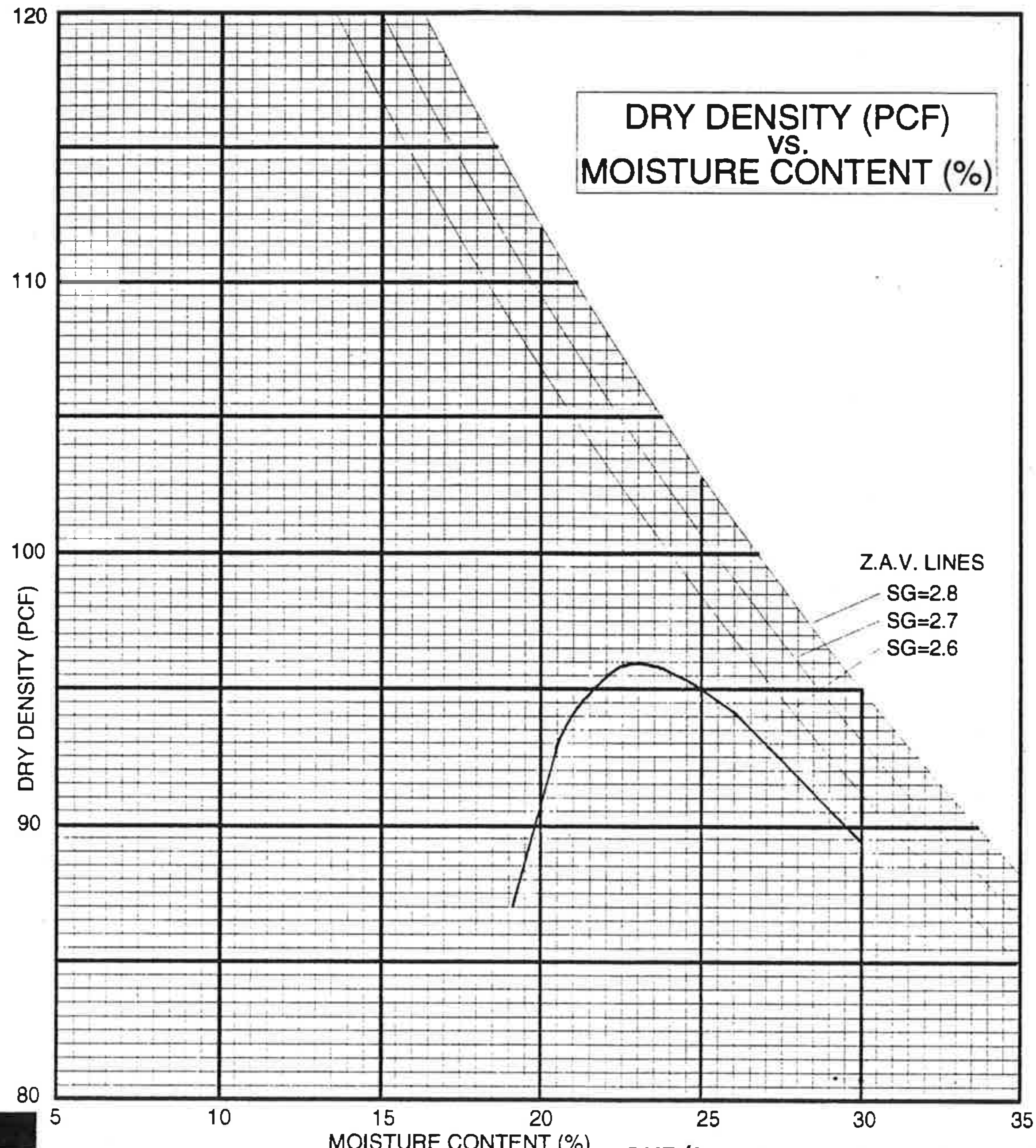
PROJECT: CLASS 2 NON-HAZARDOUS WASTE LANDFILL
FRISCO, TEXAS

PROJECT NUMBER: 50-01518.12

MOISTURE-DENSITY REALATIONSHIP DATA SHEET

TEST STANDARD	STANDARD PROCTOR - ASTM D 698
SAMPLE LOCATION	SB-16, 0-5'
SAMPLE DESCRIPTION	REDDISH BROWN FAT CLAY WITH GRAVEL

SAMPLE NUMBER	4	**MAXIMUM DRY DENSITY(PCF)**	96.0
PLASTICITY INDEX	27	**OPTIMUM MOISTURE CONTENT(%)**	23.0
LIQUID LIMIT	50		
-200 SIEVE	82.9		



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JONES & NEUSE

GULF COAST REGION OF RMT

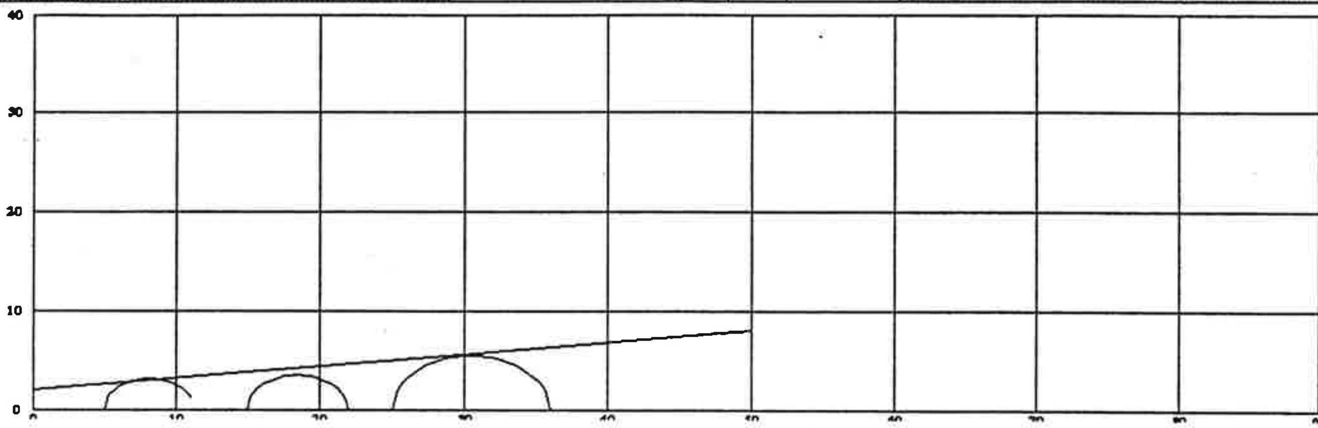
DATE: 8-17-95 REPORT NUMBER: 01518.12-11-1

TO: GNB TECHNOLOGIES, INC.

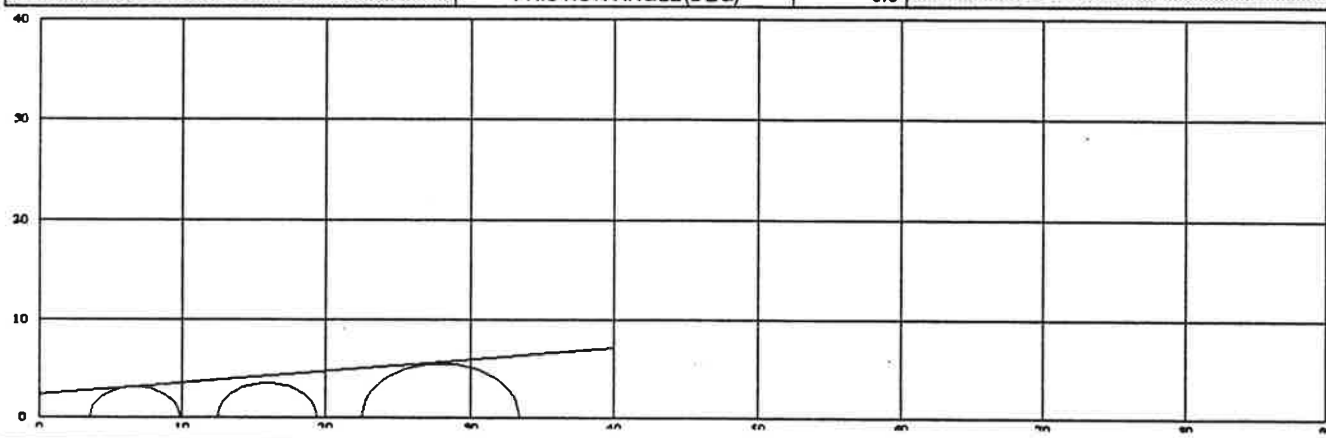
PROJECT: GNB TECHNOLOGIES CLASS 2 NON-HAZARDOUS WASTE LANDFILL, FRISCO, TEXAS PROJECT NUMBER: 50-01518.12

TEST STANDARD	ASTM D-4767 CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST		
TEST METHOD	MULTI-STAGE SINGLE SPECIMEN		
SAMPLE TYPE	UNDISTURBED	REMOLDED PARAMETERS	
SAMPLE NUMBER	CU17D0	DRY DENSITY(PCF)	-
BORING NUMBER	SB-17	MOISTURE CONTENT(%)	-
DEPTH(FT)	0-2	PERCENT COMPACTION	-
		RELATIVE MOISTURE	-

TOTAL STRESS		
	TOTAL COHESION(PSI)	2.0
	TOTAL COHESION(PSF)	288.0
	FRICTION ANGLE(DEG)	6.8



EFFECTIVE STRESS		
	EFFECTIVE COHESION(PSI)	2.3
	EFFECTIVE COHESION(PSF)	331.2
	FRICTION ANGLE(DEG)	6.8



CU17D0 PAGE 1/2

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GULF COAST REGION OF RMT

RMT/JONES & NEUSE, INC. — AUSTIN, TX

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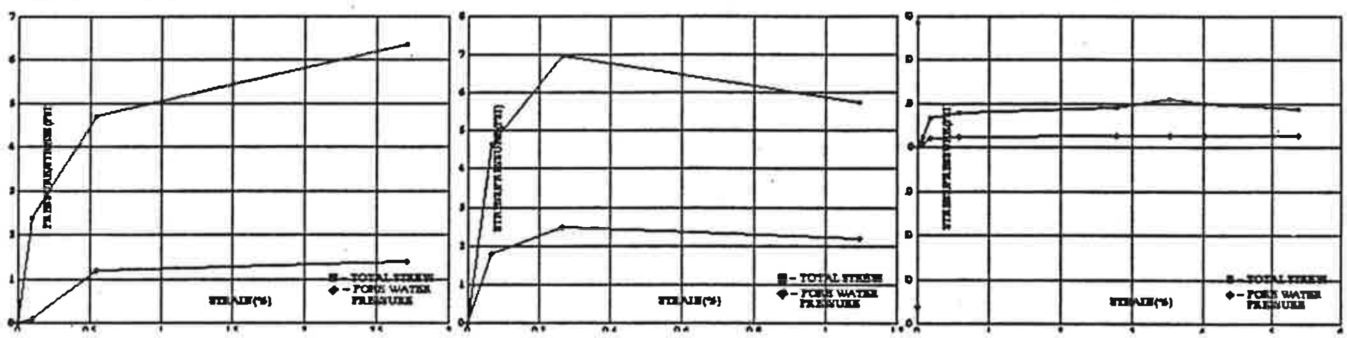
TRIAXIAL COMPRESSIVE STRENGTH TEST RESULTS

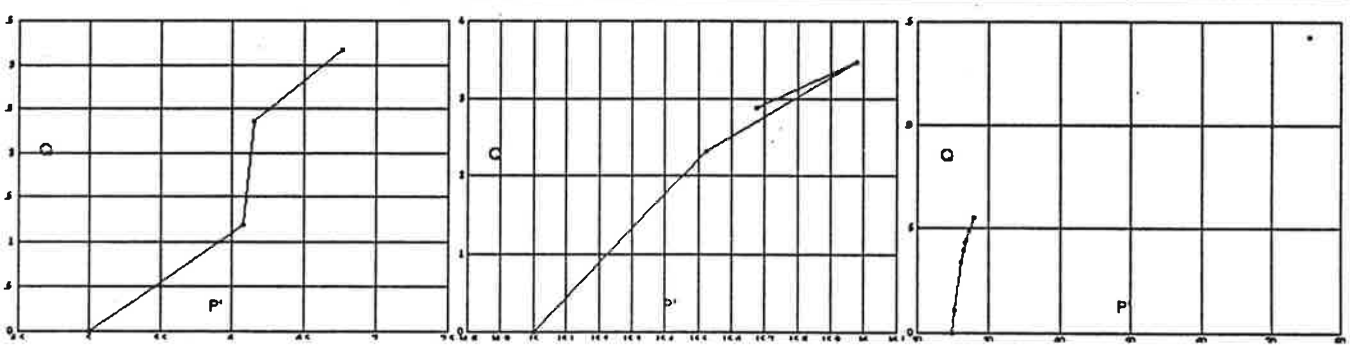
SAMPLE TYPE	UNDISTURBED
SAMPLE NUMBER	CU17D0
BORING NUMBER	SB-17
SAMPLE DEPTH	0-2

CONDITIONS	INITIAL			FINAL
EFFECTIVE CONFINING PRESSURE(PSI)		5	15	25
HEIGHT(IN)	3.09	3.09	3.01	2.98
DIAMETER(IN)	2.69	2.71	2.74	2.76
VOID RATIO	0.75	0:76	0.74	0.80
SATURATION(%)	93.4			98.1
MOISTURE CONTENT(%)	26.3			29.4
DRY DENSITY(PCF)	94.7			92.1
SPECIFIC GRAVITY	2.65			
CONFINING PRESSURE(PSI)		40	50	60
BACK PRESSURE(PSI)		35	35	35
MAX. DEVIATOR STRESS(PSI)		6.3	7	11
INDUCED PORE WATER PRESSURE(PSI)		1.4	2.5	2.5

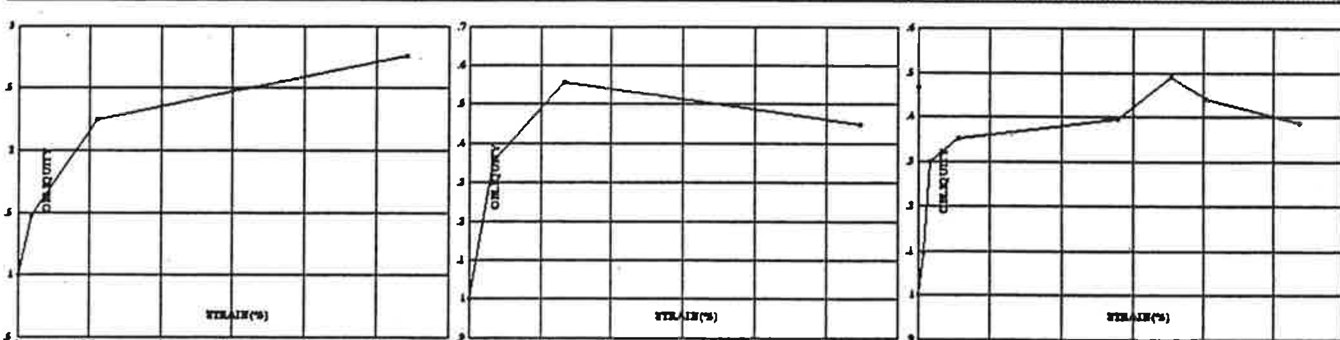
STRESS & INDUCED PORE WATER PRESSURE Vs. STRAIN



P'-Q DIAGRAMS



OBLIQUITY Vs. STRAIN



5	CONFINING	15	STRESS (PSI)	25

DATE: 8-17-95

TO: GNB TECHNOLOGIES, INC.

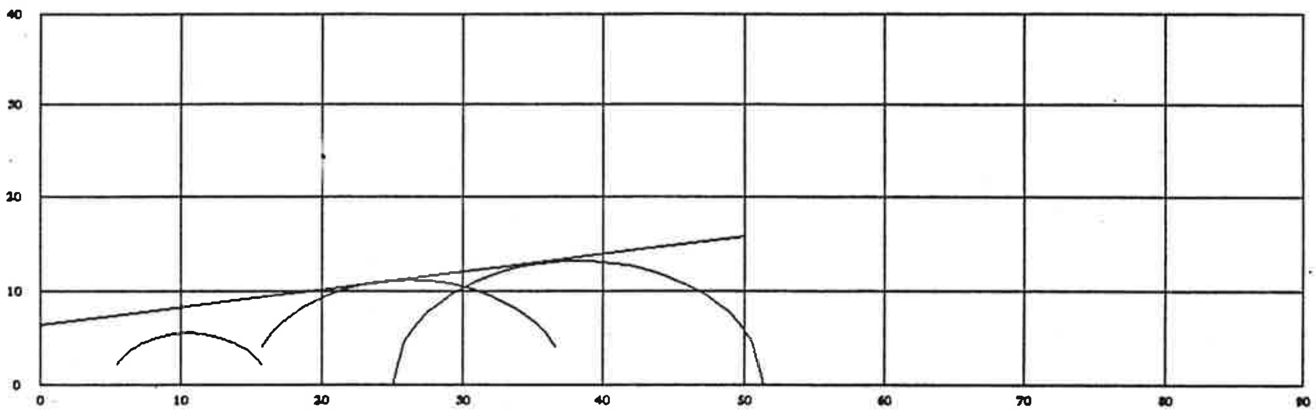
REPORT NUMBER: 01518.12-11-1

PROJECT: GNB TECHNOLOGIES CLASS 2 NON-HAZARDOUS WASTE LANDFILL, FRISCO, TEXAS

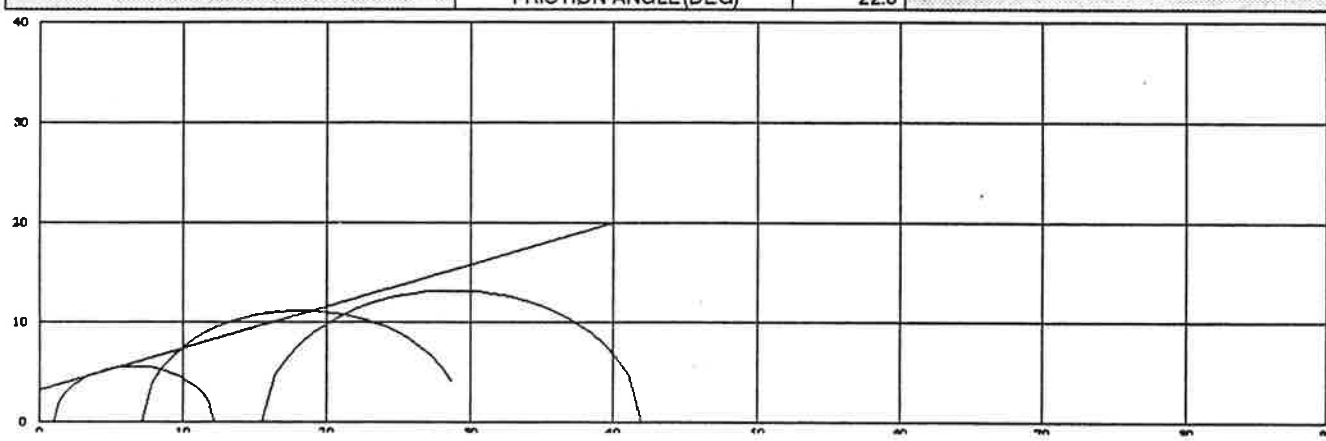
PROJECT NUMBER: 50-01518.12

TEST STANDARD	ASTM D-4767 CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST		
TEST METHOD	MULTI-STAGE SINGLE SPECIMEN		
SAMPLE TYPE	UNDISTURBED	REMOLDED PARAMETERS	
SAMPLE NUMBER	CU17D19	DRY DENSITY(PCF)	-
BORING NUMBER	SB-17	MOISTURE CONTENT(%)	-
DEPTH(FT)	19-21	PERCENT COMPACTION	-
		RELATIVE MOISTURE	-

TOTAL STRESS		
	TOTAL COHESION(PSI)	6.5
	TOTAL COHESION(PSF)	936.0
	FRICTION ANGLE(DEG)	10.5



EFFECTIVE STRESS		
	EFFECTIVE COHESION(PSI)	3.2
	EFFECTIVE COHESION(PSF)	460.8
	FRICTION ANGLE(DEG)	22.8



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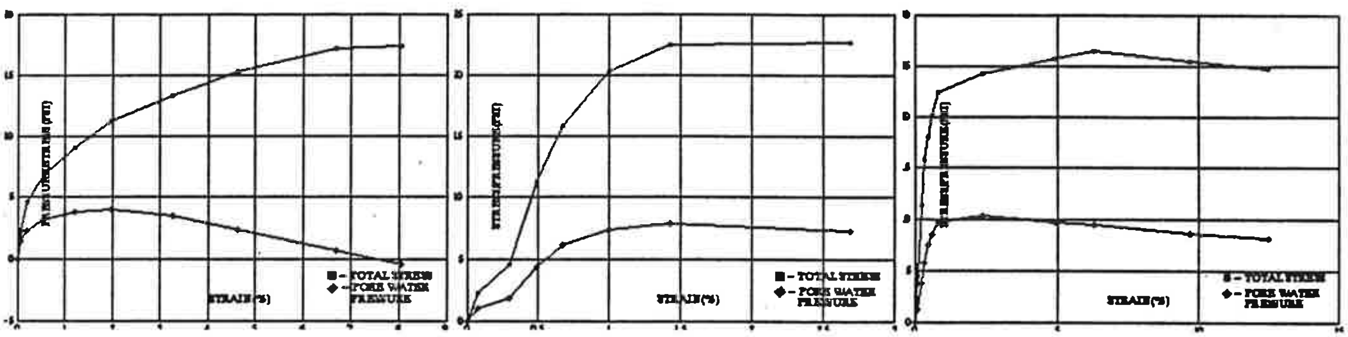
TRIAXIAL COMPRESSIVE STRENGTH TEST RESULTS

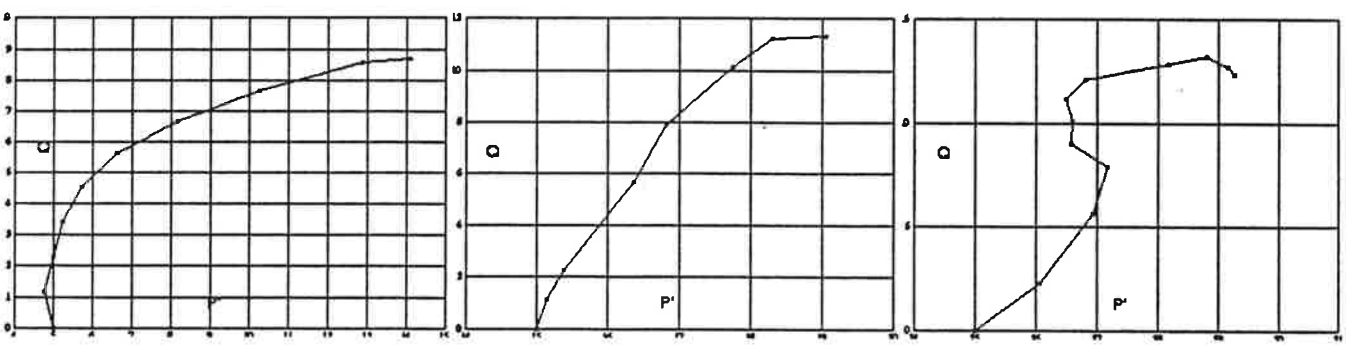
SAMPLE TYPE	UNDISTURBED
SAMPLE NUMBER	CU17D19
BORING NUMBER	SB-17
SAMPLE DEPTH	19-21

CONDITIONS	INITIAL			FINAL
EFFECTIVE CONFINING PRESSURE(PSI)		5	15	25
HEIGHT(IN)	4.05	4.05	3.72	3.62
DIAMETER(IN)	2.75	2.76	2.77	2.78
VOID RATIO	0.66	0.67	0.61	0.54
SATURATION(%)	75.7			97.9
MOISTURE CONTENT(%)	18.9			19.8
DRY DENSITY(PCF)	99.5			107.7
SPECIFIC GRAVITY	2.65			
CONFINING PRESSURE(PSI)		40	50	60
BACK PRESSURE(PSI)		35	35	35
MAX. DEVIATOR STRESS(PSI)		11.2	22.4	26.4
INDUCED PORE WATER PRESSURE(PSI)		4	7.9	9.4

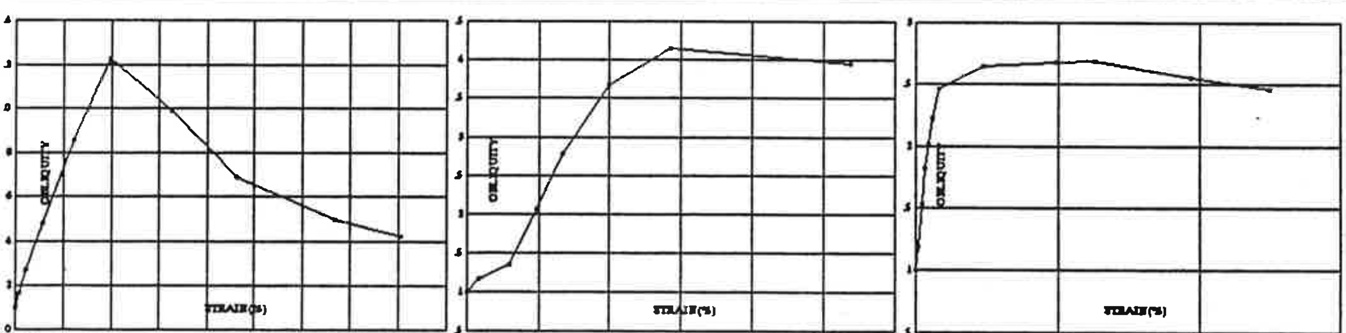
STRESS & INDUCED PORE WATER PRESSURE Vs. STRAIN



P'-Q DIAGRAMS



OBLIQUITY Vs. STRAIN



	5	CONFINING	15	STRESS (PSI)	25	

[redacted]

DATE: 7-18-95

TO: GNB TECHNOLOGIES, INC.

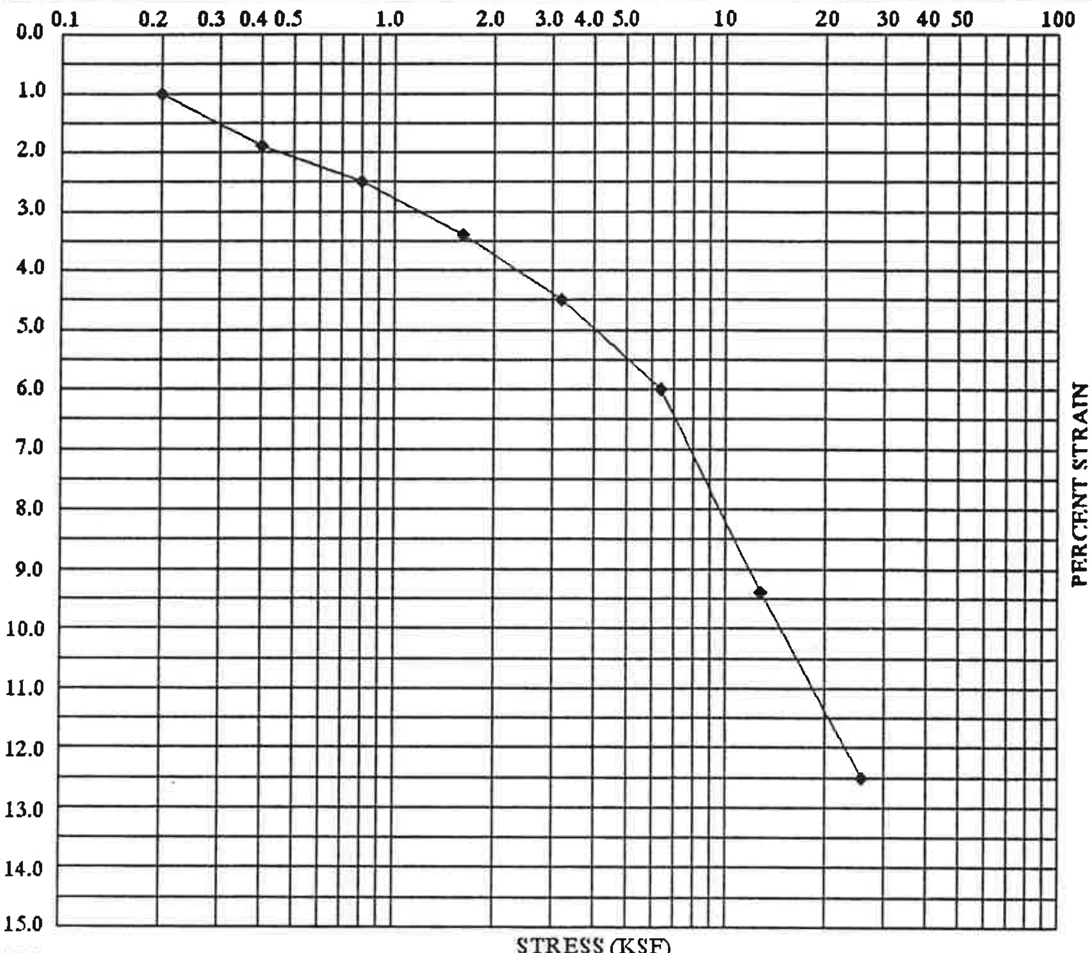
REPORT NUMBER: 01518.12-11-1

PROJECT: GNB TECHNOLOGIES CLASS 2 NON-HARZARDOUS WASTE LANDFILL FRISCO, TEXAS

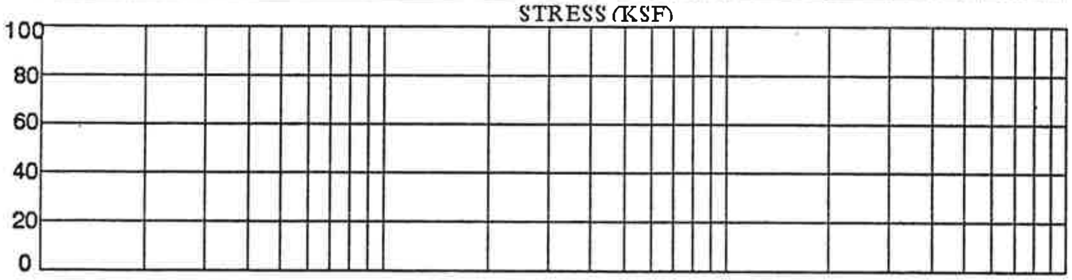
PROJECT NUMBER: 50-01518.12

CONSOLIDATION TEST RESULTS

SAMPLE TYPE	UNDISTURBED	REMOLDED PARAMETERS	-
SAMPLE NUMBER	CON17D9	PERCENT COMPACTION	-
BORING NUMBER	SB-17	RELATIVE MOISTURE(%)	-
DEPTH(FT)	9-11		



DRY DENSITY(PCF)	94.5
MOISTURE CONTENT(%)	30.6
INITIAL VOID RATIO	0.899
SATURATION(%)	99.1
MODIFIED COMPRESSION INDEX	0.17



COEFICIENT OF CONSOLIDATION (SQFT/DAY) x 10^{-2}
RECTANGLES

INITIAL CONSOLIDATION (%)
TRIANGLES

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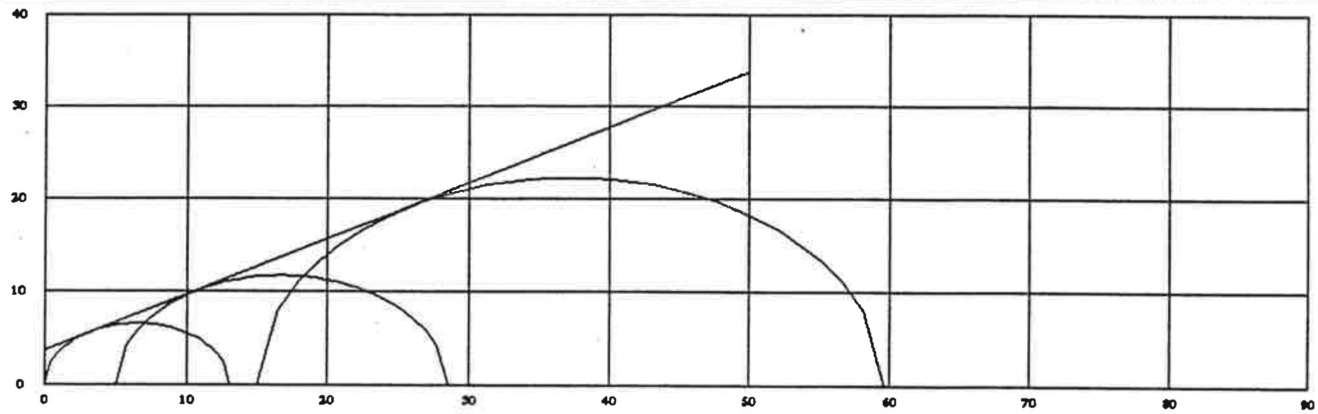
DATE:	8-17-95	REPORT NUMBER:	01518.12-11-1
TO:	GNB TECHNOLOGIES, INC.		
PROJECT:	GNB TECHNOLOGIES CLASS 2 NON-HAZARDOUS WASTE LANDFILL, FRISCO, TEXAS	PROJECT NUMBER:	50-01518.12

TEST STANDARD	ASTM D-2850 UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST		
TEST METHOD	MULTI-STAGE SINGLE SPECIMEN		
SAMPLE TYPE	UNDISTURBED	REMOLDED PARAMETERS	
SAMPLE NUMBER	UU17D14	DRY DENSITY(PCF)	-
BORING NUMBER	SB-17	MOISTURE CONTENT(%)	-
DEPTH(FT)	14-16	PERCENT COMPACTION	-
		RELATIVE MOISTURE	-

TOTAL STRESS		
	TOTAL COHESION(PSI)	3.8
	TOTAL COHESION(PSF)	540.0
	FRICTION ANGLE(DEG)	31.0



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912 CAPITAL OF TEXAS HIGHWAY SOUTH - SUITE 300 - 78746-5210
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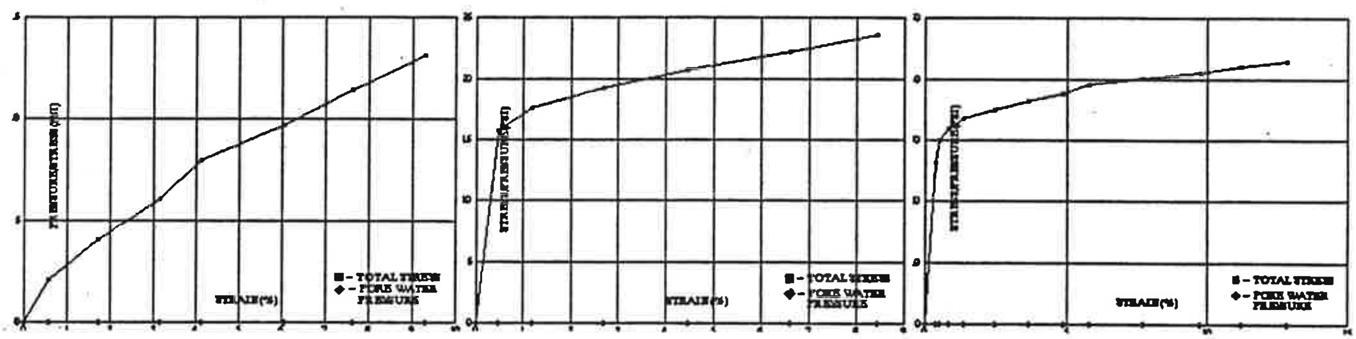
TRIAXIAL COMPRESSIVE STRENGTH TEST RESULTS

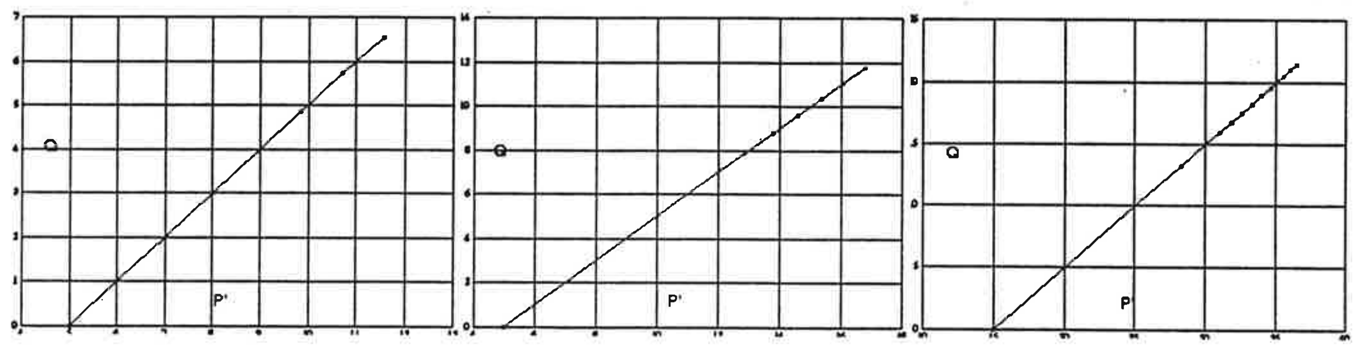
SAMPLE TYPE	UNDISTURBED
SAMPLE NUMBER	UU17D14
BORING NUMBER	SB-17
SAMPLE DEPTH	14-16

CONDITIONS	INITIAL			FINAL
EFFECTIVE CONFINING PRESSURE(PSI)		0	5	15
HEIGHT(IN)	3.01	3.01	2.73	2.50
DIAMETER(IN)	2.84	2.91	2.97	3.04
VOID RATIO	0.56	0.58	0.53	0.56
SATURATION(%)	93.1			85.8
MOISTURE CONTENT(%)	19.9			18.5
DRY DENSITY(PCF)	104.2			103.9
SPECIFIC GRAVITY	2.6			
CONFINING PRESSURE(PSI)		0	5	15
BACK PRESSURE(PSI)		0	0	0
MAX. DEVIATOR STRESS(PSI)		13.1	23.5	44.6
INDUCED PORE WATER PRESSURE(PSI)		0	0	0

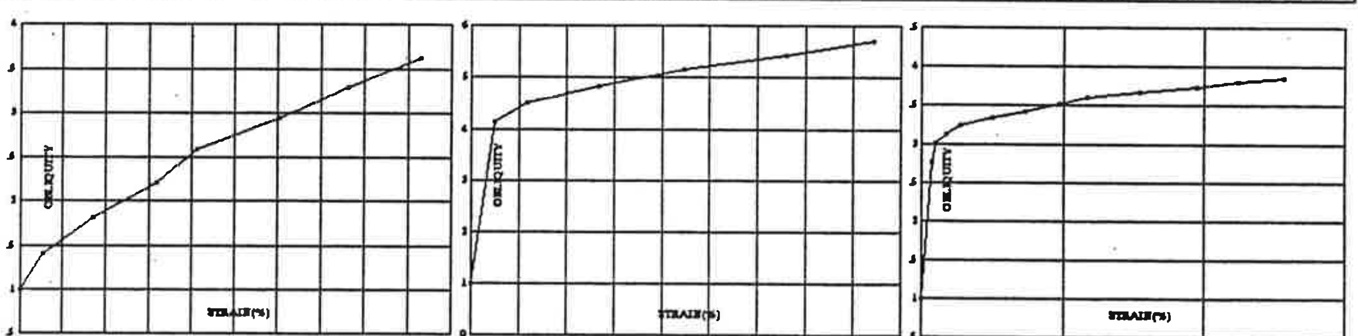
STRESS & INDUCED PORE WATER PRESSURE Vs. STRAIN



P'-Q DIAGRAMS



OBLIQUITY Vs. STRAIN



0	CONFINING	5	STRESS (PSI)	15

DATE: 5-10-95

TO: RESOURCE CONSULTANTS

REPORT NUMBER: 0158405-11-1

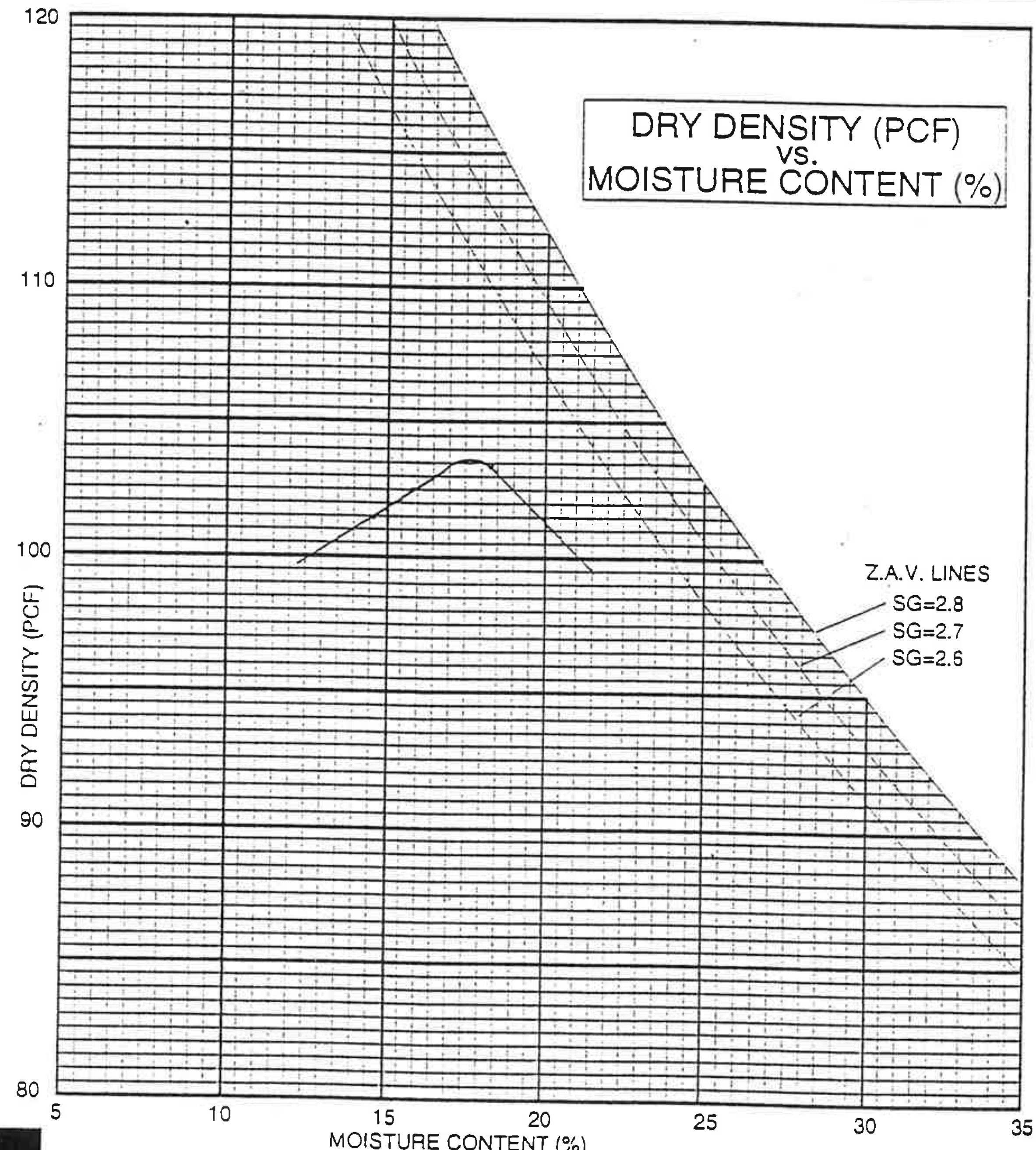
PROJECT: GNB TECHNOLOGIES LANDFILL
FRISCO, TEXAS

PROJECT NUMBER: 50-01548.05.000

MOISTURE-DENSITY REALATIONSHIP DATA SHEET

TEST STANDARD	STANDARD PROCTOR - ASTM D 698
SAMPLE LOCATION	COMPOSITE FROM BORINGS
SAMPLE DESCRIPTION	Yellow-Brown FAT CLAY (CH)

SAMPLE NUMBER	1	MAXIMUM DRY DENSITY(PCF)	103.6
PLASTICITY INDEX	37	OPTIMUM MOISTURE CONTENT(%)	17.5
LIQUID LIMIT	57		
-200 SIEVE	87.5		



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912 CAPITAL OF TEXAS HIGHWAY SOUTH - SUITE 300 - 78746-5210
512/327-9840 - 512/327-6163 FAX

JONES & NEUSE

GULF COAST REGION OF RMT

DATE: 5-10-95

TO: RESOURCE CONSULTANTS

REPORT NUMBER: 0158405-11-1

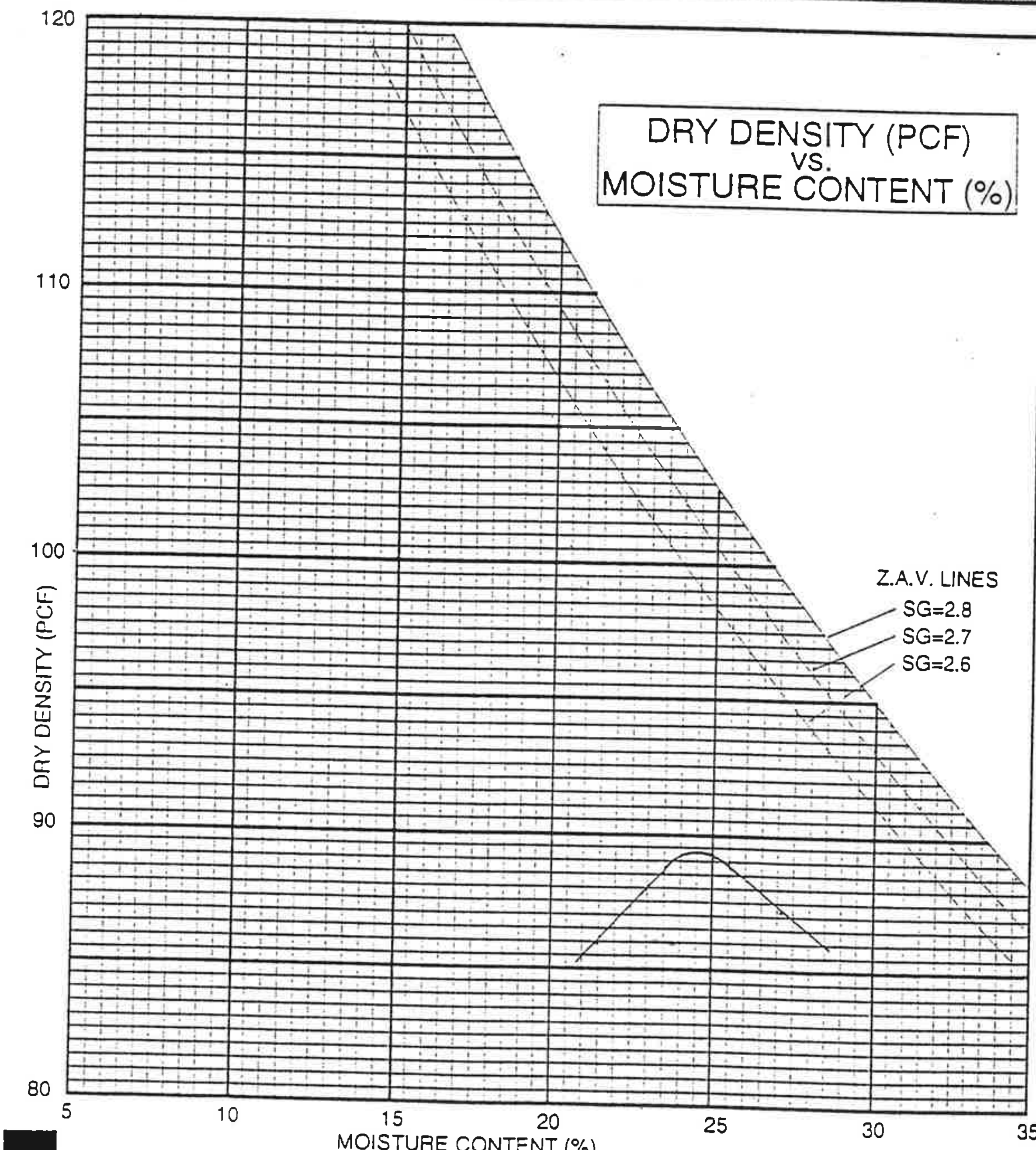
PROJECT: GNB TECHNOLOGIES LANDFILL, FRISCO, TEXAS

PROJECT NUMBER: 50-01548.05.000

MOISTURE-DENSITY REALATIONSHIP DATA SHEET

TEST STANDARD	STANDARD PROCTOR - ASTM D 698
SAMPLE LOCATION	COMPOSITE FROM BORINGS
SAMPLE DESCRIPTION	Dark Gray FAT CLAY (CH)

SAMPLE NUMBER	2		
PLASTICITY INDEX	48	MAXIMUM DRY DENSITY(PCF)	89.4
LIQUID LIMIT	74	OPTIMUM MOISTURE CONTENT(%)	24.5
-200 SIEVE	93.2		



RMT/JONES & NEUSE, INC. — AUSTIN, TX

912 CAPITAL OF TEXAS HIGHWAY SOUTH - SUITE 300 - 78746-5210

512/327-9840 - 512/327-6163 FAX

JONES & NEUSE

GULF COAST REGION OF RMT

DATE: 5-10-95

TO: RESOURCE CONSULTANTS

REPORT NUMBER: 0158405-11-1

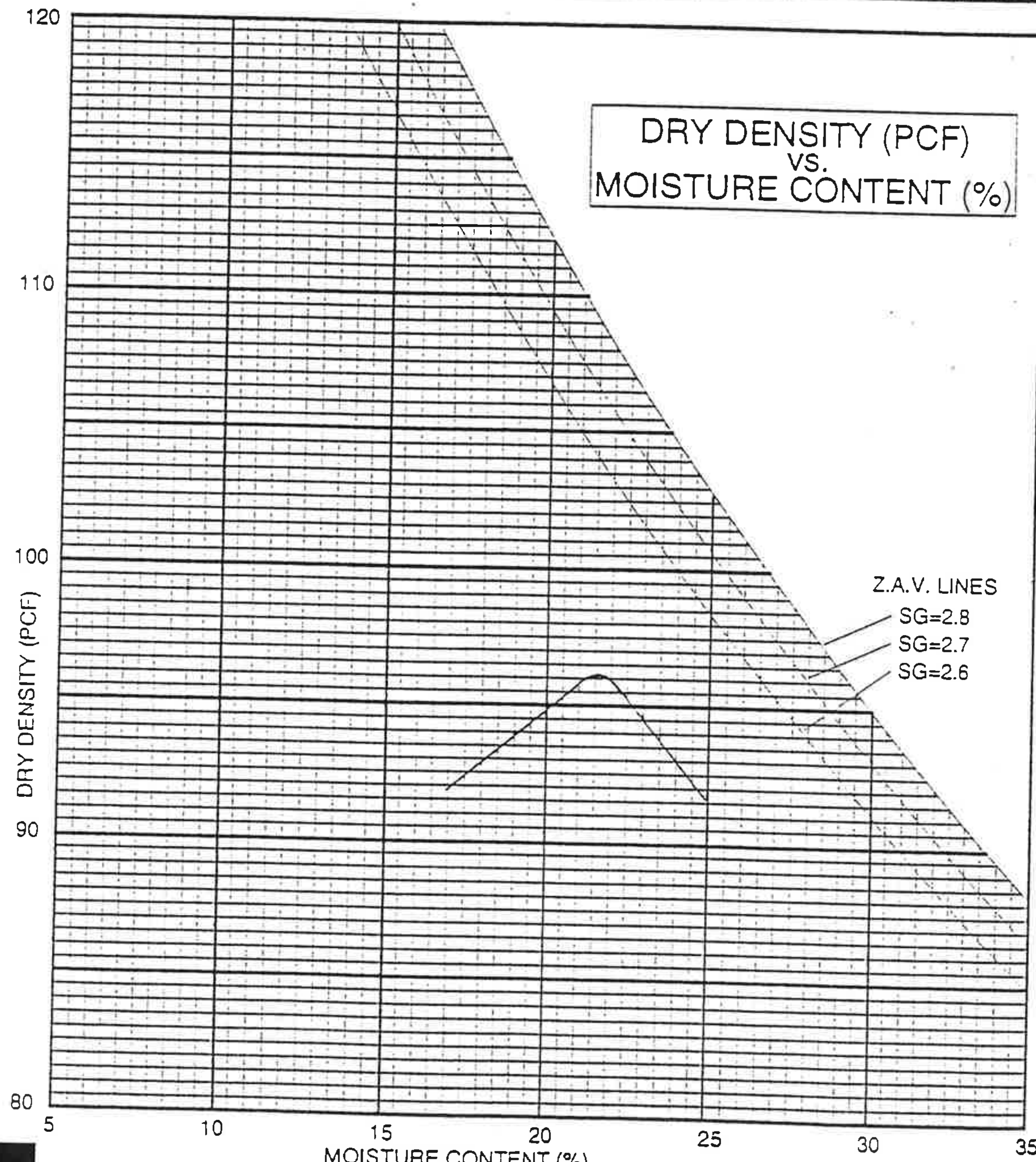
PROJECT: GNB TECHNOLOGIES LANDFILL
FRISCO, TEXAS

PROJECT NUMBER: 50-01548.05.000

MOISTURE-DENSITY REALATIONSHIP DATA SHEET

TEST STANDARD	STANDARD PROCTOR - ASTM D 698
SAMPLE LOCATION	COMPOSITE FROM BORINGS
SAMPLE DESCRIPTION	Olive-Gray FAT CLAY (CH)

SAMPLE NUMBER	3	MAXIMUM DRY DENSITY(PCF)	96.1
PLASTICITY INDEX	52	OPTIMUM MOISTURE CONTENT(%)	21.6
LIQUID LIMIT	78		
-200 SIEVE	95.1		



JONES & NEUSE
GULF COAST REGION OF RMT

RMT/JONES & NEUSE, INC. — AUSTIN, TX
912 CAPITAL OF TEXAS HIGHWAY SOUTH - SUITE 300 - 78746-5210
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[redacted]

DATE: 4-11-95

TO: RESOURCE CONSULTANTS

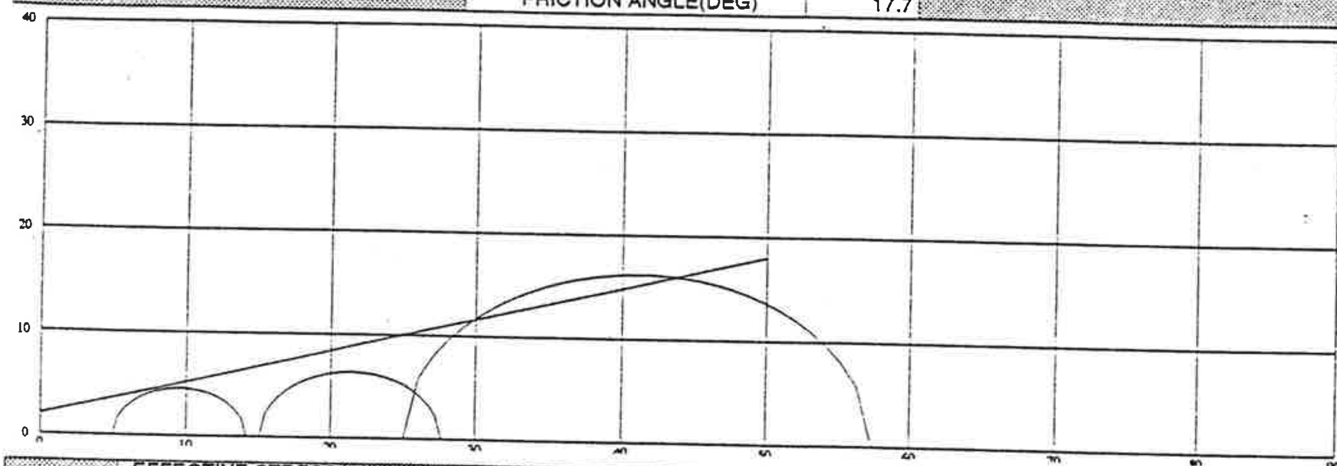
REPORT NUMBER: 0158405-11-1

PROJECT: GNB TECHNOLOGIES
FRISCO, TEXAS

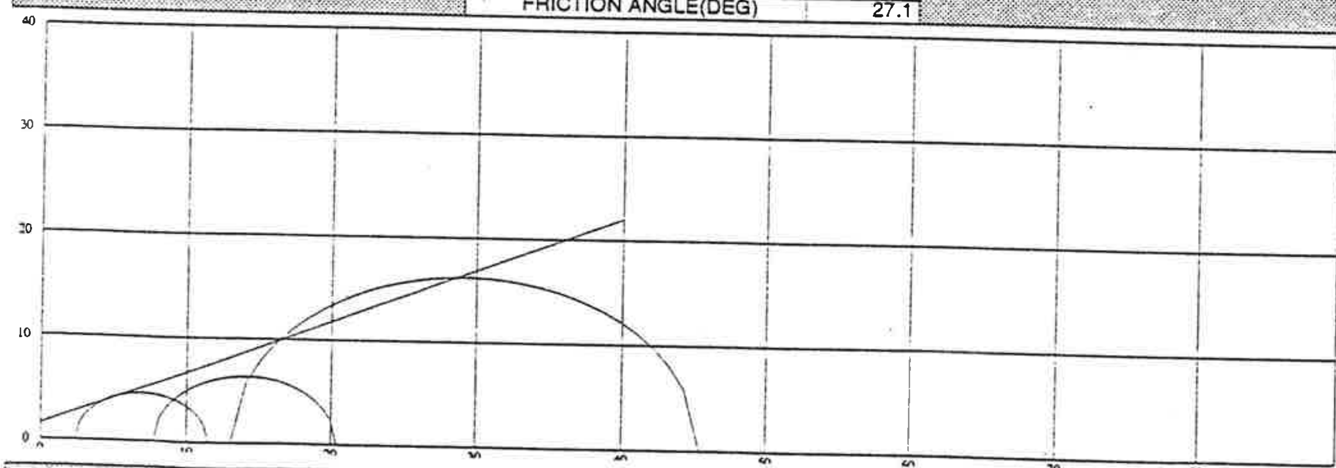
PROJECT NUMBER: 50-01584.05.000

TEST STANDARD	ASTM D-4767 CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST		
TEST METHOD	MULTI-STAGE SINGLE SPECIMEN		
SAMPLE TYPE	UNDISTURBED	REMOLDED PARAMETERS	
SAMPLE NUMBER	CU6D6	DRY DENSITY(PCF)	-
BORING NUMBER	SB-6	MOISTURE CONTENT(%)	-
DEPTH(FT)	6-7	PERCENT COMPACTION	-
		RELATIVE MOISTURE	-

TOTAL STRESS		
	TOTAL COHESION(PSI)	2.0
	TOTAL COHESION(PSF)	288.0
	FRICTION ANGLE(DEG)	17.7



EFFECTIVE STRESS		
	EFFECTIVE COHESION(PSI)	1.5
	EFFECTIVE COHESION(PSF)	216.0
	FRICTION ANGLE(DEG)	27.1



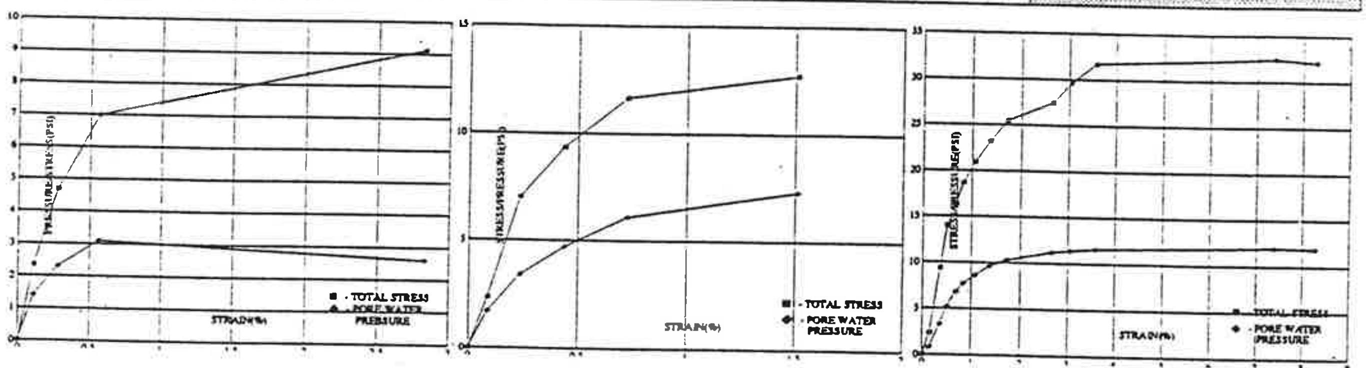
CU6D6 PAGE 1/2

TRIAXIAL COMPRESSIVE STRENGTH TEST RESULTS

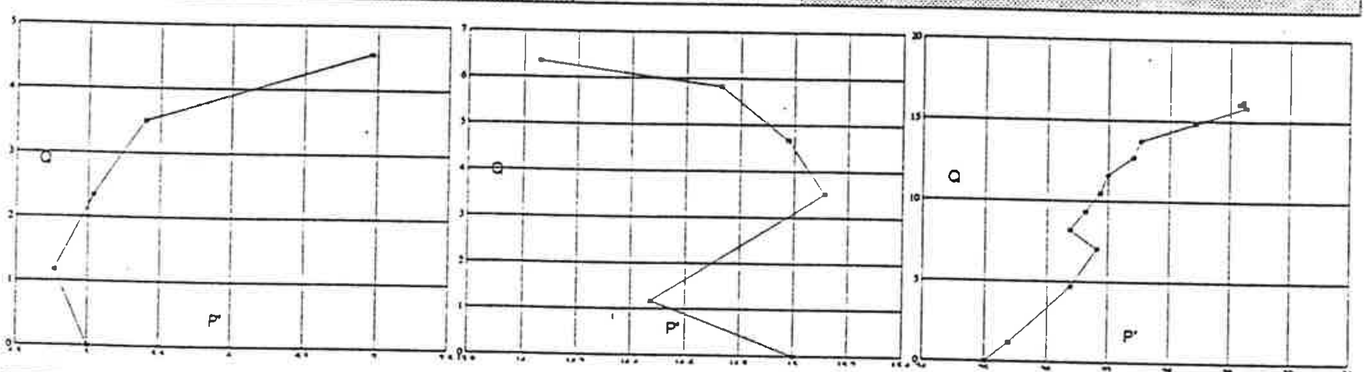
SAMPLE TYPE	UNDISTURBED
SAMPLE NUMBER	CU6D6
BORING NUMBER	B-6
SAMPLE DEPTH	6-7

CONDITIONS	INITIAL			FINAL
EFFECTIVE CONFINING PRESSURE(PSI)		5	15	25
HEIGHT(IN)	3.54	3.54	3.44	3.39
DIAMETER(IN)	2.73	2.73	2.73	2.72
VOID RATIO	0.89	0.89	0.87	0.85
SATURATION(%)	88.7			94.8
MOISTURE CONTENT(%)	29.4			30.0
DRY DENSITY(PCF)	88.9			90.9
SPECIFIC GRAVITY	2.7			
CONFINING PRESSURE(PSI)		40	50	60
BACK PRESSURE(PSI)		35	35	35
MAX. DEVIATOR STRESS(PSI)		9.1	12.7	32.4
INDUCED PORE WATER PRESSURE(PSI)		2.6	7.3	12

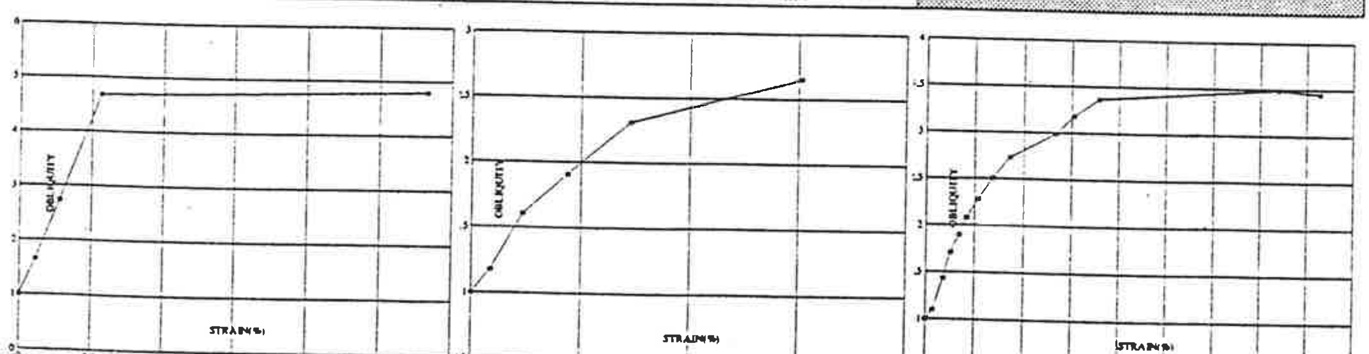
STRESS & INDUCED PORE WATER PRESSURE Vs. STRAIN



P'-Q DIAGRAMS



OBLIQUITY Vs. STRAIN



5	CONFINING	15	STRESS (PSI)	25

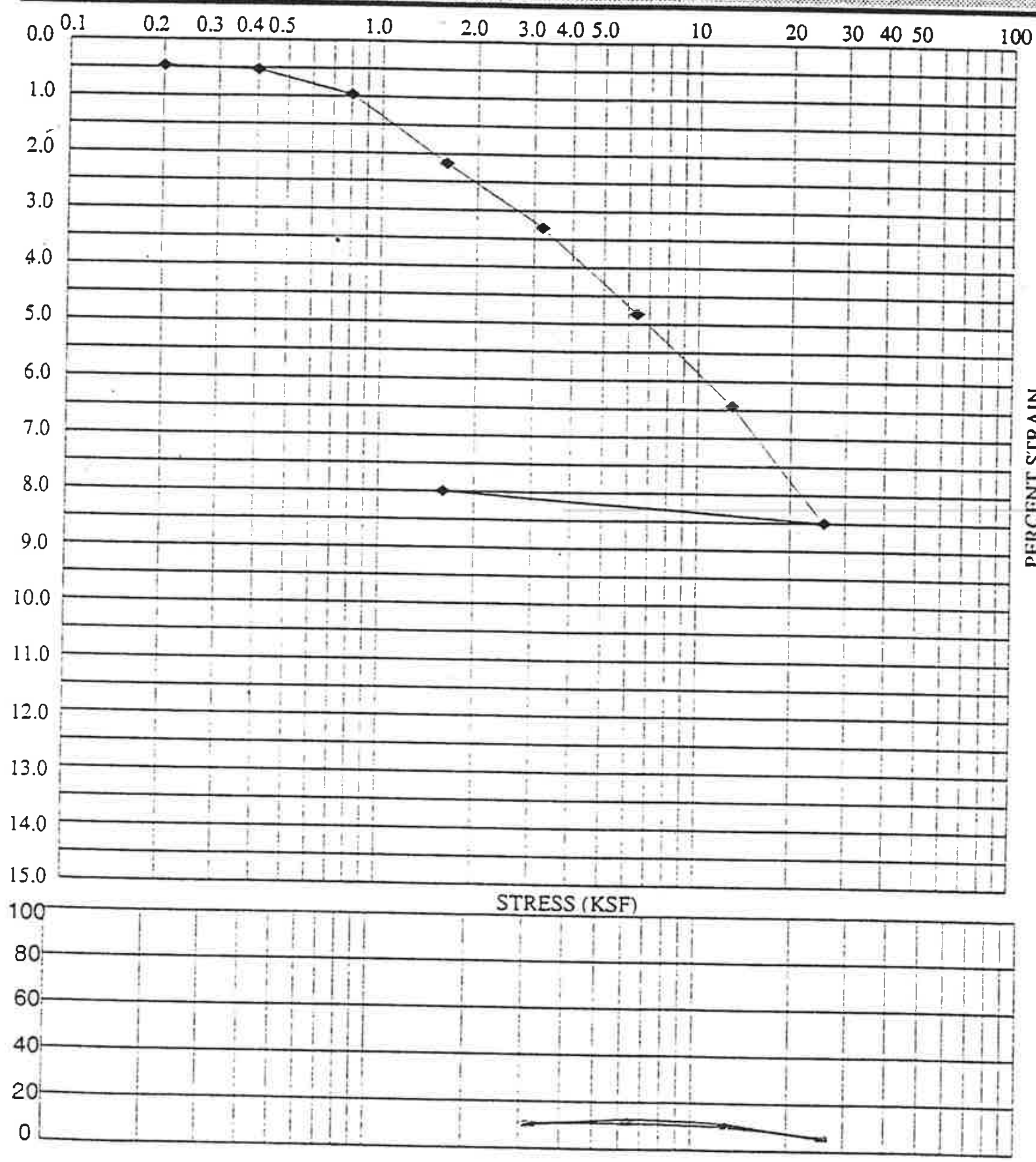
[redacted]

DATE:	4-11-95		
TO:	RESOURCE CONSULTANTS	REPORT NUMBER:	0158405-11-1
PROJECT:	GNB TECHNOLOGIES LANDFILL FRISCO, TEXAS	PROJECT NUMBER:	50-01584.05.000

CONSOLIDATION TEST RESULTS

SAMPLE TYPE	UNDISTURBED
SAMPLE NUMBER	CON10D2
BORING NUMBER	SB-10
DEPTH(FT)	2-4

REMOLDED PARAMETERS	
PERCENT COMPACTION	-
RELATIVE MOISTURE(%)	-



DRY DENSITY(PCF)	104.8
MOISTURE CONTENT(%)	21.0
INITIAL VOID RATIO	0.609
SATURATION(%)	1.14
CONSOLIDATION INDEX	.07

COEFICIENT OF CONSOLIDATION (SQFT/DAY) x 10^{-2} RECTANGLES

INITIAL CONSOLIDATION (%) TRIANGLES

JONES & NEUSE

GULF COAST REGION OF RMT

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912 CAPITAL OF TEXAS HIGHWAY SOUTH - SUITE 300 · 78746-5210
512/327-9840 - 512/327-6163 FAX

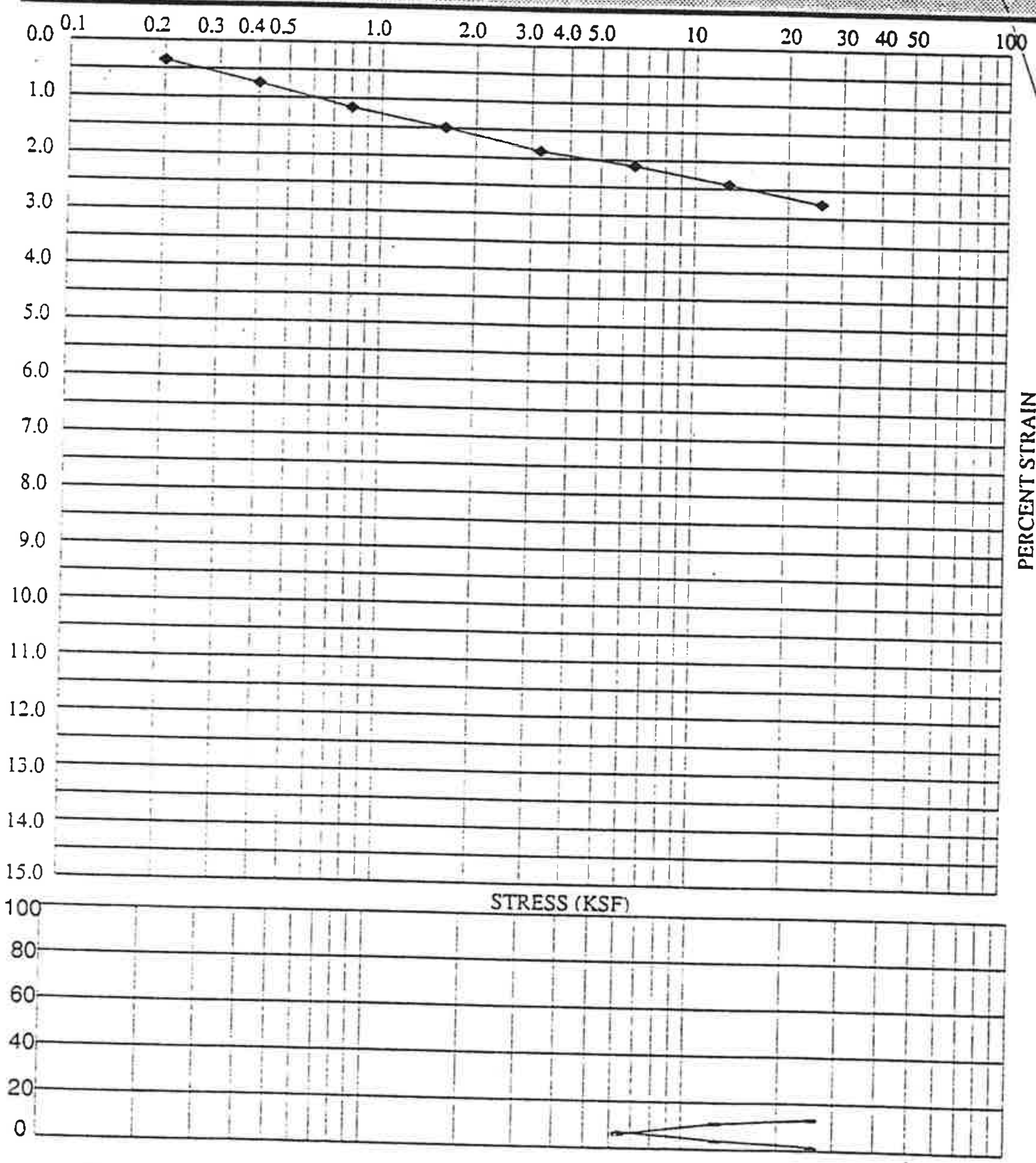
[redacted]

DATE:	4-11-95
TO:	RESOURCE CONSULTANTS
PROJECT:	GNB TECHNOLOGIES LANDFILL FRISCO, TEXAS
REPORT NUMBER:	0158405-11-1
PROJECT NUMBER:	50-01584.05.000

CONSOLIDATION TEST RESULTS

SAMPLE TYPE	UNDISTURBED
SAMPLE NUMBER	CON10D9
BORING NUMBER	SB-10
DEPTH(FT)	9-11

REMOLDED PARAMETERS	
PERCENT COMPACTION	-
RELATIVE MOISTURE(%)	-



DRY DENSITY(PCF)	95.4
MOISTURE CONTENT(%)	25.1
INITIAL VOID RATIO	0.766
SATURATION(%)	103.5
CONSOLIDATION INDEX	.02

COEFICIENT OF CONSOLIDATION (SQFT/DAY) x 10^{-2}	RECTANGLES
INITIAL CONSOLIDATION (%)	TRIANGLES

JONES & NEUSE

GULF COAST REGION OF RMT

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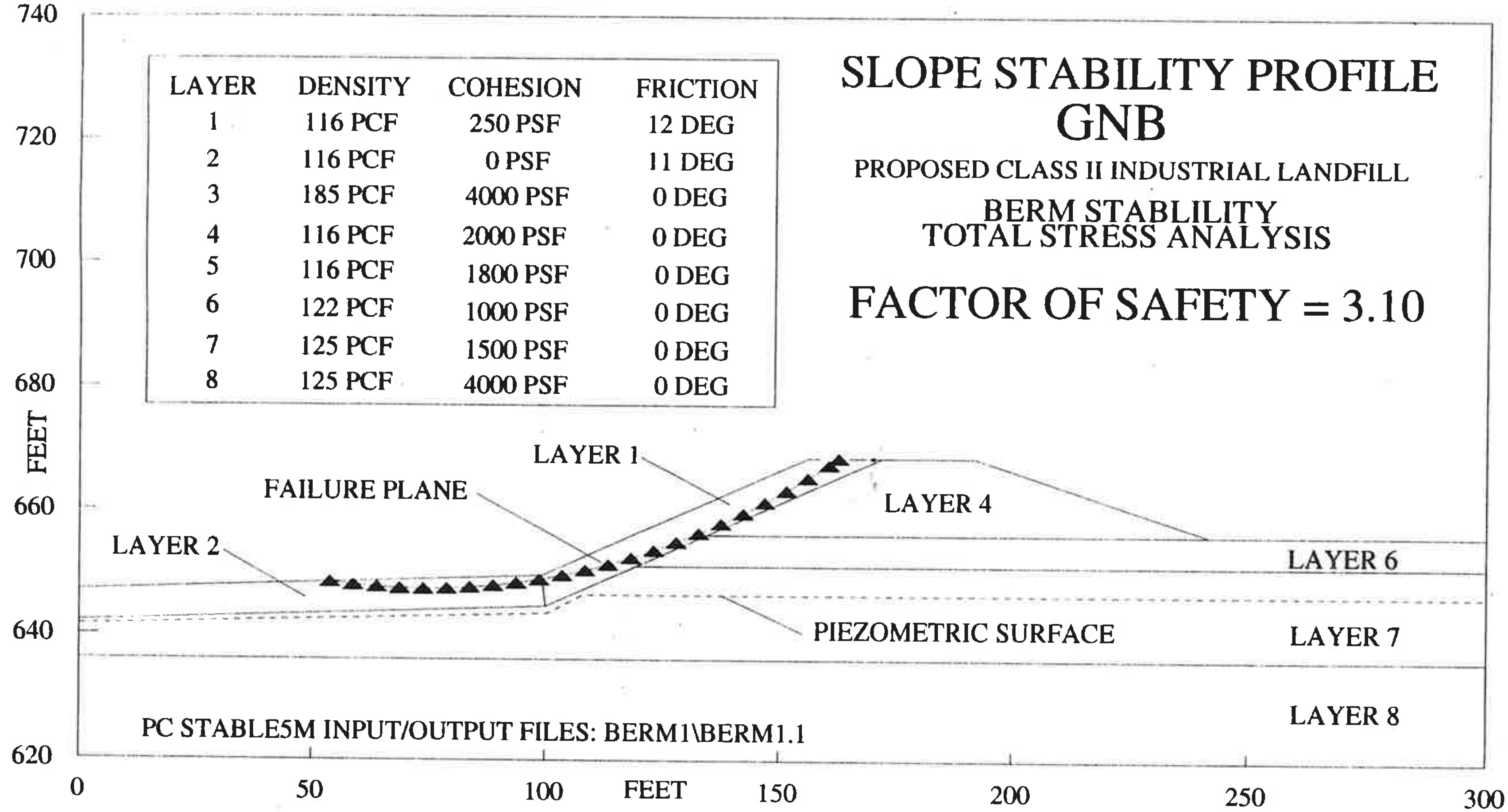
Attachment 6-A.2

SLOPE STABILITY DATA SHEETS


SLOPE STABILITY PROFILE
GNB
PROPOSED CLASS II INDUSTRIAL LANDFILL
BERM STABLILITY
TOTAL STRESS ANALYSIS
FACTOR OF SAFETY = 3.10
LAYER DENSITY COHESION FRICTION
1 116 PCF 250 PSF 12 DEG
2 116 PCF 0 PSF 11 DEG
3 185 PCF 4000 PSF 0 DEG
4 116 PCF 2000 PSF 0 DEG
5 116 PCF 1800 PSF 0 DEG
6 122 PCF 1000 PSF 0 DEG
7 125 PCF 1500 PSF 0 DEG
8 125 PCF 4000 PSF 0 DEG
LAYER 1
FAILURE PLANE
LAYER 2
LAYER 4
LAYER 6
PIEZOMETRIC SURFACE
LAYER 7
LAYER 8
PC STABLE5M INPUT/OUTPUT FILES: BERM1\BERM1.1
740
720
700
680
660
640
620
FEET
0
50
100
FEET
150
200
250
300

** PCSTABL5M **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date: 8-17-95
Time of Run: 0927
Run By: HANZ
Input Data Filename: BERM1
Output Filename: BERM1.1

PROBLEM DESCRIPTION BERM STABILITY, TOTAL ANALYSIS, BISHOP M
ETHOD

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	647.00	99.19	649.50	2
2	99.19	649.50	156.19	668.50	1
3	156.19	668.50	172.00	668.50	1
4	172.00	668.50	192.00	668.50	4
5	192.00	668.50	242.00	656.00	4
6	242.00	656.00	450.00	656.00	6
7	99.19	649.50	100.00	644.50	2
8	.00	642.00	100.00	644.50	7
9	100.00	644.50	119.50	651.00	7
10	119.50	651.00	134.50	656.00	6
11	134.50	656.00	172.00	668.50	4
12	134.50	656.00	242.00	656.00	6
13	119.50	651.00	450.00	651.00	7
14	.00	636.00	450.00	636.00	8

1

ISOTROPIC SOIL PARAMETERS

8 Type(s) of Soil

Soil Type	Total Unit Wt.	Saturated Unit Wt.	Cohesion Intercept	Friction Angle	Pore Pressure	Pressure Constant	Piez. Surface

No.	(pcf)	(pcf)	(psf)	(deg)	Param.	(psf)	No.
1	116.0	121.0	250.0	12.0	.00	.0	1
2	116.0	121.0	.0	11.0	.00	.0	1
3	185.0	190.0	4000.0	.0	.00	.0	1
4	116.0	121.0	2000.0	.0	.00	.0	1
5	116.0	121.0	1800.0	.0	.00	.0	1
6	122.0	127.0	1000.0	.0	.00	.0	1
7	125.0	130.0	1500.0	.0	.00	.0	1
8	125.0	130.0	4000.0	.0	.00	.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	642.00
2	100.00	644.50
3	104.50	646.00
4	450.00	646.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

900 Trial Surfaces Have Been Generated.

30 Surfaces Initiate From Each Of 30 Points Equally Spaced Along The Ground Surface Between X = 50.00 ft.
and X = 105.00 ft.

Each Surface Terminates Between X = 161.19 ft.
and X = 350.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

5.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.79	648.36
2	58.77	647.90
3	63.76	647.57
4	68.76	647.36
5	73.76	647.29
6	78.76	647.34
7	83.75	647.52
8	88.74	647.82
9	93.72	648.26
10	98.69	648.82
11	103.65	649.51
12	108.58	650.32
13	113.49	651.26
14	118.37	652.33
15	123.23	653.52
16	128.06	654.84
17	132.84	656.27
18	137.60	657.83
19	142.30	659.51
20	146.97	661.31
21	151.59	663.23
22	156.15	665.26
23	160.67	667.41
24	162.80	668.50

Circle Center At X = 74.2 ; Y = 842.7 and Radius, 195.5

*** 3.096 ***

Individual data on the 26 slices

Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
1	5.0	168.7	.0	.0	.0	.0	.0	.0	.0
2	5.0	470.3	.0	.0	.0	.0	.0	.0	.0
3	5.0	698.9	.0	.0	.0	.0	.0	.0	.0
4	5.0	853.5	.0	.0	.0	.0	.0	.0	.0
5	5.0	933.7	.0	.0	.0	.0	.0	.0	.0
6	5.0	939.1	.0	.0	.0	.0	.0	.0	.0
7	5.0	869.9	.0	.0	.0	.0	.0	.0	.0
8	5.0	726.6	.0	.0	.0	.0	.0	.0	.0
9	5.0	509.8	.0	.0	.0	.0	.0	.0	.0
10	.5	36.8	.0	.0	.0	.0	.0	.0	.0

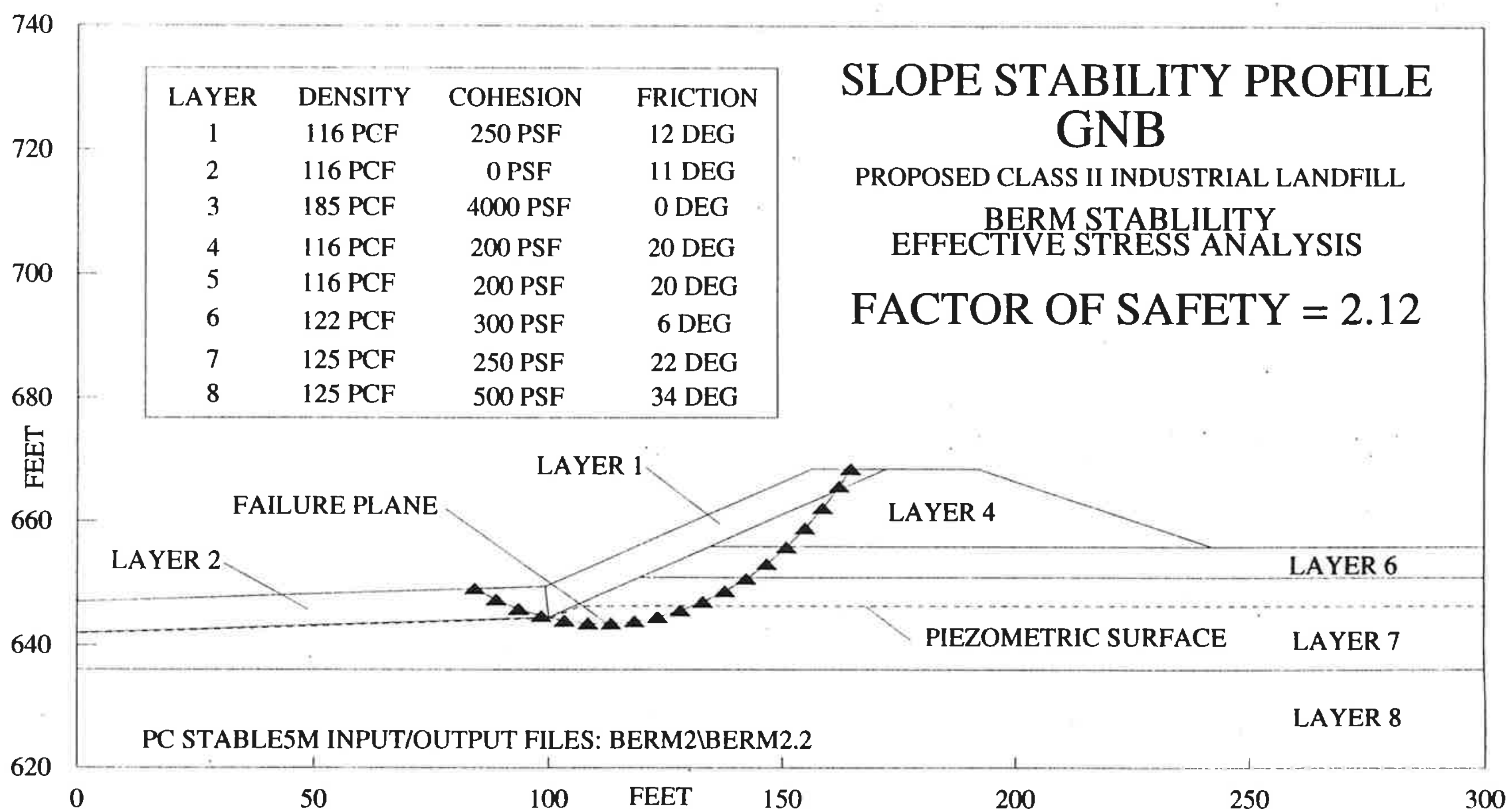
11	.1	6.9	.0	.0	.0	.0	.0	.0	.
12	4.4	532.0	.0	.0	.0	.0	.0	.0	.
13	4.9	1081.8	.0	.0	.0	.0	.0	.0	.
14	4.9	1511.5	.0	.0	.0	.0	.0	.0	.
15	4.9	1860.3	.0	.0	.0	.0	.0	.0	.
16	4.9	2128.4	.0	.0	.0	.0	.0	.0	.
17	4.8	2316.6	.0	.0	.0	.0	.0	.0	.
18	4.8	2425.7	.0	.0	.0	.0	.0	.0	.
19	4.8	2457.2	.0	.0	.0	.0	.0	.0	.
20	4.7	2412.5	.0	.0	.0	.0	.0	.0	.
21	4.7	2293.9	.0	.0	.0	.0	.0	.0	.
22	4.6	2103.6	.0	.0	.0	.0	.0	.0	.
23	4.6	1844.4	.0	.0	.0	.0	.0	.0	.
24	.0	13.5	.0	.0	.0	.0	.0	.0	.
25	4.5	1118.0	.0	.0	.0	.0	.0	.0	.
26	2.1	134.4	.0	.0	.0	.0	.0	.0	.

```
                    Y            A     X     I     S            F     T

                    .00    147.07    294.14    441.21    588.28    735.35

        X       .00 +---------+---------+---------+---------+--**-----+
                    -
                    -                                          .1
                    -                                         ..1
                    -                                        ..4*
                    -                                        ..4**
             147.07 +                                       ...44*
                    -                                       ....4*
                    -                                       .....*
                    -                                       ......
                    -                                       .....*
                    -                                        .....
        A    294.14 +                                        .....
                    -                                         ....
                    -                                          ...
                    -
                    -
                    -
        X    441.21 +                                          ***
                    -
                    -
                    -
                    -
                    -
        I    588.28 +
                    -
                    -
                    -
                    -
                    -
        S    735.35 +
                    -
                    -
                    -
                    -
                    -
             882.42 +
                    -
                    -
```

```
             -
             -
             -
F   1029.49 +
             -
             -
             -
             -
             -
T   1176.56 +
```



SLOPE STABILITY PROFILE
GNB
PROPOSED CLASS II INDUSTRIAL LANDFILL
BERM STABLILITY
EFFECTIVE STRESS ANALYSIS
FACTOR OF SAFETY = 2.12
LAYER DENSITY COHESION FRICTION
1 116 PCF 250 PSF 12 DEG
2 116 PCF 0 PSF 11 DEG
3 185 PCF 4000 PSF 0 DEG
4 116 PCF 200 PSF 20 DEG
5 116 PCF 200 PSF 20 DEG
6 122 PCF 300 PSF 6 DEG
7 125 PCF 250 PSF 22 DEG
8 125 PCF 500 PSF 34 DEG
LAYER 1
FAILURE PLANE
LAYER 2
LAYER 4
LAYER 6
PIEZOMETRIC SURFACE
LAYER 7
LAYER 8
PC STABLE5M INPUT/OUTPUT FILES: BERM2\BERM2.2
FEET
740
720
700
680
660
640
620
0
50
100
FEET
150
200
250
300

** PCSTABL5M **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date:	8-17-95
Time of Run:	1042
Run By:	HANZ
Input Data Filename:	BERM2
Output Filename:	BERM2.2

PROBLEM DESCRIPTION BERM STABILITY, EFFECTIVE ANALYSIS, BISH
OP METHOD

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	647.00	99.19	649.50	2
2	99.19	649.50	156.19	668.50	1
3	156.19	668.50	172.00	668.50	1
4	172.00	668.50	192.00	668.50	4
5	192.00	668.50	242.00	656.00	4
6	242.00	656.00	450.00	656.00	6
7	99.19	649.50	100.00	644.50	2
8	.00	642.00	100.00	644.50	7
9	100.00	644.50	119.50	651.00	7
10	119.50	651.00	134.50	656.00	6
11	134.50	656.00	172.00	668.50	4
12	134.50	656.00	242.00	656.00	6
13	119.50	651.00	450.00	651.00	7
14	.00	636.00	450.00	636.00	8

1

ISOTROPIC SOIL PARAMETERS

8 Type(s) of Soil

Soil Type	Total Unit Wt.	Saturated Unit Wt.	Cohesion Intercept	Friction Angle	Pore Pressure	Pressure Constant	Piez. Surface

No.	(pcf)	(pcf)	(psf)	(deg)	Param.	(psf)	No.
1	116.0	121.0	250.0	12.0	.00	.0	1
2	116.0	121.0	.0	11.0	.00	.0	1
3	185.0	190.0	4000.0	.0	.00	.0	1
4	116.0	121.0	200.0	20.0	.00	.0	1
5	116.0	121.0	200.0	20.0	.00	.0	1
6	122.0	127.0	300.0	6.0	.00	.0	1
7	125.0	130.0	250.0	22.0	.00	.0	1
8	125.0	130.0	500.0	34.0	.00	.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	642.00
2	100.00	644.50
3	104.50	646.00
4	450.00	646.00

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

900 Trial Surfaces Have Been Generated.

30 Surfaces Initiate From Each Of 30 Points Equally Spaced Along The Ground Surface Between X = 50.00 ft.
and X = 105.00 ft.

Each Surface Terminates Between X = 161.19 ft.
and X = 350.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

5.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	84.14	649.12
2	88.80	647.31
3	93.58	645.83
4	98.45	644.71
5	103.39	643.95
6	108.37	643.54
7	113.37	643.50
8	118.36	643.83
9	123.32	644.51
10	128.21	645.55
11	133.01	646.94
12	137.70	648.68
13	142.25	650.75
14	146.63	653.15
15	150.84	655.86
16	154.83	658.87
17	158.59	662.16
18	162.11	665.71
19	164.49	668.50

Circle Center At X = 111.4 ; Y = 712.3 and Radius, 68.9

*** 2.118 ***

Individual data on the 29 slices

Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
1	4.7	522.1	.0	.0	.0	.0	.0	.0	.0
2	4.8	1512.2	.0	.0	.0	.0	.0	.0	.0
3	4.9	2343.6	.0	.0	.0	.0	.0	.0	.0
4	.7	415.7	.0	.0	.0	.0	.0	.0	.0
5	.7	388.3	.0	.0	.0	.0	.0	.0	.0
6	.1	90.8	.0	.1	.0	.0	.0	.0	.0
7	3.4	2448.0	.0	173.7	.0	.0	.0	.0	.0
8	1.1	953.9	.0	126.2	.0	.0	.0	.0	.0
9	3.9	3837.9	.0	557.3	.0	.0	.0	.0	.0
10	5.0	5993.4	.0	772.4	.0	.0	.0	.0	.0
11	5.0	6928.5	.0	728.6	.0	.0	.0	.0	.0
12	1.1	1688.5	.0	150.1	.0	.0	.0	.0	.0
13	3.8	5884.6	.0	421.7	.0	.0	.0	.0	.0
14	4.9	7908.7	.0	302.9	.0	.0	.0	.0	.0

15	1.6	2564.3	.0	22.7	.0	.0	.0	.0	.0
16	3.2	5395.7	.0	.0	.0	.0	.0	.0	.0
17	1.5	2480.9	.0	.0	.0	.0	.0	.0	.0
18	3.2	5266.0	.0	.0	.0	.0	.0	.0	.0
19	4.5	7249.1	.0	.0	.0	.0	.0	.0	.0
20	.5	696.2	.0	.0	.0	.0	.0	.0	.0
21	3.9	5838.7	.0	.0	.0	.0	.0	.0	.0
22	4.2	5646.6	.0	.0	.0	.0	.0	.0	.0
23	.2	229.7	.0	.0	.0	.0	.0	.0	.0
24	3.8	4410.2	.0	.0	.0	.0	.0	.0	.0
25	1.4	1389.8	.0	.0	.0	.0	.0	.0	.0
26	2.4	2061.8	.0	.0	.0	.0	.0	.0	.0
27	2.8	1584.1	.0	.0	.0	.0	.0	.0	.0
28	.8	277.0	.0	.0	.0	.0	.0	.0	.0
29	2.4	384.7	.0	.0	.0	.0	.0	.0	.0

```
                    Y            A     X     I     S           F     T

               .00    147.07    294.14    441.21    588.28    735.35

   X       .00 +---------+---------+---------+---------+--**-----+
               -
               -                                          ..
               -                                         ..1
               -                                        ...*
               -                                        ...**
        147.07 +                                       ....1*
               -                                       .....*
               -                                       .....*
               -                                       ......
               -                                       .....*
               -                                        .....
   A    294.14 +                                        .....
               -                                         ....
               -                                          ...
               -
               -
               -
   X    441.21 +                                          ***
               -
               -
               -
               -
               -
   I    588.28 +
               -
               -
               -
               -
               -
   S    735.35 +
               -
               -
               -
               -
               -
        882.42 +
               -
               -
               -
```

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              -
              -
F   1029.49   +
              -
              -
              -
              -
              -
T   1176.56   +
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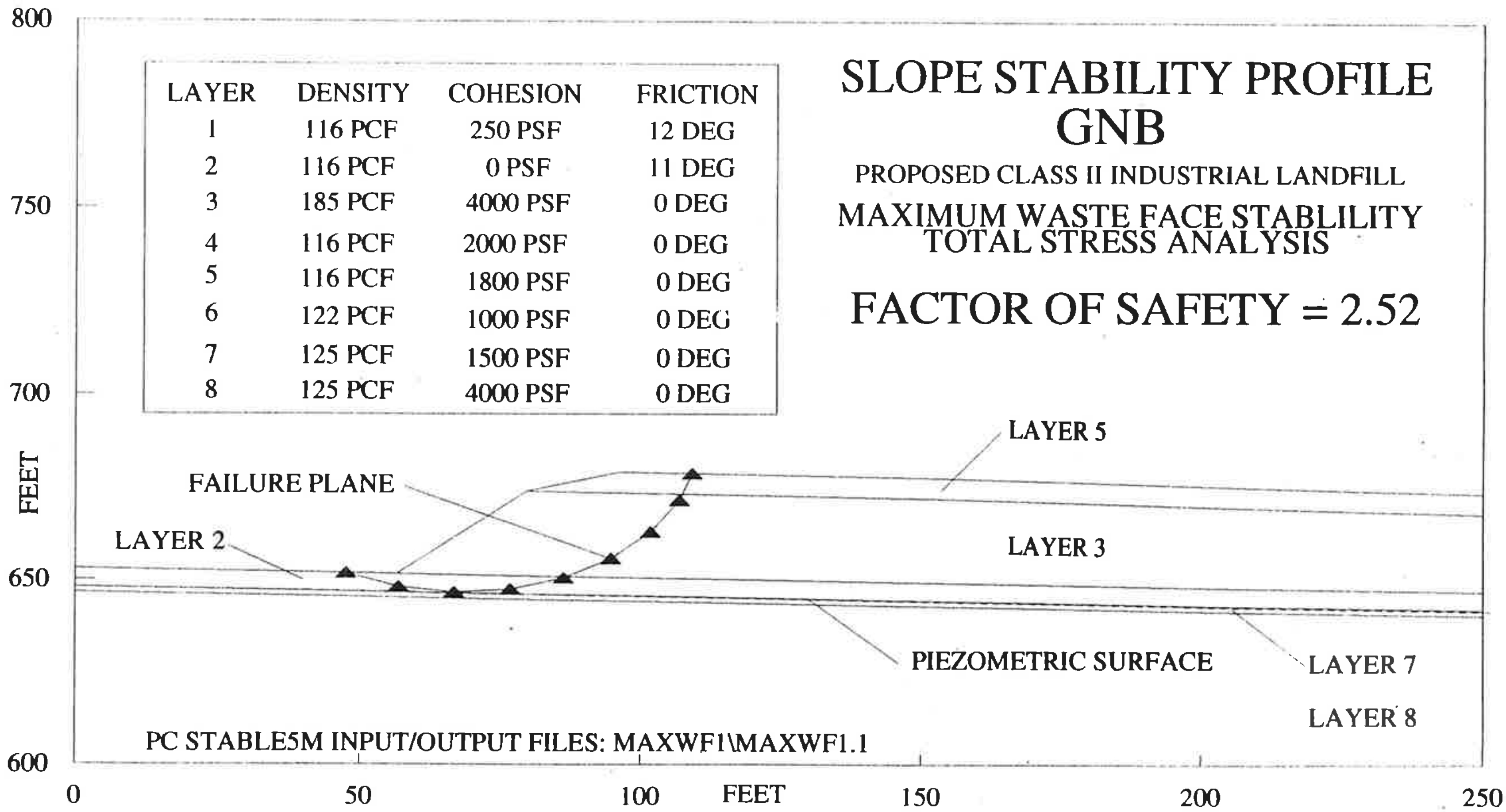

LAYER	DENSITY	COHESION	FRICTION
1	116 PCF	250 PSF	12 DEG
2	116 PCF	0 PSF	11 DEG
3	185 PCF	4000 PSF	0 DEG
4	116 PCF	2000 PSF	0 DEG
5	116 PCF	1800 PSF	0 DEG
6	122 PCF	1000 PSF	0 DEG
7	125 PCF	1500 PSF	0 DEG
8	125 PCF	4000 PSF	0 DEG

** PCSTABL5M **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date:	8-17-95
Time of Run:	1402
Run By:	HANZ
Input Data Filename:	MAXWF1
Output Filename:	MAXWF1.1

PROBLEM DESCRIPTION MAXIMUM WASTE FACE STABLITY, TOTAL ANALY SIS, BISHOP, SMOOTH BOTTOM

BOUNDARY COORDINATES

5 Top Boundaries
10 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	653.00	56.57	651.59	2
2	56.57	651.59	79.57	674.00	3
3	79.57	674.00	96.07	679.05	5
4	96.07	679.05	153.64	677.50	5
5	153.64	677.50	290.00	671.50	5
6	79.57	674.00	153.64	672.00	3
7	153.64	672.00	290.00	666.00	3
8	56.57	651.59	290.00	645.75	2
9	.00	648.00	290.00	640.75	7
10	.00	646.50	290.00	639.25	8

1

ISOTROPIC SOIL PARAMETERS

8 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	116.0	121.0	250.0	12.0	.00	.0	1
2	116.0	121.0	.0	11.0	.00	.0	1

3	185.0	190.0	4000.0	.0	.00	.0	1
4	116.0	121.0	2000.0	.0	.00	.0	1
5	116.0	121.0	1800.0	.0	.00	.0	1
6	122.0	127.0	1000.0	.0	.00	.0	1
7	125.0	130.0	1500.0	.0	.00	.0	1
8	125.0	130.0	4000.0	.0	.00	.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	648.00
2	290.00	640.75

1

BOUNDARY LOAD(S)

2 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (lb/sqft)	Deflection (deg)
1	101.07	102.87	1540.0	.0
2	108.07	109.87	1540.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

900 Trial Surfaces Have Been Generated.

30 Surfaces Initiate From Each Of 30 Points Equally Spaced
Along The Ground Surface Between X = .00 ft.
and X = 60.00 ft.

Each Surface Terminates Between X = 85.00 ft.
and X = 250.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined. They Are Ordered - Most Critical
First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.59	651.81
2	56.85	648.04
3	66.73	646.53
4	76.70	647.38
5	86.19	650.53
6	94.67	655.82
7	101.69	662.95
8	106.84	671.52
9	109.11	678.70

Circle Center At X = 68.1 ; Y = 689.0 and Radius, 42.5

*** 2.523 ***

Individual data on the 16 slices

Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
1	9.0	1792.6	.0	.0	.0	.0	.0	.0	.0
2	.3	118.9	.0	.0	.0	.0	.0	.0	.0
3	9.9	14327.3	.0	.0	.0	.0	.0	.0	.0
4	10.0	32817.4	.0	.0	.0	.0	.0	.0	.0
5	2.9	12522.8	.0	.0	.0	.0	.0	.0	.0
6	6.6	30116.1	.0	.0	.0	.0	.0	.0	.0
7	.5	2205.7	.0	.0	.0	.0	.0	.0	.0
8	8.0	33586.4	.0	.0	.0	.0	.0	.0	.0
9	1.4	5257.4	.0	.0	.0	.0	.0	.0	.0
10	5.0	15867.0	.0	.0	.0	.0	.0	.0	.0

```
11        .6   1628.0      .0       .0        .0       .0       .0       .0  952.7
12       1.2   2820.1      .0       .0        .0       .0       .0       .0 1819.3
13       4.0   6283.6      .0       .0        .0       .0       .0       .0    .0
14        .5    436.4      .0       .0        .0       .0       .0       .0    .0
15        .7    348.2      .0       .0        .0       .0       .0       .0    .0
16       1.0    199.5      .0       .0        .0       .0       .0       .0 1597.1
                    Y            A     X     I     S           F     T

                     .00   158.90   317.79   476.69   635.58   794.48

       X       .00 +---------+---------+---------+---------+*---------+
                   -                                       ..6
                   -                                       ..*
                   -                                      ...1*.
                   -                                      ...11*2/2
                   -                                      ....88
           158.90  +                                      ....**
                   -                                       .....
                   -                                       .....
                   -                                         ..
                   -
                   -                                        ***
       A   317.79  +
                   -
                   -
                   -
                   -
                   -
       X   476.69  +
                   -
                   -
                   -
                   -
                   -
       I   635.58  +
                   -
                   -
                   -
                   -
                   -
       S   794.48  +
                   -
                   -
                   -
                   -
                   -
           953.37  +
                   -
                   -
                   -
                   -
                   -
       F  1112.27  +
                   -
                   -
                   -
                   -
                   -
       T  1271.16  +
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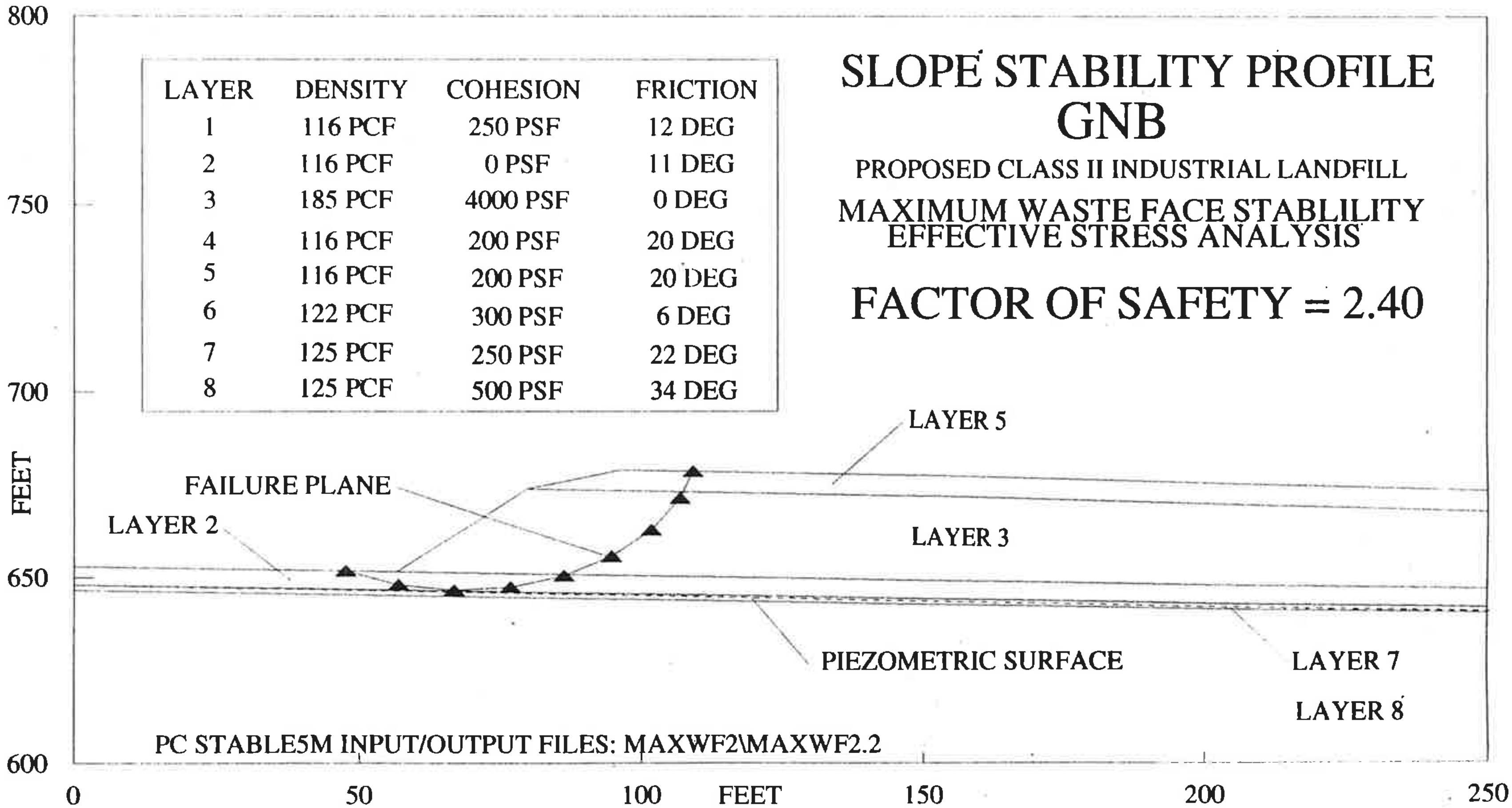

LAYER	DENSITY	COHESION	FRICTION
1	116 PCF	250 PSF	12 DEG
2	116 PCF	0 PSF	11 DEG
3	185 PCF	4000 PSF	0 DEG
4	116 PCF	200 PSF	20 DEG
5	116 PCF	200 PSF	20 DEG
6	122 PCF	300 PSF	6 DEG
7	125 PCF	250 PSF	22 DEG
8	125 PCF	500 PSF	34 DEG

** PCSTABL5M **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date:	8-17-95
Time of Run:	1403
Run By:	HANZ
Input Data Filename:	MAXWF2
Output Filename:	MAXWF2.2

PROBLEM DESCRIPTION MAXIMUM WASTE FACE STABLITY, EFFECTIVE A
NALYSIS, BISHOP, SMOOTH BOTTOM

BOUNDARY COORDINATES

5 Top Boundaries
10 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	653.00	56.57	651.59	2
2	56.57	651.59	79.57	674.00	3
3	79.57	674.00	96.07	679.05	5
4	96.07	679.05	153.64	677.50	5
5	153.64	677.50	290.00	671.50	5
6	79.57	674.00	153.64	672.00	3
7	153.64	672.00	290.00	666.00	3
8	56.57	651.59	290.00	645.75	2
9	.00	648.00	290.00	640.75	7
10	.00	646.50	290.00	639.25	8

1

ISOTROPIC SOIL PARAMETERS

8 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	116.0	121.0	250.0	12.0	.00	.0	1
2	116.0	121.0	.0	11.0	.00	.0	1

3	185.0	190.0	4000.0	.0	.00	.0	1
4	116.0	121.0	200.0	20.0	.00	.0	1
5	116.0	121.0	200.0	20.0	.00	.0	1
6	122.0	127.0	300.0	6.0	.00	.0	1
7	125.0	130.0	250.0	22.0	.00	.0	1
8	125.0	130.0	500.0	34.0	.00	.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	648.00
2	290.00	640.75

1

BOUNDARY LOAD(S)

2 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (lb/sqft)	Deflection (deg)
1	101.07	102.87	1540.0	.0
2	108.07	109.87	1540.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

900 Trial Surfaces Have Been Generated.

30 Surfaces Initiate From Each Of 30 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 60.00 ft.

Each Surface Terminates Between X = 85.00 ft.
and X = 250.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.59	651.81
2	56.85	648.04
3	66.73	646.53
4	76.70	647.38
5	86.19	650.53
6	94.67	655.82
7	101.69	662.95
8	106.84	671.52
9	109.11	678.70

Circle Center At X = 68.1 ; Y = 689.0 and Radius, 42.5

*** 2.395 ***

Individual data on the 16 slices

Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
1	9.0	1792.6	.0	.0	.0	.0	.0	.0	.0
2	.3	118.9	.0	.0	.0	.0	.0	.0	.0
3	9.9	14327.3	.0	.0	.0	.0	.0	.0	.0
4	10.0	32817.4	.0	.0	.0	.0	.0	.0	.0
5	2.9	12522.8	.0	.0	.0	.0	.0	.0	.0
6	6.6	30116.1	.0	.0	.0	.0	.0	.0	.0
7	.5	2205.7	.0	.0	.0	.0	.0	.0	.0
8	8.0	33586.4	.0	.0	.0	.0	.0	.0	.0
9	1.4	5257.4	.0	.0	.0	.0	.0	.0	.0
10	5.0	15867.0	.0	.0	.0	.0	.0	.0	.0

11	.6	1628.0	.0	.0	.0	.0	.0	.0	952.7
12	1.2	2820.1	.0	.0	.0	.0	.0	.0	1819.3
13	4.0	6283.6	.0	.0	.0	.0	.0	.0	.0
14	.5	436.4	.0	.0	.0	.0	.0	.0	.0
15	.7	348.2	.0	.0	.0	.0	.0	.0	.0
16	1.0	199.5	.0	.0	.0	.0	.0	.0	1597.1

```
                 Y            A     X     I     S           F     T

              .00   158.90   317.79   476.69   635.58   794.48

X        .00 +---------+---------+---------+---------+*---------+
             -                                       ..8
             -                                       .9*
             -                                      ..01*.
             -                                      ...11*2/2
             -                                      ......
      158.90 +                                      ....**
             -                                       .....
             -                                       .....
             -                                         ..
             -
             -                                        ***
A     317.79 +
             -
             -
             -
             -
             -
X     476.69 +
             -
             -
             -
             -
             -
I     635.58 +
             -
             -
             -
             -
             -
S     794.48 +
             -
             -
             -
             -
             -
      953.37 +
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F    1112.27 +
             -
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             -
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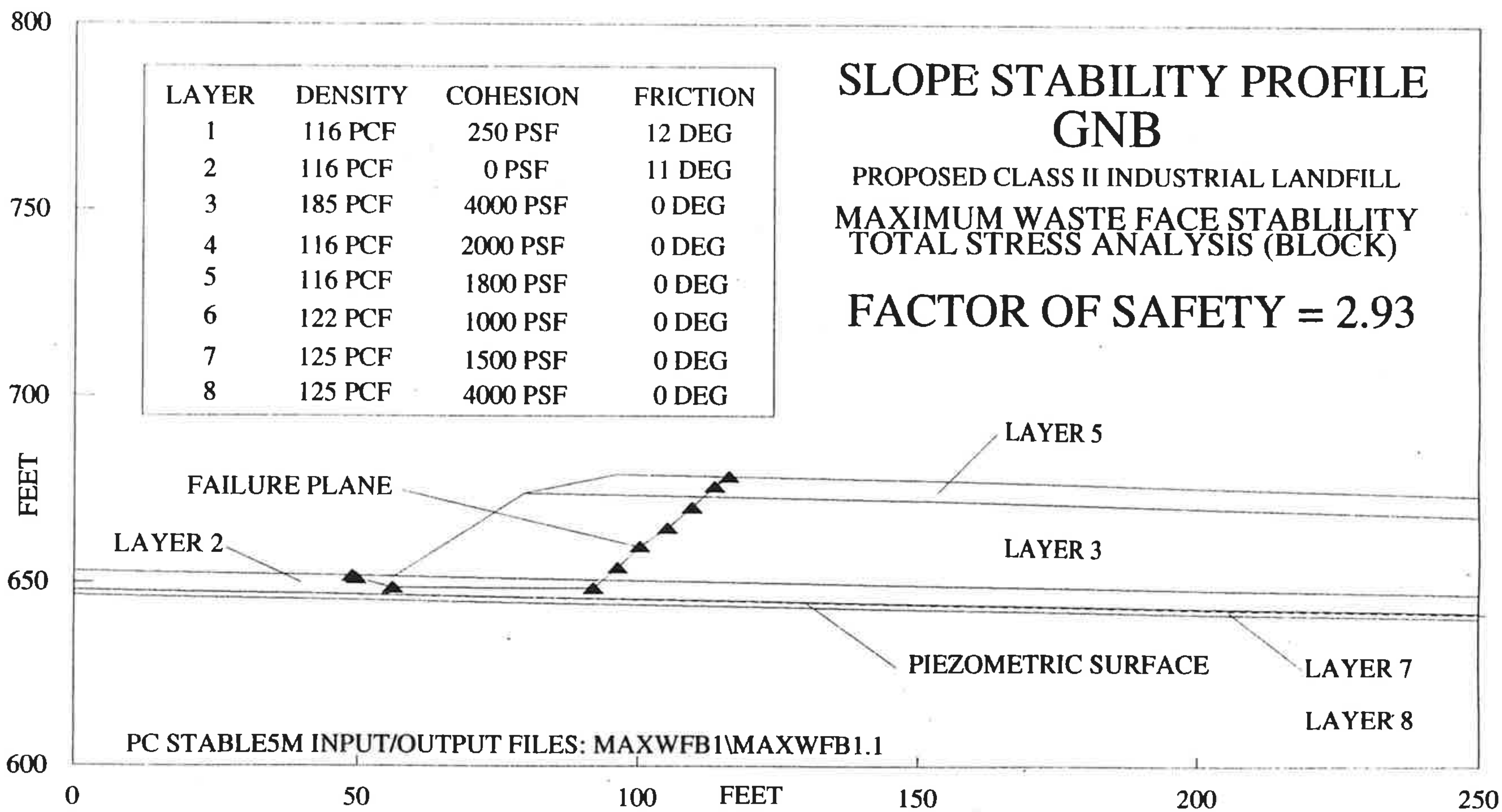
T    1271.16 +
```



LAYER	DENSITY	COHESION	FRICTION
1	116 PCF	250 PSF	12 DEG
2	116 PCF	0 PSF	11 DEG
3	185 PCF	4000 PSF	0 DEG
4	116 PCF	2000 PSF	0 DEG
5	116 PCF	1800 PSF	0 DEG
6	122 PCF	1000 PSF	0 DEG
7	125 PCF	1500 PSF	0 DEG
8	125 PCF	4000 PSF	0 DEG

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date:	8-17-95
Time of Run:	1432
Run By:	HANZ
Input Data Filename:	MAXWFB1
Output Filename:	MAXWFB1.1

PROBLEM DESCRIPTION MAXIMUM WASTE FACE STABLITY, TOTAL ANALY SIS, BLOCK, SMOOTH BOTTOM

BOUNDARY COORDINATES

5 Top Boundaries
10 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	653.00	56.57	651.59	2
2	56.57	651.59	79.57	674.00	3
3	79.57	674.00	96.07	679.05	5
4	96.07	679.05	153.64	677.50	5
5	153.64	677.50	290.00	671.50	5
6	79.57	674.00	153.64	672.00	3
7	153.64	672.00	290.00	666.00	3
8	56.57	651.59	290.00	645.75	2
9	.00	648.00	290.00	640.75	7
10	.00	646.50	290.00	639.25	8

1

ISOTROPIC SOIL PARAMETERS

8 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	116.0	121.0	250.0	12.0	.00	.0	1

2	116.0	121.0	.0	11.0	.00	.0	1
3	185.0	190.0	4000.0	.0	.00	.0	1
4	116.0	121.0	2000.0	.0	.00	.0	1
5	116.0	121.0	1800.0	.0	.00	.0	1
6	122.0	127.0	1000.0	.0	.00	.0	1
7	125.0	130.0	1500.0	.0	.00	.0	1
8	125.0	130.0	4000.0	.0	.00	.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	648.00
2	290.00	640.75

1

BOUNDARY LOAD(S)

2 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (lb/sqft)	Deflection (deg)
1	101.07	102.87	1540.0	.0
2	108.07	109.87	1540.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 7.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	55.57	649.12	57.57	649.07	2.00
2	79.57	648.52	179.57	646.02	2.00

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.01	651.78
2	49.69	651.11
3	56.24	648.65
4	91.99	648.48
5	96.31	653.99
6	100.32	659.73
7	105.26	664.69
8	109.61	670.18
9	113.68	675.87
10	116.20	678.51

*** 2.925 ***

Individual data on the 18 slices

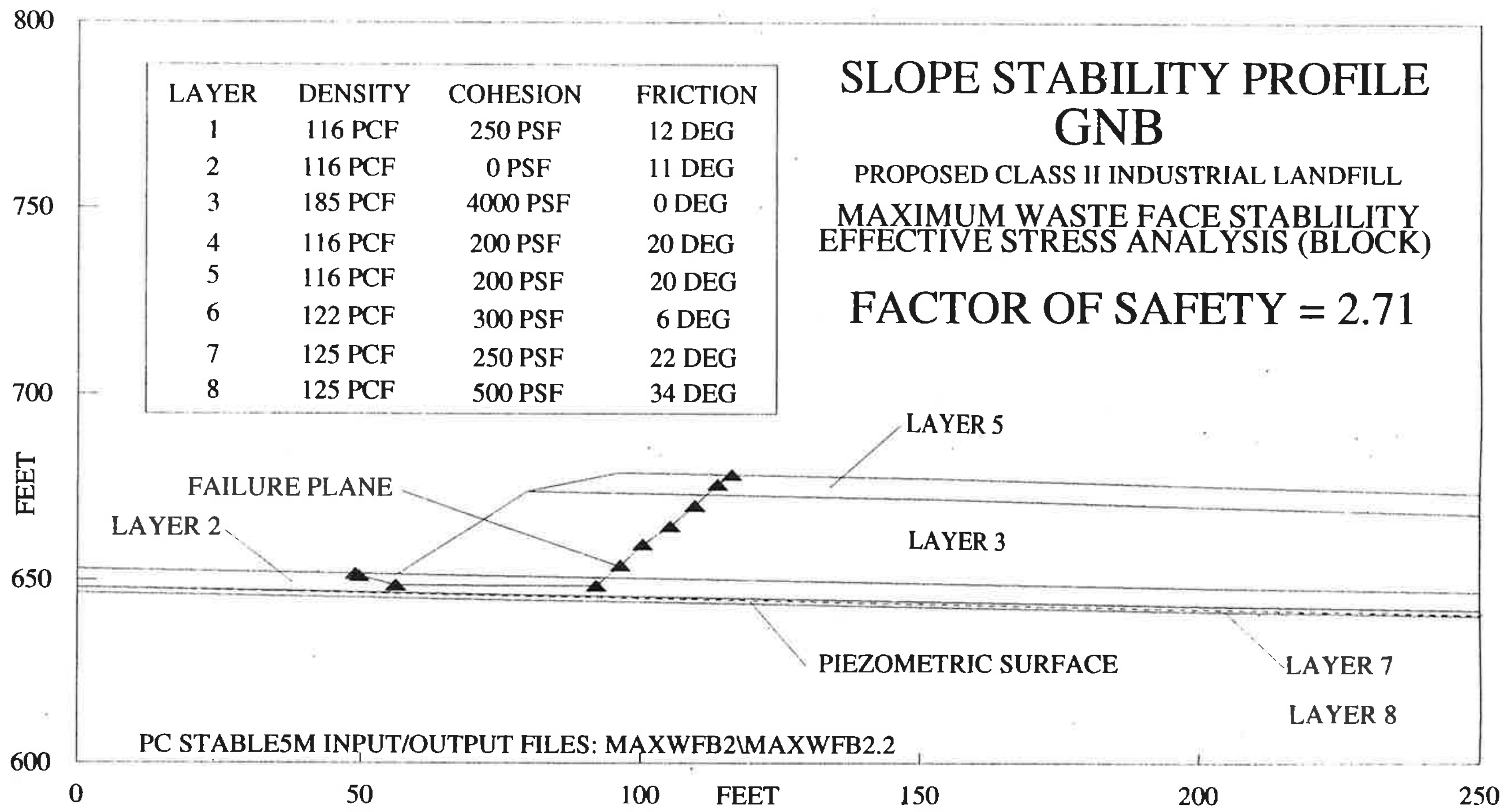
Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
1	.7	25.4	.0	.0	.0	.0	.0	.0	.0
2	6.6	1366.2	.0	.0	.0	.0	.0	.0	.0
3	.3	112.2	.0	.0	.0	.0	.0	.0	.0
4	23.0	56119.6	.0	.0	.0	.0	.0	.0	.0
5	12.4	59150.4	.0	.0	.0	.0	.0	.0	.0
6	1.7	8342.0	.0	.0	.0	.0	.0	.0	.0
7	2.4	10803.5	.0	.0	.0	.0	.0	.0	.0
8	.2	1010.4	.0	.0	.0	.0	.0	.0	.0
9	4.0	14919.1	.0	.0	.0	.0	.0	.0	.0
10	.7	2320.8	.0	.0	.0	.0	.0	.0	.0
11	1.8	5147.2	.0	.0	.0	.0	.0	.0	2772.0
12	2.4	5872.7	.0	.0	.0	.0	.0	.0	.0
13	2.8	5333.1	.0	.0	.0	.0	.0	.0	.0

14	1.5	2117.4	.0	.0	.0	.0	.0	.0	2366.
15	.3	305.8	.0	.0	.0	.0	.0	.0	405.
16	1.8	1630.0	.0	.0	.0	.0	.0	.0	.
17	2.0	931.2	.0	.0	.0	.0	.0	.0	.
18	2.5	396.3	.0	.0	.0	.0	.0	.0	.

```
                 Y            A     X     I     S            F     T

                 .00    158.90    317.79    476.69    635.58    794.48

X          .00 +---------+---------+---------+---------+*--------+
               -                                         .
               -                                         *
               -                                         1*
               -                                         11*2/2
               -                                         094
        158.90 +                                         .**
               -                                         ...
               -                                          ..
               -
               -
               -                                        ***
A       317.79 +
               -
               -
               -
               -
               -
X       476.69 +
               -
               -
               -
               -
               -
I       635.58 +
               -
               -
               -
               -
               -
S       794.48 +
               -
               -
               -
               -
               -
        953.37 +
               -
               -
               -
               -
               -
F      1112.27 +
               -
               -
               -
               -
               -
T      1271.16 +
```


SLOPE STABILITY PROFILE
GNB
PROPOSED CLASS II INDUSTRIAL LANDFILL
MAXIMUM WASTE FACE STABLILITY
EFFECTIVE STRESS ANALYSIS (BLOCK)
FACTOR OF SAFETY = 2.71
LAYER DENSITY COHESION FRICTION
1 116 PCF 250 PSF 12 DEG
2 116 PCF 0 PSF 11 DEG
3 185 PCF 4000 PSF 0 DEG
4 116 PCF 200 PSF 20 DEG
5 116 PCF 200 PSF 20 DEG
6 122 PCF 300 PSF 6 DEG
7 125 PCF 250 PSF 22 DEG
8 125 PCF 500 PSF 34 DEG
LAYER 5
FAILURE PLANE
LAYER 2
LAYER 3
PIEZOMETRIC SURFACE
LAYER 7
LAYER 8
PC STABLE5M INPUT/OUTPUT FILES: MAXWFB2\MAXWFB2.2
800
750
700
650
600
FEET
0
50
100
150
200
250
FEET

** PCSTABL5M **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date:	8-17-95
Time of Run:	1440
Run By:	HANZ
Input Data Filename:	MAXWFB2
Output Filename:	MAXWFB2.2

PROBLEM DESCRIPTION MAXIMUM WASTE FACE STABLITY, EFFECTIVE A
NALYSIS, BLOCK, SMOOTH BOTTOM

BOUNDARY COORDINATES

5 Top Boundaries
10 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	653.00	56.57	651.59	2
2	56.57	651.59	79.57	674.00	3
3	79.57	674.00	96.07	679.05	5
4	96.07	679.05	153.64	677.50	5
5	153.64	677.50	290.00	671.50	5
6	79.57	674.00	153.64	672.00	3
7	153.64	672.00	290.00	666.00	3
8	56.57	651.59	290.00	645.75	2
9	.00	648.00	290.00	640.75	7
10	.00	646.50	290.00	639.25	8

1

ISOTROPIC SOIL PARAMETERS

8 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	116.0	121.0	250.0	12.0	.00	.0	1
2	116.0	121.0	.0	11.0	.00	.0	1

3	185.0	190.0	4000.0	.0	.00	.0	1
4	116.0	121.0	200.0	20.0	.00	.0	1
5	116.0	121.0	200.0	20.0	.00	.0	1
6	122.0	127.0	300.0	6.0	.00	.0	1
7	125.0	130.0	250.0	22.0	.00	.0	1
8	125.0	130.0	500.0	34.0	.00	.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	648.00
2	290.00	640.75

1

BOUNDARY LOAD(S)

2 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (lb/sqft)	Deflection (deg)
1	101.07	102.87	1540.0	.0
2	108.07	109.87	1540.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 7.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	55.57	649.12	57.57	649.07	2.00
2	79.57	648.52	179.57	646.02	2.00

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.01	651.78
2	49.69	651.11
3	56.24	648.65
4	91.99	648.48
5	96.31	653.99
6	100.32	659.73
7	105.26	664.69
8	109.61	670.18
9	113.68	675.87
10	116.20	678.51

*** 2.712 ***

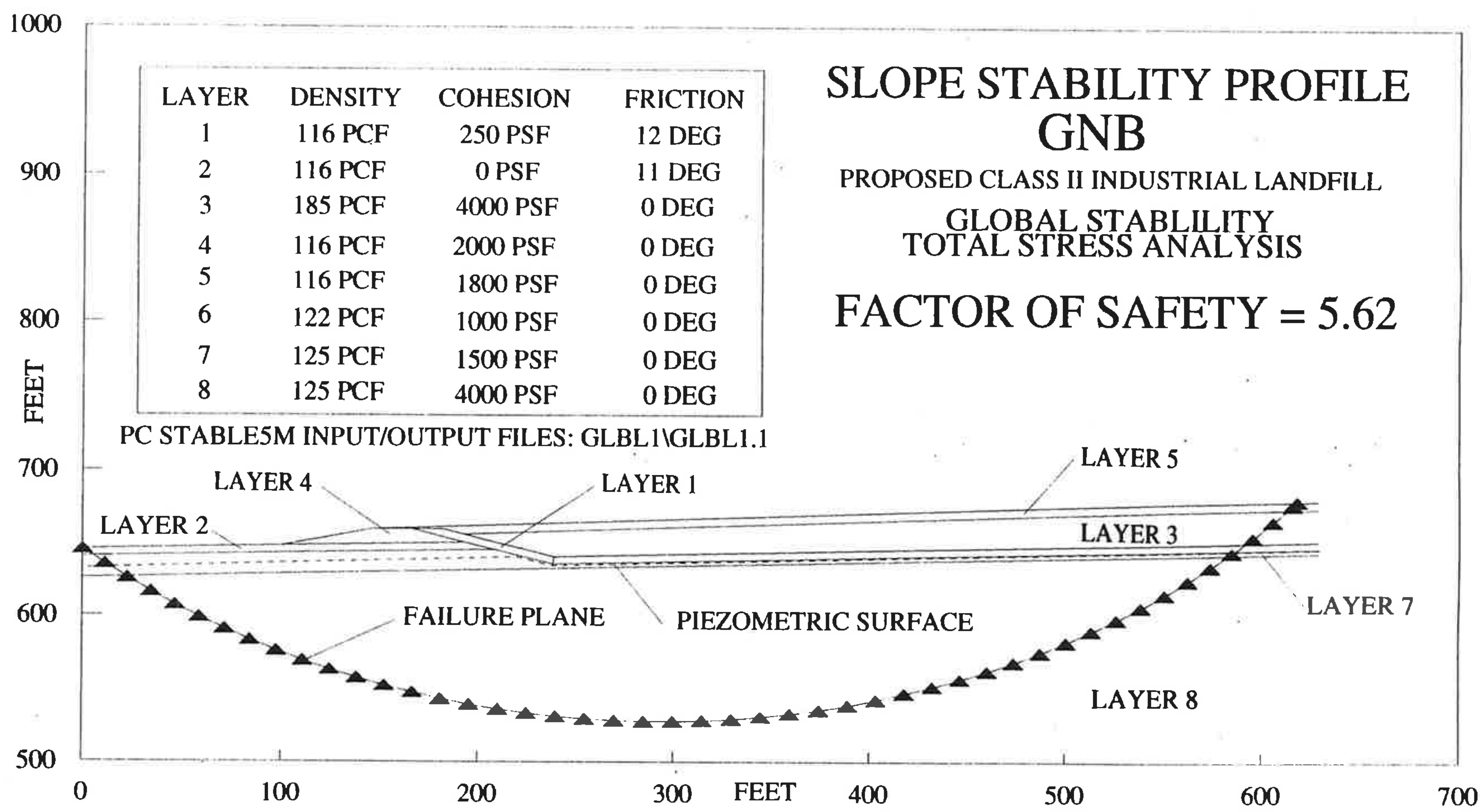
Individual data on the 18 slices

Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
1	.7	25.4	.0	.0	.0	.0	.0	.0	.(
2	6.6	1366.2	.0	.0	.0	.0	.0	.0	.(
3	.3	112.2	.0	.0	.0	.0	.0	.0	.(
4	23.0	56119.6	.0	.0	.0	.0	.0	.0	.(
5	12.4	59150.4	.0	.0	.0	.0	.0	.0	.(
6	1.7	8342.0	.0	.0	.0	.0	.0	.0	.(
7	2.4	10803.5	.0	.0	.0	.0	.0	.0	.(
8	.2	1010.4	.0	.0	.0	.0	.0	.0	.(
9	4.0	14919.1	.0	.0	.0	.0	.0	.0	.(
10	.7	2320.8	.0	.0	.0	.0	.0	.0	.(
11	1.8	5147.2	.0	.0	.0	.0	.0	.0	2772.(
12	2.4	5872.7	.0	.0	.0	.0	.0	.0	.(
13	2.8	5333.1	.0	.0	.0	.0	.0	.0	.(
14	1.5	2117.4	.0	.0	.0	.0	.0	.0	2366.1

```
15       .3    305.8      .0      .0       .0      .0      .0      .0  405.
16      1.8   1630.0      .0      .0       .0      .0      .0      .0     .
17      2.0    931.2      .0      .0       .0      .0      .0      .0     .
18      2.5    396.3      .0      .0       .0      .0      .0      .0     .
                   Y            A     X     I     S            F     T

                    .00    158.90    317.79    476.69    635.58    794.48

        X       .00 +---------+---------+---------+---------+*--------+
                    -                                        .
                    -                                        *
                    -                                        1*
                    -                                        11*2/2
                    -                                        .05
             158.90 +                                        .**
                    -                                        ...
                    -                                         ..
                    -
                    -
                    -                                       ***
        A    317.79 +
                    -
                    -
                    -
                    -
                    -
        X    476.69 +
                    -
                    -
                    -
                    -
                    -
        I    635.58 +
                    -
                    -
                    -
                    -
                    -
        S    794.48 +
                    -
                    -
                    -
                    -
                    -
             953.37 +
                    -
                    -
                    -
                    -
                    -
        F   1112.27 +
                    -
                    -
                    -
                    -
                    -
        T   1271.16 +
```


SLOPE STABILITY PROFILE
GNB
PROPOSED CLASS II INDUSTRIAL LANDFILL
GLOBAL STABLILITY
TOTAL STRESS ANALYSIS
FACTOR OF SAFETY = 5.62
LAYER DENSITY COHESION FRICTION
1 116 PCF 250 PSF 12 DEG
2 116 PCF 0 PSF 11 DEG
3 185 PCF 4000 PSF 0 DEG
4 116 PCF 2000 PSF 0 DEG
5 116 PCF 1800 PSF 0 DEG
6 122 PCF 1000 PSF 0 DEG
7 125 PCF 1500 PSF 0 DEG
8 125 PCF 4000 PSF 0 DEG
PC STABLE5M INPUT/OUTPUT FILES: GLBL1\GLBL1.1
LAYER 5
LAYER 4
LAYER 1
LAYER 2
LAYER 3
LAYER 7
LAYER 8
FAILURE PLANE
PIEZOMETRIC SURFACE
FEET
FEET
1000
900
800
700
600
500
0
100
200
300
400
500
600
700

** PCSTABL5M **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date: 8-17-95
Time of Run: 1546
Run By: HANZ
Input Data Filename: GLBL1
Output Filename: GLBL1.1

PROBLEM DESCRIPTION GLOBAL STABLITY, TOTAL ANALYSIS, BISHOP METHOD

BOUNDARY COORDINATES

4 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	645.50	100.00	648.00	6
2	100.00	648.00	146.00	659.50	4
3	146.00	659.50	555.09	677.50	5
4	555.09	677.50	629.16	679.50	5
5	146.00	659.50	166.00	659.50	4
6	166.00	659.50	181.81	659.50	1
7	181.81	659.50	192.37	655.98	1
8	192.37	655.98	555.09	672.00	3
9	555.09	672.00	629.16	674.00	3
10	192.37	655.98	238.81	640.50	1
11	238.81	640.50	629.16	651.75	2
12	238.00	635.50	238.81	640.50	2
13	166.00	659.50	193.00	650.50	4
14	100.00	648.00	193.00	650.50	6
15	193.00	650.50	208.00	645.50	6
16	.00	640.50	208.00	645.00	7
17	208.00	645.50	238.00	635.50	7
18	238.00	635.50	629.16	646.75	7
19	.00	625.50	629.16	643.60	8

ISOTROPIC SOIL PARAMETERS

8 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	116.0	121.0	250.0	12.0	.00	.0	1
2	116.0	121.0	.0	11.0	.00	.0	1
3	185.0	190.0	4000.0	.0	.00	.0	1
4	116.0	121.0	2000.0	.0	.00	.0	1
5	116.0	121.0	1800.0	.0	.00	.0	1
6	122.0	127.0	1000.0	.0	.00	.0	1
7	125.0	130.0	1500.0	.0	.00	.0	1
8	125.0	130.0	4000.0	.0	.00	.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	635.50
2	223.00	640.50
3	238.00	635.50
4	629.16	646.75

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

900 Trial Surfaces Have Been Generated.

30 Surfaces Initiate From Each Of 30 Points Equally Spaced
Along The Ground Surface Between X = .00 ft.
and X = 120.00 ft.

Each Surface Terminates Between X = 146.00 ft.
and X = 620.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

15.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 48 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	.00	645.50
2	11.03	635.34
3	22.42	625.57
4	34.14	616.21
5	46.19	607.28
6	58.54	598.77
7	71.19	590.70
8	84.11	583.09
9	97.30	575.93
10	110.73	569.25
11	124.38	563.04
12	138.25	557.32
13	152.31	552.10
14	166.54	547.37
15	180.94	543.15
16	195.47	539.43
17	210.13	536.24
18	224.88	533.56
19	239.73	531.41
20	254.64	529.78
21	269.60	528.68
22	284.59	528.10
23	299.59	528.06
24	314.58	528.54
25	329.55	529.56
26	344.47	531.10
27	359.32	533.17
28	374.10	535.76
29	388.77	538.87
30	403.33	542.50
31	417.75	546.64
32	432.01	551.28
33	446.10	556.43
34	460.00	562.06
35	473.69	568.19
36	487.16	574.80
37	500.38	581.87
38	513.35	589.41
39	526.04	597.40
40	538.45	605.84
41	550.54	614.71
42	562.32	624.00

43	573.76	633.70
44	584.86	643.79
45	595.59	654.28
46	605.94	665.13
47	615.90	676.34
48	618.27	679.21

Circle Center At X = 293.3 ; Y = 952.9 and Radius, 424.8

*** 5.622 ***

Individual data on the 65 slices

Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
1	5.3	1623.7	.0	.0	.0	.0	.0	.0	.0
2	5.3	4899.7	.0	.0	.0	.0	.0	.0	.0
3	.4	548.4	.0	7.5	.0	.0	.0	.0	.0
4	10.7	20488.4	.0	4533.0	.0	.0	.0	.0	.0
5	.6	1653.6	.0	538.4	.0	.0	.0	.0	.0
6	11.7	37807.7	.0	14261.5	.0	.0	.0	.0	.0
7	12.0	53637.0	.0	23071.4	.0	.0	.0	.0	.0
8	12.4	69503.6	.0	31489.9	.0	.0	.0	.0	.0
9	12.6	85283.9	.0	39506.8	.0	.0	.0	.0	.0
10	12.9	100856.1	.0	47111.8	.0	.0	.0	.0	.0
11	13.2	116102.5	.0	54295.8	.0	.0	.0	.0	.0
12	2.7	25367.5	.0	11764.0	.0	.0	.0	.0	.0
13	10.7	107042.9	.0	49285.6	.0	.0	.0	.0	.0
14	13.7	151424.5	.0	67364.8	.0	.0	.0	.0	.0
15	13.9	170106.7	.0	73233.6	.0	.0	.0	.0	.0
16	7.8	101893.8	.0	42723.9	.0	.0	.0	.0	.0
17	6.3	85872.1	.0	35924.6	.0	.0	.0	.0	.0
18	13.7	193294.7	.0	80327.8	.0	.0	.0	.0	.0
19	.5	7852.6	.0	3275.3	.0	.0	.0	.0	.0
20	14.4	212874.5	.0	88091.0	.0	.0	.0	.0	.0
21	.9	13208.2	.0	5429.4	.0	.0	.0	.0	.0
22	10.6	162001.3	.0	66713.9	.0	.0	.0	.0	.0
23	.6	9806.0	.0	4043.1	.0	.0	.0	.0	.0
24	2.5	38687.7	.0	15920.1	.0	.0	.0	.0	.0
25	12.5	201753.0	.0	81568.9	.0	.0	.0	.0	.0
26	2.1	35123.2	.0	14076.0	.0	.0	.0	.0	.0
27	12.9	217817.9	.0	85941.0	.0	.0	.0	.0	.0
28	1.9	32554.2	.0	12087.5	.0	.0	.0	.0	.0
29	13.1	231064.3	.0	82550.1	.0	.0	.0	.0	.0
30	.8	14549.0	.0	5305.0	.0	.0	.0	.0	.0
31	.9	16539.3	.0	6028.6	.0	.0	.0	.0	.0
32	14.9	270795.1	.0	98400.1	.0	.0	.0	.0	.0
33	15.0	275793.2	.0	*******	.0	.0	.0	.0	.0
34	15.0	279443.6	.0	*******	.0	.0	.0	.0	.0
35	15.0	281724.9	.0	*******	.0	.0	.0	.0	.0
36	15.0	282623.6	.0	*******	.0	.0	.0	.0	.0
37	15.0	282136.6	.0	*******	.0	.0	.0	.0	.0
38	14.9	280269.9	.0	*******	.0	.0	.0	.0	.0

39	14.9	277039.3	.0	99774.1	.0	.0	.0	.0	.C
40	14.8	272469.0	.0	97993.4	.0	.0	.0	.0	.C
41	14.7	266593.3	.0	95722.5	.0	.0	.0	.0	.C
42	14.6	259455.1	.0	92963.8	.0	.0	.0	.0	.C
43	14.4	251105.9	.0	89721.1	.0	.0	.0	.0	.C
44	14.3	241606.6	.0	85998.6	.0	.0	.0	.0	.C
45	14.1	231024.8	.0	81800.3	.0	.0	.0	.0	.C
46	13.9	219437.5	.0	77132.1	.0	.0	.0	.0	.C
47	13.7	206927.8	.0	71999.3	.0	.0	.0	.0	.0
48	13.5	193586.8	.0	66408.6	.0	.0	.0	.0	.0
49	13.2	179511.2	.0	60367.0	.0	.0	.0	.0	.0
50	13.0	164804.4	.0	53881.9	.0	.0	.0	.0	.0
51	12.7	149574.3	.0	46961.3	.0	.0	.0	.0	.0
52	12.4	133935.1	.0	39614.0	.0	.0	.0	.0	.0
53	12.1	118003.1	.0	31849.2	.0	.0	.0	.0	.0
54	4.5	40901.7	.0	10129.2	.0	.0	.0	.0	.0
55	7.2	60916.1	.0	13547.1	.0	.0	.0	.0	.0
56	11.4	85282.0	.0	15105.8	.0	.0	.0	.0	.0
57	9.4	59397.6	.0	5808.7	.0	.0	.0	.0	.0
58	1.7	9432.3	.0	339.4	.0	.0	.0	.0	.0
59	1.8	9682.9	.0	130.1	.0	.0	.0	.0	.0
60	5.3	26657.3	.0	.0	.0	.0	.0	.0	.0
61	3.7	16370.6	.0	.0	.0	.0	.0	.0	.0
62	10.4	32518.9	.0	.0	.0	.0	.0	.0	.0
63	7.5	10508.9	.0	.0	.0	.0	.0	.0	.0
64	2.5	1183.7	.0	.0	.0	.0	.0	.0	.0
65	2.4	384.4	.0	.0	.0	.0	.0	.0	.0

```
                   Y            A     X     I     S            F     T

                    .00   149.49    298.98    448.47    597.96    747.45

        X       .00 +---------+---------+---------+---------+-**------+
                    -                                        114
                    -                                       1140
                    -                                      116..
                    -                                     110..*.
                    -                                     16.....
             149.49 +                                    16.....*
                    -                                   11......*
                    -                                   17.....**
                    -                                   1......W.
                    -                                  11......*.
                    -                                  13.........
        A    298.98 +                                  13.........
                    -                                  138........
                    -                                   18........
                    -                                   158.......
                    -                                   128.......
                    -                                    138......
        X    448.47 +                                    1158.....
                    -                                     12588...
                    -                                     112588..
                    -                                      1125988
                    -                                       .1225*
                    -                                         1123
        I    597.96 +                                          012
                    -                                          ***
                    -
                    -
```

```
                -
                -
S     747.45 +
                -
                -
                -
                -
                -
      896.94 +
                -
                -
                -
                -
                -
F    1046.43 +
                -
                -
                -
                -
                -
T    1195.92 +
```

SLOPE STABILITY PROFILE
GNB

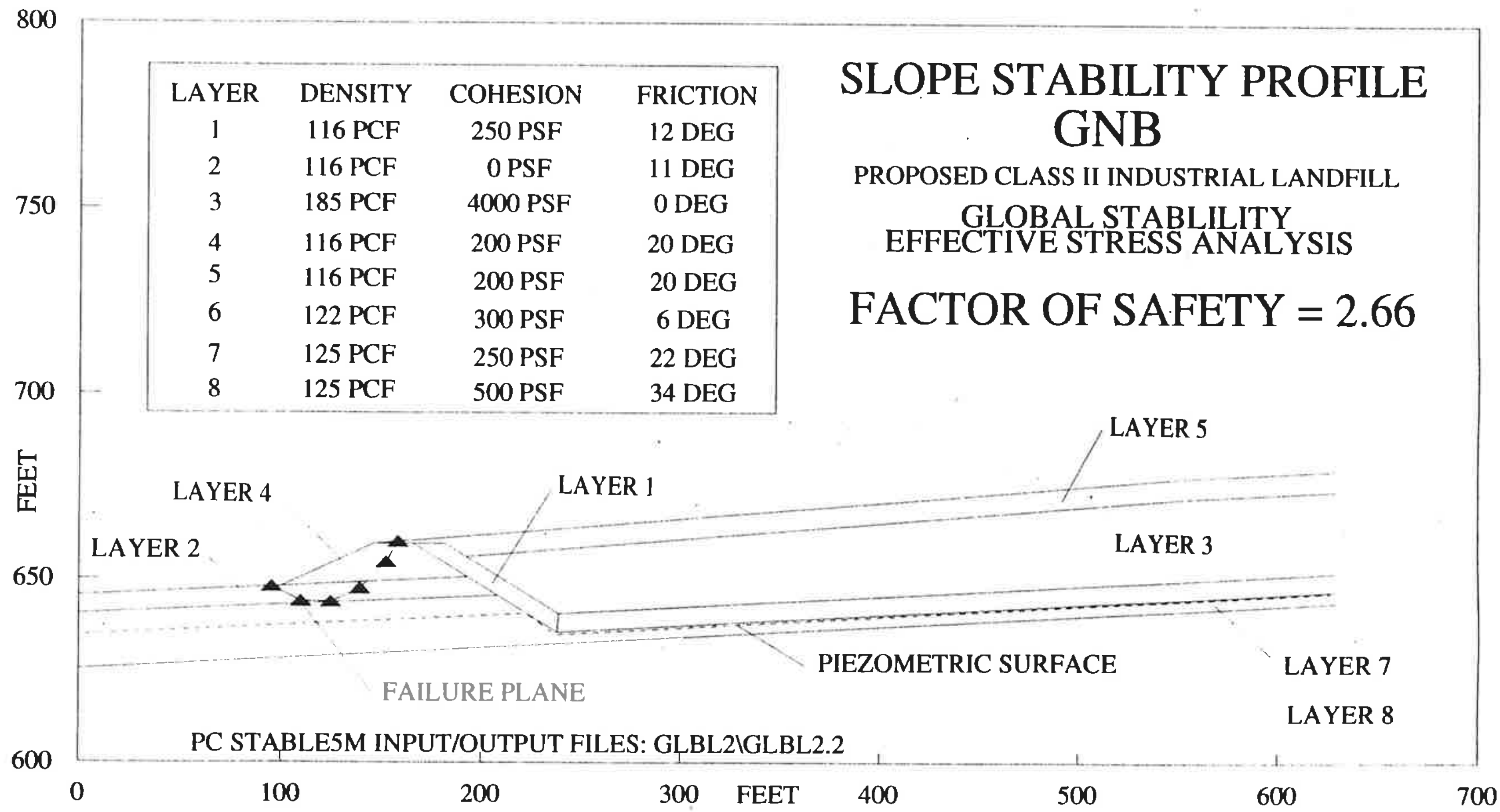
PROPOSED CLASS II INDUSTRIAL LANDFILL

GLOBAL STABLILITY

EFFECTIVE STRESS ANALYSIS

FACTOR OF SAFETY = 2.66

LAYER	DENSITY	COHESION	FRICTION
1	116 PCF	250 PSF	12 DEG
2	116 PCF	0 PSF	11 DEG
3	185 PCF	4000 PSF	0 DEG
4	116 PCF	200 PSF	20 DEG
5	116 PCF	200 PSF	20 DEG
6	122 PCF	300 PSF	6 DEG
7	125 PCF	250 PSF	22 DEG
8	125 PCF	500 PSF	34 DEG



PC STABLE5M INPUT/OUTPUT FILES: GLBL2\GLBL2.2

** PCSTABL5M **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date:	8-17-95
Time of Run:	1550
Run By:	HANZ
Input Data Filename:	GLBL2
Output Filename:	GLBL2.2

PROBLEM DESCRIPTION GLOBAL STABLITY, EFFECTIVE ANALYSIS, BIS
HOP METHOD

BOUNDARY COORDINATES

4 Top Boundaries
19 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	645.50	100.00	648.00	6
2	100.00	648.00	146.00	659.50	4
3	146.00	659.50	555.09	677.50	5
4	555.09	677.50	629.16	679.50	5
5	146.00	659.50	166.00	659.50	4
6	166.00	659.50	181.81	659.50	1
7	181.81	659.50	192.37	655.98	1
8	192.37	655.98	555.09	672.00	3
9	555.09	672.00	629.16	674.00	3
10	192.37	655.98	238.81	640.50	1
11	238.81	640.50	629.16	651.75	2
12	238.00	635.50	238.81	640.50	2
13	166.00	659.50	193.00	650.50	4
14	100.00	648.00	193.00	650.50	6
15	193.00	650.50	208.00	645.50	6
16	.00	640.50	208.00	645.00	7
17	208.00	645.50	238.00	635.50	7
18	238.00	635.50	629.16	646.75	7
19	.00	625.50	629.16	643.60	8

ISOTROPIC SOIL PARAMETERS

8 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	116.0	121.0	250.0	12.0	.00	.0	1
2	116.0	121.0	.0	11.0	.00	.0	1
3	185.0	190.0	4000.0	.0	.00	.0	1
4	116.0	121.0	200.0	20.0	.00	.0	1
5	116.0	121.0	200.0	20.0	.00	.0	1
6	122.0	127.0	300.0	6.0	.00	.0	1
7	125.0	130.0	250.0	22.0	.00	.0	1
8	125.0	130.0	500.0	34.0	.00	.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	635.50
2	223.00	640.50
3	238.00	635.50
4	629.16	646.75

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

900 Trial Surfaces Have Been Generated.

30 Surfaces Initiate From Each Of 30 Points Equally Spaced Along The Ground Surface Between X = .00 ft. and X = 120.00 ft.

Each Surface Terminates Between X = 146.00 ft. and X = 620.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

15.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	95.17	647.88
2	109.62	643.85
3	124.62	643.63
4	139.18	647.25
5	152.33	654.45
6	158.22	660.04

Circle Center At X = 117.8 ; Y = 700.3 and Radius, 57.1

*** 2.660 ***

Individual data on the 9 slices

Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
1	4.8	432.2	.0	.0	.0	.0	.0	.0	.0
2	9.6	4648.1	.0	.0	.0	.0	.0	.0	.0
3	15.0	15284.1	.0	.0	.0	.0	.0	.0	.0
4	14.6	18090.1	.0	.0	.0	.0	.0	.0	.0
5	3.5	4054.2	.0	.0	.0	.0	.0	.0	.0
6	3.4	3508.5	.0	.0	.0	.0	.0	.0	.0
7	6.3	5083.5	.0	.0	.0	.0	.0	.0	.0
8	5.3	1801.7	.0	.0	.0	.0	.0	.0	.0
9	.6	16.9	.0	.0	.0	.0	.0	.0	.0

```
                      Y            A     X     I     S           F     T

                     .00    149.49    298.98    448.47    597.96    747.45

       X       .00 +---------+---------+---------+---------+-**-------+
                   -                                         ...
                   -                                        ....
                   -                                        .....
                   -                                       .....*.
                   -                                       .....1.
```

```
         149.49 +                                    ......1*
                -                                   ........*
                -                                   .......**
                -                                   .......W.
                -                                  ........*.
                -                                  ...........
A        298.98 +                                  ...........
                -                                  ...........
                -                                   ..........
                -                                   ..........
                -                                   ..........
                -                                    .........
X        448.47 +                                    .........
                -                                     ........
                -                                     ........
                -                                      .......
                -                                       .....*
                -                                         ....
I        597.96 +                                          ...
                -                                          ***
                -
                -
                -
                -
S        747.45 +
                -
                -
                -
                -
                -
         896.94 +
                -
                -
                -
                -
                -
F       1046.43 +
                -
                -
                -
                -
                -
T       1195.92 +
```

Attachment 6-A.3

CALCULATION SHEETS

CALCULATION SHEET

SUBJECT Loads

SHEET 1 OF 5

DATE 8-16-95

OJECT GNB Landfill

BY Don Anderson

JOB NO. SD-01518.12 LOCATION Frisco, TX

CHECKED

SUPERSEDED

APPROVED

Calculate Maximum Loads on Subgrade at Bottom of Landfill,
Calculate for Maximum Waste Hieght (Near NE Landfill Corner).

Liner:	3' Compacted Clay Liner	@ 116.0 pcf	= 348.0
	2' Protective Cover	@ 116.0 pcf	= 232.0
			580.0
Waste:	22.5' Waste	@ 185.0 pcf	= 4,162.5
Cover:	4', Compacted Clay Liner	@ 116.0 pcf	= 464.0
	1.5' Protective Cover/Topsoil	@ 116.0 pcf	= 174.0
			638.0
			5380.5

Say 5400 psf is Max Load

Calculate Minimum Load at Toe of Perimeter Cut Slope to Estimate Differential Settlement of Landfill Floor (Along W Edge of Landfill).

Liner:	Liner Total	= 580.0
Waste:	17.5' Waste @ 185.0	= 3,237.5
Cover:	Cover Total	= 638.0
		4455.5

Say 4450 psf is Min Load

CALCULATION SHEET

SUBJECT: Bearing Capacity
SHEET 2 OF 5
DATE 8-16-95
PROJECT: GNB Land Fill
BY: Dan Anderson
JOB NO. 50-01518.12 LOCATION: Frisco, TX
CHECKED
SUPERSEDED
APPROVED

Calculate Bearing Capacity of Clays & Shales Underlying Landfill

Use Terzaghi Equation

$$q_{ult} = c N_c + \gamma D_f N_q + 0.5 \gamma B N_\gamma$$

For Deep Clays say Cohesion = 1500 psf & Bottom of Landfill is ~ 20 feet Below Adjacent Ground Surface.

$\therefore$ $c = 1500$ psf
$N_c = 5.7$ (For $\phi = 0°$)
$\gamma D_f = 5'$ of Dark Brown Clay + 15' of Tan Grey Clay
$= (5' \times 122) + (15' \times 125) = 2485$ psf
$N_q = 1$ (For $\phi = 0°$)
$0.5 \gamma B N_\gamma = 0$ For $\phi = 0°$

Tan Grey Clay $q_{ult} = 1500(5.7) + 2485(1) =$

$q_{ult} = 8550 + 2485 = 11{,}035$

$FS = \dfrac{q_{ult}}{\text{Max Load}} = \dfrac{11{,}035}{5{,}400} = 2.0$ ✓ OK

$\therefore$ Factor of Safety Against Bearing Failure of Deep Clays is Acceptable

Check Bearing in Shales, say Cohession, $C = 4000$ psf

$q_{ult} = 4000(5.7) + 2485(1) = 22{,}800 + 2485 = 25{,}285$

$FS = \dfrac{25{,}285}{5{,}400} = 4.7$ ✓ OK

$\therefore$ Factor of Safety Against Bearing Failure of Shales is Acceptable

CALCULATION SHEET

SUBJECT: Bearing Capacity
PROJECT: GNB Landfill
JOB NO.: 50-01518.12 LOCATION: Frisco, TX
SUPERSEDED:

SHEET 3 OF 5
DATE: 8-16-95
BY: Don Anderson
CHECKED:
APPROVED:

CHECK BEARING CAPACITY OF UPPER DARK BROWN SOILS TO SUPPORT PERIMETER EMBANKMENTS.

MAX EMBANKMENT HIEGHT IS APPROX. 12 FEET & $\gamma_{FILL} = 116.0$ PCF

FOR UPPER DARK CLAY, $C = 1000$ PSF

EMBANKMENT LOAD = 12' x 116 PCF = 1392 PSF → SAY 1,400 PSF

$$q_{ULT} = 1000\,(5.7) + \cancelto{0}{\gamma D_f N_q} + \cancelto{0}{0.5\gamma B N_\gamma}$$

$$q_{ULT} = 5700 \text{ PSF}$$

$$FS = \frac{5700}{1400} = 4.1 \checkmark \text{ OK}$$

∴ FACTOR OF SAFETY OF UPPER DARK CLAYS AGAINST BEARING FAILURE DUE TO EMBANKMENT LOADS IS ACCEPTABLE

CALCULATION SHEET

SUBJECT: SETTLEMENT | SHEET 4 OF 5
DATE: 8-17-95
PROJECT: GNB LANDFILL | BY: DON ANDERSON
JOB NO. 50-01518.12 LOCATION: FRISCO, TX | CHECKED
SUPERSEDED | APPROVED

CHECK SETTLEMENT UNDER MAX LANDFILL LOADS

ASSUME A WORST CASE CONDITION WHERE 10 FEET OF CLAY IS PRESENT BENEATH BOTTOM OF LANDFILL. USE CONSOLIDATION THEORY FOR CLAYS, USE ELASTIC METHOD FOR DEEPER SHALES. ASSUME EMBEDMENT DEPTH OF 15', USE MAX LOAD, ASSUME CLAYS ARE ABOVE PIEZOMETRIC SURFACE.

FROM LAB TESTING OF CLAYS $C_{ce} = 0.17$, $\gamma = 12$

FOR CLAYS $S = C_{ce} H \log \frac{\sigma'_{vo} + \Delta\sigma_v}{\sigma'_{vo}}$

FROM BOYLES 'FOUNDATION ANALYSIS & DESIGN', P. 167, SHALES E_s RANGE FROM 500 TO 2000 KSI

∴ FOR SHALES USE $E_s = 1000$ KSF AND

$$S = P_{MAX}(H/E_s)$$

SINCE LANDFILL WILL BE EMBED, START SETTLEMENT CALCULATIONS AT 15' AND ASSUME ORIGINAL OVERBURDEN PRESSURE AS INITIAL σ_{ov}, PMAX = 5400 PSF

METHOD	DEPTH	σ_{ov}	$\Delta\sigma$	H	C_{ce}	$S_{(CON)}$	$S_{(ELASTIC)}$	TOTAL
CONSOL	15-20	2172	5400	5	.17	0.461'	–	
CONSOL	20-25	2797	5400	5	.17	0.397'	–	
ELASTIC	25-125	$S = 5400(100/1{,}000{,}000)$				–	0.540'	
						0.858'	0.540	= 1.40 FT

SAY 1 TO 2 FEET OF TOTAL SUBGRADE SETTLEMENT MAY OCCUR UNDER MAX LANDFILL LOAD

CALCULATE MINIMUM LANDFILL SUBGRADE SETTLEMENT, ASSUME EXCAVATION EXTENDS INTO SHALES, √ 125' BENEATH LANDFILL, PMIN = 4450 PSF

$$\therefore S = P_{MIN}(H/E_s) = 4450(125/1{,}000{,}000) = 0.56 \text{ FT}$$

∴ DIFFERENTIAL SETTLEMENT = 1.40' − 0.56' = .84' ∴ ΔS SHOULD BE LIMITED TO LESS THAN 1 FOOT OVER A 350' LONG SEGMENT

∴ $\delta = 1/350 = 0.003$ OR 0.3% AND IS ACCEPTABLE

CALCULATION SHEET

SUBJECT SETTLEMENT | SHEET 5 OF 5
DATE 8-17-95
JECT GNB LANDFILL | BY DON ANDERSON
JOB NO. 50-01518.12 LOCATION FRISCO, TX | CHECKED
SUPERSEDED | APPROVED

CHECK SETTLEMENT OF MAX HEIGHT PERIMETER DIKE

PERFORM CONSERVATIVE ANALYSIS, SAY I = 1.0 DOWN TO SHALES, THEN NEGLECT ANY SETTLEMENT DUE TO SHALE

MAX DIKE HEIGHT = 12 FEET ∴ $q = 12' \times 116 = 1,400$

USE CONSOLIDATION METHOD

	σ_{ov}	$\Delta\sigma$	H	C_{ce}	$S = C_{ce} H \log \frac{\sigma_v' + \Delta\sigma}{\sigma_{ov}}$
0-5	305	1400	5	.11	.411
5-10	922	1400	5	.17	.341
10-15	1547	1400	5	.17	.238
15-20	2172	1400	5	.17	.184
20-25	2797	1400	5	.17	.150
					1.32'

SINCE METHOD OF CALCULATION IS CONSERVATIVE SAY ACTUAL SETTLEMENT OF PERIMETER DIKE WILL BE 3/4 TO 1 FOOT

CHECK SETTLEMENT OF CLAY LINER

FOR CLAY LINER ASSUME 10% SETTLEMENT, FOR 5' THICK LAYER SETTLEMENT SHOULD BE LIMIT ∴ ANY ERRORS IN THIS ASSUMPTION SHOULD ALSO BE LIMITED

5 FEET × 0.10 = 0.5 FEET

∴ MAX CAP SETTLEMENT SHOULD BE 1.4 FT + 0.5 FT = 1.9 FEET (1½ TO 2½)

MIN CAP SETTLEMENT SHOULD BE 0.6 FT + 0.5 FT = 1.1 FEET (¾ TO 1¼)

ΔS 0.8 FEET

Appendix 6-B

SOILS AND LINER QUALITY CONTROL PLAN

APPENDIX 6-B
SOIL AND LINER QUALITY CONTROL PLAN
CLASS 2 NON-HAZARDOUS INDUSTRIAL WASTE LANDFILL

GNB TECHNOLOGIES, INC.
FRISCO, TEXAS

AUGUST 1995

Donald L. Anderson, P.E.
Geotechnical Engineer

STATE OF TEXAS
DONALD L. ANDERSON
71330
REGISTERED PROFESSIONAL ENGINEER

JONES & NEUSE

RMT/JONES & NEUSE, INC. – AUSTIN, TX
912 CAPITAL OF TEXAS HIGHWAY SOUTH - SUITE 300 - 78746-5210
512/327-9840 - 512/327-6163 FAX

GULF COAST REGION OF RMT

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Section 1
INTRODUCTION

This Soil and Liner Quality Control Plan (SLQCP) has been prepared for construction of the GNB Technologies, Inc. Class 2 non-hazardous industrial waste landfill in Frisco, Texas. Quality Assurance\Quality Control (QA\QC) procedures and material requirements for construction of the soil and FML liner and cover system, and the perimeter berms of the landfill are specified in this SLQCP. Material requirements, specific test requirements and testing frequencies contained in this SLQCP are intended to comply with current rules and guidelines established by the Hazardous and Industrial Waste Section of the Texas Natural Resource and Conservation Commission (TNRCC).

The QA\QC program will be implemented by a third party quality assurance firm (QA Firm). The roles, responsibilities, and documentation requirements of the QA Firm, as well as those of the earthwork contractor (Contractor) and the geosynthetics installer (Installer) are specified in this SLQCP. The construction QA\QC program must be directed and supervised by a Geotechnical Professional (GP). The GP must be a professional engineer registered in the State of Texas who possesses professional experience in geotechnical engineering and testing.

Portions of the landfill may extend below the seasonal high piezometric ground-water surface. Therefore, Section 10 of this SLQCP discusses procedures to resist liner uplift due to hydrostatic pressures.

Section 2

NON-HAZARDOUS WASTE LANDFILL UNIT COMPONENTS

The non-hazardous landfill will receive a bottom liner consisting of 36 inches of compacted clay with a maximum permeability of 1×10^{-7} cm/s, a smooth 60-mil HDPE FML, a Leachate Collection System (LCS) and 24 inches of protective cover soil. The LCS will be a drainage geocomposite composed of a geonet with geotextile filter fabric fused to its upper surface.

A similar composite liner system and protective cover will be used on the sideslopes, however, textured 60-mil FML will replace the smooth FML used on the landfill bottom. Further, the geocomposite drainage layer used on the sideslopes will have geotextile filter fabrics fused to its upper and lower surfaces. The landfill sideslopes will be constructed on a maximum 3:1 (horizontal:vertical) inclination, therefore, the sideslope and bottom liners will be constructed monolithically.

The final cover of the non-hazardous landfill will include a composite cover, composed of 36 inches of low permeability compacted clay cover soil with a maximum permeability of 1×10^{-7} cm/s, overlain by a 40-mil HDPE FML. The FML will be covered by a 18-inch thick layer of topsoil. A smooth FML will be used on the five percent slopes of the landfill cover.

Liner and cover systems of the non-hazardous waste landfill are illustrated on Figure 6-B-1.

Section 3
SOIL MATERIAL DESCRIPTIONS

Soil materials used for construction of the non-hazardous waste landfill unit include the following:

- Compacted Clay Liner and Cover Soils - Low permeability compacted clay composite liner and cover soils placed directly beneath the liner and cover FML's;
- Topsoil-A thick layer of soil used to protect the cover and provide a medium for vegetative cover growth;
- Protective Cover Soils - A thick layer of soil used to protect the liner FML and LCS without clogging the geotextile component or the LCS;
- Granular Backfill Material - Clean gravel and/or sand placed around leachate sump access risers as bedding material;
- Granular Drainage Material - Clean gravel placed in LCS pipe trenches and LCS sumps, and used to construct gravel chimneys; and
- Structural Fill - Fill soil used to construct perimeter dikes and drainage diversion berms.

Section 4
SPECIFIED TESTING PROCEDURES

4.1 Soil Materials

The tests presented below will be performed with the designated testing standard when specified for the soil components of the non-hazardous waste landfill unit cover and liner systems. The table is applicable to compacted clay liner and cover soils, protective cover soils, topsoil, granular backfill material, granular drainage material, and structural fill.

Specified Test	Test Standard
Coefficient of Permeability-Compacted Clay Liner and Cover Soils	ASTM D 5084 flexible wall parameter method, or USCOE EM-1110-2-1906 App. VII falling head method
Coefficient of Permeability-Granular Backfill and Granular Drainage Soils	ASTM D 2434 Constant head method
Sieve Analysis (percent passing 2-inch or the 1 inch, No. 40 and No. 200 sieves)	ASTM D 422 (percent passing 2-inch or the 1-inch and No. 40 sieves); and ASTM D 1140 (percent passing the No. 200 sieve)
Sieve Analysis (full sieve, full sieve with hydrometer)	ASTM D 422
Atterberg Limits (PI and LL)	ASTM D 4318
Standard Proctor Moisture-Density Relationship	ASTM D 698
Carbonate Content	ASTM D 4373
Moisture Content (Laboratory)	ASTM D 2216
In-Place Density	ASTM D 2922 (nuclear gage); or, ASTM D 2937 (drive cylinder); or, ASTM D 2937 (sand cone)
In-Place Moisture Content	ASTM D 3017 (nuclear gage); or, ASTM D 2216 (oven); or, ASTM D 4643 (microwave); or, ASTM D 4959 (direct heating)

4.2 Geosynthetic Materials

Geosynthetic materials include geotextile filter fabric, geonet, liner HDPE FML, and cover HDPE FML. The following tests will be performed in accordance with the designated testing standard when specified for the various geosynthetic components of the cover and lining systems:

Specified Test	Test Standard
Thickness (HDPE)	ASTM D 5199 plus conformance testing
Density	ASTM D 1505 or D 792
Melt Flow Index	ASTM D 1238
Carbon Black Content	ASTM D 1603
Tensile Properties	ASTM D 638 plus conformance testing
Tear Resistance	ASTM D 1004
Puncture resistance (HDPE)	FTMS 101 Method 2065
Carbon Black Dispersion	ASTM D 3015
Low Temperature Brittleness	ASTM D 746
Dimensional Stability	ASTM D 1204 (212°, 15 min)
Environmental Stress Cracks	ASTM D 1693 Condition B (Modified NSF 54)
Coefficient of Permeability	ASTM D 4991
Flow Rate	ASTM D 4491
Trapezoidal Tear	ASTM D 4533
Ultraviolet Light	ASTM D 4355
Thickness (Geonet)	ASTM D 1777
Transmissivity	ASTM D 4716
Weight	ASTM D 3776
Puncture Resistance (Geotextile)	ASTM D 4833 (Geosynthetics Research Institute Test GM4, where noted)
Grab Strength	ASTM D 4632
Grab Elongation	ASTM D 4632
Apparent Opening Size	ASTM D 4751
Peel and Shear Testing	ASTM D 4377

Section 5

MATERIALS REQUIREMENTS

5.1 Soil Materials

The following table presents the materials requirements for the soil components of the liner and cover systems.

Soil Component	Test Parameters	Value
Compacted Clay Liner Soil and Cover Soil	Plasticity Index	15, Minimum
	Liquid Limit	30, Minimum
	Percent Passing the No. 200 Sieve	30%, Minimum
	Percent Passing the 1½ Inch Sieve	100% Minimum
	In-Place Permeability	1 x 10^{-7} cm/s, Maximum
	In-Place Density	95% of Standard Proctor or Maximum Dry Density, Minimum
	In-Place Moisture Content	0% to 4% over Standard Proctor Optimum Moisture Content
Granular Backfill Material	Sieve Analysis	Sieve % Passing 2" 100 #4 0-20% #200 0-3%

Soil Component	Test Parameters	Value
Granular Drainage Material	Laboratory Permeability	1×10^{-1} cm/s, Minimum
	Sieve Analysis (Full Sieve)	Sieve % Passing 2" 100 1 ½ 90-100 1" 20-55 3/4" 0-15 3/8" 0
Protective Cover Soil	In-Place Density	90% of Standard Proctor Maximum Dry Density, Minimum
	Laboratory Permeability	No requirement with leachate drainage trench, leachate drainage trench optional if permeability greater than or equal to 1×10^{-4} cm/s.
	Sieve Analysis (Full Sieve with Hydrometer)	The lower 1 foot of the 2-foot thick layer shall have a gradation such that it is retained by the geotextile of the LCS. Refer to Attachment 6-B.1 for calculation procedures. The upper 1 foot of the protective cover soil has no gradation specification.
Structural Fill	In-Place Density	95% of Standard Proctor Maximum Dry Density, Minimum
	In-Place Moisture Content	3% under to 3% over Standard Proctor Optimum Moisture Content
	Sieve Analysis	No Particles greater than 3 inches in diameter

In addition to the material requirements specified above, the compacted clay liner and cover soils should be classified according to ASTM D 2487 as a CH, CL, or SC. The granular drainage material and granular backfill material should be non-angular stone or gravel, or it may be an angular stone or gravel provided a satisfactory 10-ounce/square yard (minimum) geotextile is placed between the granular material and the underlying FML. The geotextile may be placed over the leachate collection layer or may be placed directly on top of the FML in place of the leachate collection layer. The granular backfill material and granular drainage material shall be free of shale, clay, friable materials or other debris. Topsoil should be classified as a CL or CH, and be capable of sustaining root growth. Compacted clay liner and cover soil, topsoil, protective cover soil, granular backfill and drainage material and structural fill may consist of on-site excavated materials which meet the specified materials requirements.

5.2 Geosynthetic Materials

A HDPE FML, textured on both sides, will be used for sideslope liners, and a smooth HDPE FML will be used for the bottom liner, A smooth HDPE FML will also be used for the cover liner. The bottom geocomposite LCS for the landfill will consist of a HDPE geonet with filter fabric fused to its upper surface. The sideslope geocomposite will have filter fabric fused to both sides. A geotextile filter fabric will also be placed to separate granular drainage material from protective cover soil and waste.

The following table presents the material requirements for the geosynthetic components of the liner and cover systems.

Geosynthetic Component	Test Parameters	Values
HDPE FML	Thickness - Liner	60 Mil, Average to 54 Mil, Minimum
	Thickness - Cover	40 Mil, Average to 36 Mil, Minimum
	Density	0.94 g/cc, Minimum
	Melt Index	0.4 g/10 minutes, Maximum
	Carbon Black Content	2% to 3% Roll Average
	Carbon Black Dispersion	A-1, A-2, B-1

Geosynthetic Component	Test Parameters	Values
HDPE FML	Tensile Strength at Break-Liner	288 lbs/inch width, Minimum Roll Average
	Tensile Strength at Break-Cover	152 lbs/inch width, Minimum Roll Average
	Tensile Strength at Yield-Liner	126 lbs/inch width, Minimum Roll Average
	Tensile Strength at Yield-Cover	84 lbs/inch width, Minimum Roll Average
	Elongation at Break	560%, Minimum Roll Average
	Elongation at Yield	12%, Minimum Roll Average
	Tear Strength Liner	39 lbs, Minimum Roll Average
	Tear Strength Cover	26 lbs, Minimum Roll Average
	Puncture Resistance Liner	72 lbs, FTMS 101C 2065, Minimum Roll Average
	Puncture Resistance Cover	48 lbs, FTMS 101 C 2065, Minimum Roll Average
	Low Temperature Brittleness	-94°F, Maximum Roll Average
	Dimensional Stability	± 1% change, Maximum Roll Average
	Environmental Stress Crack	2000 hours, Minimum Roll Average
Geotextile Filter Fabric	Grab Strength	200 lbs, Minimum
	Puncture Resistance	130 lbs, Minimum
	Percent Elongation	50%, Minimum
	Coefficient of Permeability	0.2 cm/s, Minimum
	Flow Rate	80 gpm/ft^2, Minimum
	AOS	70, Minimum
	Trapezoidal Tear	80 lbs, Minimum
	Ultraviolet Light	70% strength retention per 150 hrs exposure, Min.

Geosynthetic Component	Test Parameters	Values
Filter Fabric Components of Drainage Geocomposite	Grab Strength	160 lbs, Minimum
	Puncture Resistance	80 lbs, Minimum
	Percent Elongation	60%, Minimum
	Coefficient of Permeability	0.33 cm/s, Minimum
	Flow Rate	130 gpm/ft^2, Minimum
	AOS	70, Minimum
	Trapezoidal Tear	60 lbs, Minimum
Geonet and Geonet Component of Drainage Geocomposites	Density	0.935 g/cm^3, Minimum
	Melt Flow Index	1.0 g/10 minutes, Maximum
	Carbon Black Content	2.0%, Minimum
	Tensile Strength (Machine Direction)	40 lbs/inch width, Minimum
	Elongation at Break (Machine Direction)	50%
	Elongation at Break (Diagonal Direction)	20%
	Hydraulic Conductivity at Overburden Pressure of 8,500 PSF	1 cm/s, Minimum

Materials which do not meet the above material requirements may be approved on an individual basis by the project design engineer.

5.3 Incidental Materials

Twelve-inch diameter perforated and non-perforated pipe will be integrated into the LCS as leachate sump access risers. This pipe should be HDPE, PE 3408 and 345434C, SDR 17, or approved equal, as covered by ASTM D 3350 and F 714.

Section 6
PRE-CONSTRUCTION TESTING

6.1 Soil Components

Preconstruction testing will be performed to check that soil materials planned for use in liner and cover systems meet the materials properties requirements specified in Section 5.1. The minimum preconstruction frequencies presented in the following table are intended to extend over the entire life of the landfill, and, therefore, each specific test may represent soil materials used as cover or liner materials in different cells.

Soil Component	Required Tests	Testing Frequency
Compacted Clay Liner and Cover Soil	Atterberg Limits; Sieve Analysis (percent passing 1-inch, No. 4, No. 40 and No. 200 Sieve); Standard Proctor Moisture Content (laboratory);	1 per each 7400 yd^3 or significant change in soil (i.e., plasticity index or liquid limit of material changes by 10 or more); or change in borrow source
	Permeability (soil remolded to 95% of its standard Proctor maximum dry density, at its optimum moisture content)	1 per each 14,800 yd^3 or significant change in soil or change in borrow source
Granular Drainage and Granular Backfill Material	Permeability; Full Sieve	1 per each 2600 yd^3 or significant change in soil or change in borrow source
Protective Cover Soil	Standard Proctor; Full Sieve (with hydrometer)	1 per each soil type or significant change in soil; or 1 per change in borrow source
Structural Fill	Standard Proctor	1 per each soil type or significant change in soil; or 1 per change in borrow source

6.2 Geosynthetic Components

Preconstruction testing will be performed to check that geosynthetic materials planned for use in liner and cover systems meet the materials properties requirements specified in Section 5.2. The results of the pre-construction testing will be supplied by the geosynthetic manufacturer or the geosynthetic installer. The minimum preconstruction frequencies presented in the following table are intended to extend over the entire life of the landfill unit, and, therefore, each specific test may represent geosynthetic materials used as cover or liner materials in several different cells.

Geosynthetic Component	Required Tests	Testing Frequency
HDPE FML	Thickness Melt Flow Index Carbon Black Content Carbon Black Dispersion Tear Resistance Puncture resistance Density	1 test per lot of resin used to manufacture materials
	Tensile Properties for Strength and Elongation at Yield and at Break	1 test per lot of resin used to manufacture materials
The Geonet Component of the Drainage Geocomposite	Density Melt Index Carbon Black Content Thickness Tensile Strength Geonet to Fabric Adhesion	1 test per lot of resin used to manufacture materials used on site
The Filter Fabric Component of the Drainage Composite; and the Geotextile Filter Fabric	Grab Strength Grab Elongation Apparent Opening Size Density	1 test per lot of resin used to manufacture materials used on site

Section 7

SOIL LINER AND COVER CONSTRUCTION

7.1 Compacted Clay Liner and Cover Soils

Prior to beginning construction of these soil components, pre-construction testing as specified in Section 6.1 should be performed to identify materials which meet project requirements. Also, the subgrade to receive these components should be properly graded and smoothed. Areas of the subgrade containing soft or otherwise unstable materials should typically be repaired by undercutting and backfilling to grade with compacted soil. After proper grades have been established, the subgrade should be surveyed so the thickness of the low permeability cover soils may be confirmed after construction.

Prior to placement, the compacted clay liner and cover soils may require processing to break up any large clods and to adjust the moisture content. The soil may be processed in a staging area or it may be placed as a loose six-to eight-inch thick lift and processed in place prior to compaction. For moisture adjustments, water should be spread evenly on the surface of the soil and then be thoroughly mixed and evenly distributed throughout the lift by disking, tilling or other satisfactory means. If water adjustments are not needed, disking or tilling may still be required to break up large clods.

After processing, six-to eight-inch thick loose lifts should be compacted with a large sheeps-foot or tamp-foot roller with prongs long enough to totally penetrate the thickness of the lift. The roller should make sufficient passes to produce a relatively homogenous blend of the liner materials.

The lift should be compacted to specifications, and tested to check that proper compaction has been achieved prior to placement of the overlying lift. Any areas which fail to meet the compaction criteria should be reworked and retested. Also, the surface of each lift should be scarified one to two inches deep so that it bonds to each subsequent lift. The finished surface of the soil component should be rolled smooth with a drummed roller and surveyed to check its thickness prior to placing overlying geosynthetics or other soil components.

The surface of any compacted clay liner or cover lift left uncovered for any extended period of time should be inspected for desiccation cracks. Areas experiencing significant desiccation cracking should be repaired prior to additional construction.

The compacted clay liner and composite cover may be constructed in phases. Continuous covers shall not be constructed by "butting" a new cover segment next to the previously constructed section of cover. The edge of the prior cover shall be cut back on one foot off-set layers (stair-stepped) so that each foot of the existing cover edge is tied to new construction without superimposed construction joints.

7.2 Protective Cover Soils, Structural Fill, Granular Drainage and Backfill Materials, and Topsoil

This section of the SLQCP addresses granular drainage and backfill materials, protective cover soils, topsoil and structural fill.

Prior to beginning construction of these soil components, pre-construction testing as specified in Section 3.6.1 should be performed to identify materials which meet project requirements. If necessary, the soil components may be moisture conditioned to make them easier to compact. Six- to eight-inch thick loose lifts of the soil components should be placed and compacted to the specified densities. Initial lifts placed directly above an FML may be thickened and be densified with light tracked (ground pressure of 5 psi or less) equipment to prevent damage to the FML. Granular drainage/backfill material may be placed in a single lift. Cover soils placed above geosynthetic components on sideslopes should be placed working up the slope. Any FML damaged during this process must be repaired. The finished surface of the completed cover or liner system should be surveyed.

Section 10

SURVEYING AND REPORTING

The Contractor is responsible for ensuring that soil components of the liner and cover systems are constructed to specified thicknesses and grades. The subgrade, the compacted clay liner, and the low permeability composite cover soil will be surveyed at the minimum frequency of one point per 5,000 square feet. Based on the survey data, the QA Firm will verify the minimum thicknesses of the clay liner and low permeability composite cover.

The results of the QA/QC testing will be compiled into a comprehensive Construction Observation, Testing and Summary Report presenting the test results and detailing the liner and cover construction procedures for each cell. The report should be signed by a geotechnical professional. One original and two copies of the report shall be submitted to GNB Technologies, Inc.

Section 8
CONSTRUCTION QA/QC TESTING AND OBSERVATION

8.1 Quality Control\Quality Assurance - Soil Liner and Cover Components

Construction quality control of the soil liner and cover components will be the responsibility of the Contractor. The Contractor's quality control efforts to meet project specifications shall include:

- Checks that the subgrade has been properly prepared;
- Checks that only soil from approved borrow sources are used and to provide notification to QA Firm prior to switching borrow sources;
- Checks of loose lift thickness;
- Checks that a consistent application of water is used, if necessary, to provide a uniform moisture content throughout the lifts;
- Checks for consistent operation of the compactor to achieve uniform density throughout the lift; and
- Checks for desiccation of the compacted clay liner and low permeability composite cover soils.

The QA Firm will be responsible for quality assurance testing, and construction monitoring and documentation of the soil liner and cover quality assurance procedures. Further, the QA Firm will record the lift and location of all in-place density tests and be responsible for developing plan layouts of the evaluated area showing the test locations for each six-inch thickness of constructed liner.

8.2 Construction Testing - Soil Liner and Cover Components

During construction of the soil liner and cover, the QA Firm will test the in-place density and moisture content of the compacted lifts. Density will be measured using the nuclear density gauge, drive cylinder or sand cone methods. Moisture content may be determined using either the nuclear gauge, oven, direct-heating or microwave methods. Any tested area which does not meet the project specifications will require reworking and retesting until a passing condition is achieved. The QA Firm will document all test locations, elevations or lift numbers, test dates, and test results. Undisturbed samples of the compacted clay liner and cover soils will be obtained using a thin wall tube sampler for the laboratory determination of the coefficient of permeability. Voids resulting from density testing or undisturbed sampling will be filled with bentonite or a bentonite and soil mixture by the QA firm.

The minimum testing frequencies for the specific soil components are listed below.

Soil Component	Test	Frequency
Compacted Clay Liner and Cover Soil	In-place density	Minimum of 1 test per 8,000 ft^2 per 6 inches of depth of landfill liner or cover (but no less than 3 tests per each 6-inch lift) and at least one test for each day soil is compacted
	In-place moisture content	1 per density test
	Standard Proctor Moisture-Density relationship	1 per every 280,000 ft^2 per 6 inch lift (These tests may be considered pre-construction tests)
	Sieve-percent fines and gravels (Percent passing the No. 200 sieve and Percent retained on the No. 4 sieve) Liquid Limit and Plasticity Index	1 per every 56,000 ft^2 per 6 inch lift
	Undisturbed permeability	Minimum 1 per 100,000 ft^2 per 6 inch lift or major fraction thereof (a minimum of 1 test per each 6-inch lift regardless of size)

Soil Component	Test	Frequency
Granular Backfill and Drainage Material	Sieve-Full	1 every 100,000 ft^2 for drainage layers and 1 per 650 yd^3 for other uses
	Permeability	1 every 300,000 ft^2 for drainage layers and 1 per 1950 yd^3 for other uses
	Carbonate Content	1 per 2600 yd^3
Structural Fill	In-place density	Minimum of 1 test per 10,000 ft^2 per 12 inch thickness of fill (Note: Diversion berms do not require testing.)
	In-place moisture content	1 per density test

Construction testing is not required for soil materials which are not included in the proceeding table.

If ASTM D 2922(nuclear gauge) or ASTM D 2937 (drive tube) are used for testing of liner and cover components, then density test results should be verified by ASTM D 1556 (sand cone) every 20 tests. If ASTM D 3017, ASTM D 4643, ASTM D 4944 or ASTM D 4959 are used for testing of liner and cover components, then moisture content test results should be verified by ASTM D 2216 every 20 tests.

8.3 Construction Monitoring - Soil Liner and Cover Components

The QA Firm will monitor placement of compacted clay liner and cover soils at least 50% of the days that construction of these elements occur to check that proper materials and techniques are utilized. The QA firm is also required to periodically monitor the placement of the granular drainage and backfill materials, protective cover soil and topsoil. Structural fill placement will also be periodically monitored.

Each construction day the QA Firm is on-site, the QA Firm will observe and document at a minimum:

- Work area and elevation or lift;
- Soil material source;
- Loose lift thickness;

- Maximum particle size;
- Lift placement technique;
- Moisture adjustment technique;
- Compaction equipment type; and
- Verification that nuclear gauge test probe, drive cylinder, sand cone, and thin wall tube sampler voids are backfilled with bentonite or a bentonite and soil mixture.

Any observations by the QA firm that indicate soil component construction is not meeting the project specifications shall immediately be brought to the attention of the Contractor. Any discrepancy which is not corrected shall be brought to the attention of GNB Technologies, Inc.

Section 9

GEOSYNTHETICS INSTALLATION AND QA/QC PROCEDURES

9.1 Flexible Membrane Liner Installation - Liner and Cover

After completion of construction and testing of the compacted clay liner and low permeability composite soil cover, the surface to receive the FML should be smoothed by rolling with a smooth drum roller or similar piece of equipment and surveyed. The soil cover surface must then be accepted as satisfactory to receive the FML by the QA Firm and FML installer. FML rolls delivered to site should be handled in such a manner as to prevent punctures or other damage and should be stored in a dedicated area restrictive of site traffic.

Prior to installation of any FML panels, appropriate pre-construction test data for the specific material to be installed will be supplied to and approved by the QA Firm. Also, trial seams will be required each day prior to a piece of welding equipment being used and for every five hours of usage. Each welder will be required to complete a test seam prior to welding each day.

No support equipment, smoking, shoes which may damage the FML, or any other items or activities which may cause damage are permitted on the FML. Exposed edges of panels should be weighted with sand bags or other acceptable methods at the end of each day.

The FML should not be placed or seamed during inclement weather, such as high winds or rain, or if the ambient temperature exceeds 104°F. If the ambient temperature is below 41°F preheating of the FML will be needed prior to seaming. Also, all dirt, water, oil, etc. should be removed from the area to be seamed prior to seaming.

Seaming using double track fusion welding equipment and extrusion welding equipment using extrudate which is the same as the materials being welded are acceptable. Temporary welds may consist only of heated tack welds.

As much as possible, seams should be oriented parallel to the maximum slope and situated such that the number of field seams is minimized. Panel overlaps should conform to the FML manufacturer's recommendations, but the overlap should not be less than two inches. Field seaming should proceed in such a manner as to minimize the occurrence of wrinkles. Any wrinkles, folds, or fish mouths shall be repaired by cutting and fusion welding. During fold and wrinkle repairs, overlaps do not need to meet the two inch overlap requirement provided this is acceptable to the QA Firm.

9.2 Quality Control-Geosynthetics

Quality control of the installation of FML's, drainage geocomposite and filter fabrics is the responsibility of the Installer. The Installer must submit a Quality Control (QC) plan to the QA Firm for approval. The QA Firm may amend the QC Plan to provide additional information, testing and documentation as necessary. The Installer is responsible for completing all quality control activities listed in their plan. The Installer will submit all supporting quality control information to the QA Firm for review in a timely manner.

The Installer's QC Plan must address the following general procedures:

- Quality control of raw materials and manufacturing;
- Acceptance requirements for surfaces of soil components to receive FML's;
- Handling procedures;
- Deployment procedures;
- Seaming procedures;
- Procedure for non-destructively testing FML seams and criteria for passing test results;
- Procedure for tracking and reconstructing FML seams after any failing non-destructive or destructive seam strength test; and
- Repair procedures.

At a minimum, the Installer's quality control procedures should include the following tests during installation of the FML's:

- Non-destructive testing of all seams using vacuum and/or pressure testing;

- Destructive testing of seams at the minimum rate of one test per each 500 feet of seam; and

- Trial seams completed and tested for each welder each day, and for each five hours of use of each welding device.

Vacuum-box testing, applied at nominal vacuum pressure between 2 psig and 4 psig as discussed in ASTM D 4437, and/or air pressure testing on double welds are the only acceptable non-destructive testing procedures. A 27 psi minimum pressure shall be applied to 60 mil FML seams and a minimum 24 psi pressure will be applied to 40 mil FML seams. A pressure drop of 3 psi or less over a five minute period will constitute a passing test.

Destructive test results for both field and laboratory tests shall include qualitative data, including the location of the failure and the failure code. Peel tests on double-tracked fusion welds shall be performed on both inside and outside tracks.

Acceptable repair procedures include patching to repair large holes and destructive test locations, spot welding or seaming to repair small tears and pinholes, capping to repair large areas of failed seam, and extrusion welding the flap to repair poor fusion welds of limited length. Patches and caps must extend at least six inches beyond the defect, and patch and cap corners should be rounded.

9.3 Quality Assurance - Geosynthetics

Prior to installation of geosynthetic components, the QA Firm will review the Installer's QC documentation to check that the materials meet the project specifications. The QA Firm will also inspect each roll for damage and observe the storage and handling procedures employed by the Installer.

The QA Firm will check that the quality control activities relating to testing identified in the Installer's approved QC plan are performed. The QA Firm will identify areas of FML seams to be sampled for destructive testing at the minimum frequency of one per 500 linear feet of seam. The sample will be approximately three feet long and will be divided into three equal length samples. The Installer and GNB Technologies, Inc. will each receive a sample and the QA Firm will test the remaining sample for peel adhesion and shear strength according to ASTM D 4437. The QA Firm will be responsible for ensuring complete tracking of any failed destructive seam strength tests and retesting, and will be responsible for recording that the installer properly repairs test locations and reconstructs any failing seams between passing tests.

The QA Firm will be responsible for peel and shear testing of destructive samples of FML seams. Specimens will be tested for peel and shear in accordance with ASTM D 4437. Five test specimens will be used to conduct a test at each sample location. Passing test criteria include the following:

- HDPE: Shear-at least 95% of parent sheet specified minimum yield strength;
- HDPE: Peel-at least 62% of parent sheet specified minimum yield strength and must exhibit a Film Tear Bond (FTB);

Four of the five test specimens must meet the specified requirements and the average of all five tests must meet or exceed the specified requirements for the test to be considered passing.

If a failing destructive peel\shear test is recorded, additional destructive samples will be obtained a minimum distance of 10 feet to each side of the original failing test along the seam to track the path of the welding machine. This process will be repeated until passing tests bracket the area of poor seam. The seam between the two passing samples will then be reconstructed or otherwise properly repaired.

During installation of the geosynthetics, the QA Firm will observe 100% of the FML installation and will periodically monitor installation of the remaining geosynthetic components of the cover and liner systems. The QA firm will also verify that the installation, including: panel deployment, trial seams, seaming, destructive seam strength sampling, repairs, nondestructive testing, documentation, and protective cover placement proceeds in accordance with the project specifications and the approved Installer's QC plan. The QA Firm will also review the previous testing of the composite cover/liner soils, and the protective cover soils to verify they meet project specifications. Any items which do not meet the project specifications or the approved QC plan will immediately be brought to the attention of the Installer. If the deficiency is not corrected, GNB Technologies, Inc. will be notified.

The QA Firm will document activities of the Installer, overall project status and any review of Installer's quality control documentation. Field activity reports will also include the locations of destructive and non-destructive testing and test results. The QA Firm will also record the locations of major repairs, the name of each seamer, and seaming apparatus.

As the FML arrives on site the rolls will be logged in by the QA Firm. As each roll is being deployed, the QA Firm will take and record field micrometer measurements on all edges of the FML to verify the thickness of each roll. Each panel placed will be individually identified and coded for future reference. After installation and placement of the protective cover soil the QA Firm will verify the protective cover thickness based on survey data.

Section 11
POTENTIAL LINER UPLIFT

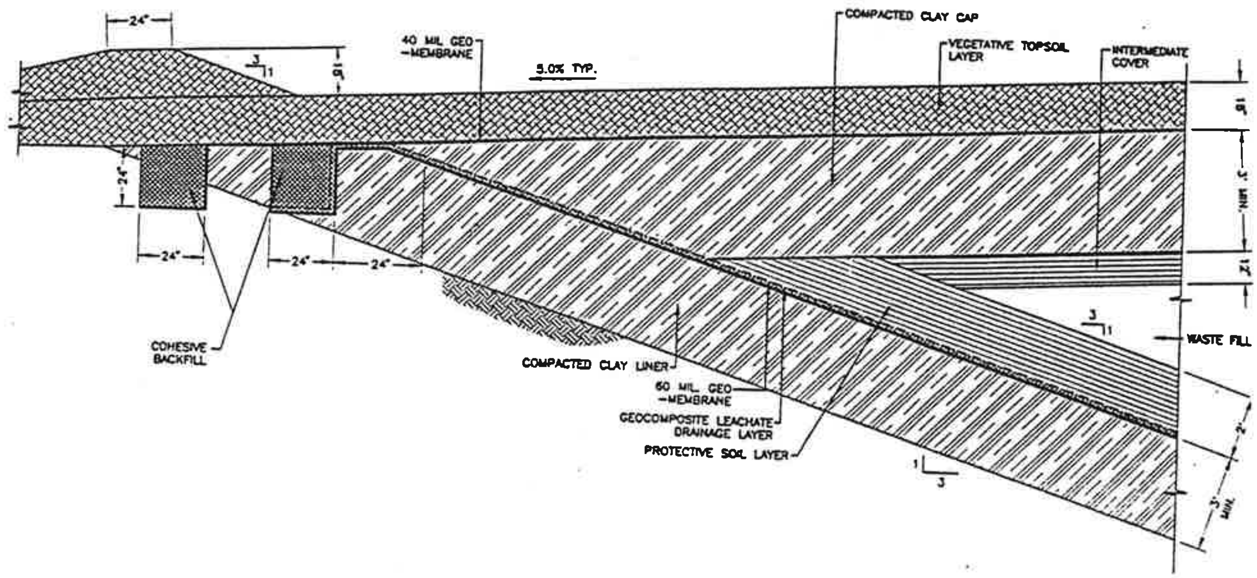
The southwest corner of the landfill may extend below the seasonal high water table. Piezometer data obtained from the project site indicates that ground water exists within transmissive soil layers and piezometer levels may approach within about five feet of the existing ground surface. Therefore, the landfill must be designed to resist uplift of the liner system due to hydrostatic pressures.

The landfill is designed to use the weight of the liner system and waste as ballast to resist uplift and provide long-term stability of the liner system. During construction, thick layers of low permeability clays underlying the landfill should retard the rate of potential heave, or uplift, such that liner construction can be completed and ballast can be placed to compensate for the hydrostatic pressure prior to any significant heaving of the liner system occurring. However, it is possible that some excavations for the landfill may penetrate saturated transmissive zones. If this occurs, dewatering well system will be installed in the transmissive stratum to relieve hydrostatic pressures. The dewatering well will be maintained until sufficient ballast has been placed to resist the hydrostatic uplift forces. Detail description of the dewatering well system is contained in Section 5 - Site Geology.

The landfill will extend as much as 20 feet below the existing ground surface. Based on the ground-water data obtained at the project site, it appears that the seasonal high water table may by located as much as 15 feet above the base of the landfill. This will result in a hydrostatic uplift pressure of about 936 psf acting on the liner system. Ballast calculations are attached that demonstrate that long term stability against hydrostatic uplift will be maintained since the thickness of the waste in the landfill will exceed the thickness needed to resist liner uplift. Unit weights of clay liner and protective cover soils were based on laboratory test results contained in Attachment 6-B.3. A conservative unit weight of 140 pcf was assumed for the waste, although actual unit weights may approach 185 pcf.

Generally, most of the landfill excavations will be underlain by low permeability clays. Test results contained in Attachment 6-B.3 indicates these clays typically possess hydraulic conductivities in the 1×10^{-8} cm/s range. Therefore, in many areas unbalanced upward hydrostatic forces will be moderated. However, other areas of the landfill bottom may be subjected to the full force of unbalanced hydrostatic forces. Since the potential for such various conditions exist, the potential for liner uplift will need to be evaluated on an area by area basis.

FIGURES



50-01518.10

NTS

FIGURE 6-B-1
LINER and COVER DETAILS

GNB TECHNOLOGIES, INC.
CLASS 2 NON-HARZARDOUS WASTE LANDFILL
FRISCO, TEXAS

JN JONES AND NEUSE, INC.
Environmental and Engineering Services

Attachment 6-B.1

LCS GEOTEXTILE/SOIL FILTER CALCULATIONS

CALCULATION SHEET

SUBJECT GNB Technologies, Inc. Geotextile Filter Calcs. SHEET 1 OF 2

DATE 8/18/95

ECT

BY

JOB NO. 50-01518.10 LOCATION Frisco, Tx

CHECKED

SUPERSEDED

APPROVED

[Reference: TNRCC Leachate Collection System Handbook (October, 1993)]

• OBJECTIVE

The geotextile must allow liquid to pass through it into the leachate collection layer (the drainage geonet), while at the same time, prevent the protective soil on the upstream side from filtering through. Three criteria must be considered:

(1) Retention Criterion
(2) Permeability Criterion
(3) Porosity Criterion

(1) RETENTION CRITERION

According to the TNRCC LCS Handbook, the protective soil must meet the following specifications:

Soil Type	Relative Density	Linear Coefficient of Uniformity, C_u'	
		$1 < C_u' < 3$	$C_u' > 3$
Loose	$I_D < 35\%$	$O_{95} < C_u' d_{50}$	$O_{95} < 9 d_{50} / C_u'$
Medium	$35\% < I_D < 65\%$	$O_{95} < 1.5 C_u' d_{50}$	$O_{95} < 13.5 d_{50} / C_u'$
Dense	$I_D > 65\%$	$O_{95} < 2.0 C_u' d_{50}$	$O_{95} < 18 d_{50} / C_u'$

• O_{95} ~ apparent opening size (AOS) of the geotextile
• d_{50} ~ diameter corresponding to 50% finer in the particle-size distribution curve
• $C_u' = \sqrt{d_{100}/d_0}$

The protective soil must meet the specifications for d_{50} and C_u' values based on the selected geotextile and its AOS.

[Reference: Giroud's Retention Criterion]

CALCULATION SHEET

SUBJECT GMB Geotext. Filter Calcs. SHEET 2 OF 2
DATE 8/18/95
,ECT BY MJ
JOB NO. 50-01518.10 LOCATION Frisco, Tx CHECKED
SUPERSEDED APPROVED

(2) PERMEABILITY CRITERION

Based on a selected geotextile, the hydraulic conductivity of the geotextile can be derived using the geotextiles permittivity:

$k = \Psi_{ult} t$

k ~ hydraulic conductivity of geotextile
Ψ_{ult} ~ permittivity of geotextile
t ~ thickness of geotextile

To determine the allowable k, the following equation is used:

$$\Psi_{allow} = \Psi_{ult} \left[\frac{1}{FS_{cb}\, FS_{cr}\, FS_{i}\, FS_{cc}\, FS_{bl}} \right]$$

$\Rightarrow k = \Psi_{allow} t$

FS_{cb} ~ factor of safety for soil clogging and binding = 3.0
FS_{cr} ~ factor of safety for creep reduction = 1.75
FS_{i} ~ factor of safety adjacent materials intruding void space = 1.1
FS_{cc} ~ factor of safety for chemical clogging = 1.35
FS_{bl} ~ factor of safety for biological clogging = 2.25

$\therefore k = 0.106\, \Psi_{ult} t$

The k of the geotextile must be greater than the k of the soil

$\Rightarrow k_{geotextile} > k_{soil}$

[Reference: Koerner, Designing With Geosynthetics 2nd E

(3) CLOGGING CRITERION

To ensure that the geotextile has a large number of openings so that the blocking of a few openings will not significantly impair the performance of the filter, the following specifications for geotextile porosity are recommende

- nonwovens : porosity > 30 % ; - wovens : porosity > 4 %

According to Koerner, typical porosities for nonwovens range from 50 to 95 %, well above the suggested minimum of 30 %.

Attachment 6-B.2

UPLIFT CALCULATIONS

CALCULATION SHEET

SUBJECT UPLIFT RESISTANCE - BALLAST

SHEET 1 OF 1

DATE 8-18-95

PROJECT GNB LANDFILL

BY Dan Anderson

JOB NO. 50-01518.10 LOCATION Frisco, TX

CHECKED

SUPERSEDED

APPROVED

CHECK THICKNESS OF WASTE TO USE AS BALLAST TO RESIST HYDROSTATIC UPLIFT PRESSURE

MAX LANDFILL EXCAVATION DEPTH ~ 20'
MAX HT. OF PIEZOMETRIC SURFACE ~ 5' BELOW GROUND SURFACE

UPLIFT PRESSURE = 15' x 62.4 pcf = 936 psf

USE LINER & PROTECTIVE COVER AS BALLAST, $\gamma = 116$

5' x 116 pcf = 580 psf

∴ FOR $FS_{UPLIFT} = 1.2$ NEED 936 x 1.2 = 1123 psf RESISTANCE

CALCULATE WASTE (γ = 140 pcf) NEEDED FOR BALLAST

1123 - 580 = 543

543 ÷ 140 pcf = 3.8', SAY 4' OF WASTE NEEDED

LANDFILL BOTTOM WILL RECEIVE MORE THAN 4' OF WASTE IN ALL LOCATIONS
∴ HYDROSTATIC PRESSURE WILL BE RESISTED

Section 7

LANDFILL OPERATIONS PLAN

STATE OF TEXAS
MARY B. ADRIAN
64338
REGISTERED
PROFESSIONAL ENGINEER

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Senior Project Engineer

9/1/95

Section 7
LANDFILL OPERATIONS PLAN

The Landfill Operations Plan was developed to provide for general operation and maintenance of the landfill, as well as ground-water monitoring, leachate monitoring and management, and stormwater management. This plan addresses all items identified in the TNRCC's Technical Guideline No. 3 under Operating Methods/Considerations. The Ground-Water Monitoring Plan for the Class II landfill is presented in Section 8 and GNB Technology, Inc.'s Emergency Contingency Plan for the Frisco facility is presented in Appendix 7-A.

7.1 General Operations

After stabilization of the waste in the Slag Treatment Building, an enclosed truck will haul the waste to the Class II landfill. The waste is then dumped by the truck into the currently active cell. The waste quickly hardens (within hours) and becomes like concrete. The waste is unlikely to produce any leachate, however, the landfill is conservatively designed with a leachate collection system.

The equipment listed below will be available at the facility for routine operation and maintenance. This list represents the minimum equipment which will normally be at the site. Additional or substitute units of equipment may be provided to enhance site operation.

Following is a list of routine equipment available at the GNB facility, which can be utilized at the landfill, as needed:

____

____

____

7.2 Supervision

Landfill operations will occur on-site and will be under the supervision of the facility's environmental engineer. Experienced and properly trained staff will be involved in the stabilization, transportation and landfilling of the slag waste.

7.3 Operating Records

GNB will maintain the records for the landfill at the facility's office. This operating record will contain a copy of this notification, including all design information, records of maintenance resulting from inspections, and ground-water sampling and analytical data (for the landfill unit). GNB will maintain the operating record during the active life of the landfill and through the post-closure care period.

7.4 On-Site Roads

The Class II waste will be transported from the Slag Treatment Building to the landfill. The area of the facility where the landfill is located will be accessed via Fifth Street, which is currently a public road. Fifth Street is being relocated and is under construction at the present time. After the street relocation is completed, the section of Fifth Street used to transport the waste will be owned by GNB. If the City of Frisco removes the road, GNB will provide alternate access. There will be an all-weather access road from Fifth Street to the landfill location, as presented on Attachment 4 to Section 6, and described in the Engineering Design and Specifications Section.

7.5 Treatment or Stabilization of Free Liquids

The composition of the waste to be disposed in the Class II landfill is described in detail in Section 2. Waste management practices are described in Section 3.

7.6 Compaction

Due to the fact that the waste is stabilized/fixated prior to placement in the landfill and the fact that the waste quickly hardens to a cement-like substance, compaction of the waste is not necessary or appropriate at this landfill.

7.7 Working Face

The size of the working face will be minimized to the extent possible. The sequence of fill for the landfill results in a maximum working face of ____. The design calculations and drawings for the landfill are presented in the Engineering Design and Specifications Section. No daily cover will be utilized because waste is not subject to vectors or odors.

7.8 Blowing Debris

The waste to be disposed in the Class II landfill is stabilized lead slag. The waste is "concrete-like", and the consistency of the stabilized waste eliminates any concern regarding blowing debris.

7.9 Wet Weather Operations and Water Management

The facility will construct an all-weather road from Fifth Street to the landfill location. This will allow landfilling operations to continue during periods of wet weather.

The facility will install and maintain temporary stormwater berms in the bottom of the active cell as described in the Engineering Design Section. These berms will separate stormwater which has contacted the waste from uncontaminated stormwater in the bottom of the cell. The height of this berm will be approximately seven feet. The berm will be sized and located correctly so that it contains the 25-year, 24-hour storm. Facility personnel will place and operate the portable pump which will pump the uncontaminated stormwater out of the cell for discharge.

Ponded contaminated stormwater will be removed to contaminated water storage, or will infiltrate through the protective soil or waste upon which it is ponded and removed through the leachate collection system.

The facility's Stormwater Management Plan is provided in Appendix 7-B to this report.

7.10 Inspections and Maintenance

To assure the safe and proper operation of the facility during its projected active life, inspection and maintenance programs will be implemented.

Facility components will be inspected for malfunctions, deterioration, and other conditions which may lead to the release of wastes. The inspections will be performed according to the tasks and schedule presented in Table 7-1. The schedule will be followed during the active life of the landfill and a record of all inspections and maintenance will be maintained by the facility.

Remedial actions will be performed to correct any situation which presents imminent danger to the environment or human health. The general procedures for inspection and maintenance will be as follows:

1. The assigned inspector completes the inspection and records the results, including any maintenance performed during the inspection and any further maintenance actions that may be required;

2. The facility manager reviews the inspection results and directs any additional maintenance;

3. Upon completion of the required maintenance, the inspector verifies the adequacy of the maintenance by conducting a follow-up inspection; and

4. The inspector records the date that maintenance was completed on the original inspection log. The inspection log will then be placed in the operating record for the landfill.

The following paragraphs identify inspection and maintenance procedures for each facility component.

Components of the drainage control system to be inspected and maintained consist primarily of the run-on and run-off drainage control systems. The run-on control system consists of a series of temporary berms around the active cell and active disposal area which help to minimize the stormwater from contacting the waste. The run-off control system includes drainage facilities required to control stormwater run-off from the non-active areas of the landfill and from landfill areas which have reached planned elevations and have had the final cover system constructed. The active disposal area of the landfill will be separated from adjacent areas by temporary berms that will be constructed of clay rich soils to prevent uncontaminated stormwater from coming into contact with the waste.

Stormwater run-off from areas surrounding the working face which have received intermediate or final cover will be handled as uncontaminated stormwater and discharged under the facility's stormwater discharge permit. The stormwater run-off from constructed cells which have not received waste will also be discharged under the facility's stormwater discharge permit as uncontaminated stormwater. Run-off from portions of active cells or the working face will be collected as contaminated stormwater and will be transported to the stormwater pond, and may subsequently be used as process water, depending on constituent levels.

Run-off and run-on controls inside the landfill units will be inspected quarterly and after storms. Run-off controls on the final cover system and outside the landfill units will be inspected after storms. The condition of drainage channels, waste containment berms, and portable pumps are among the items to be inspected.

Damage observed during inspections of the drainage areas will be repaired and will be kept clear and free flowing. Any ponded water due to settlement will be corrected by filling to the established grade and compacting the fill as required to establish proper flow line elevations. Debris blocking culverts will be removed upon discovery. Significant erosion will be repaired by filling with topsoil and seeding as conditions warrant.

The leachate collection system (LCS) components to be inspected include the buried collection laterals and the mains overlying the landfill liner system. Dedicated sumps, each equipped with a submersible pump, will collect and store leachate prior to their transfer via forcemain to the leachate storage tanks. The leachate collection system will function for all landfill cells which have received waste.

The LCS for each cell will be inspected quarterly during the active life of the facility. For active cells which have not received final cover, inspections will be quarterly and after storms. For cells which have the final cover system installed, inspections will be quarterly during the active life of the landfill. Items to be inspected include the leachate level in the sump, whether the sump pump is still operational, and that the leachate sump access riser and above-ground valves and appurtenances on the forcemain are operational.

Leachate will be pumped from each sump automatically as each sump becomes full. If it appears that the leachate collection pipe in a cell is becoming blocked, as indicated by a reduced volume of leachate collected versus historical operating records, corrective action will be taken. Pipe blockage can be removed by a variety of methods including jetting, flushing and chemical methods. Any pumps found to be inoperative will be repaired or replaced. Any significant damage to the leachate collection system will be evaluated by an independent Texas Registered Professional Engineer.

The Final Cover System will be constructed over those areas of the landfill in which waste has been placed to final grades and elevations. During the active life of the facility, areas of the landfill over which final cover has been constructed will be inspected quarterly for erosion, ponded water, barren areas, and settlement.

Grass growth in the vegetated topsoil layer will be mowed as needed to aid in grass seeding and to prevent the growth of large vegetation. Erosion, gullies, and areas subjected to ponding will be repaired by filling with topsoil. These filled areas, as well as other bare spots, will be reseeded and fertilized as necessary to promote vegetative growth.

Damage to the cover system caused by minor settlement will be repaired by filling with topsoil and applying the appropriate seed/fertilizer mix. Any evidence of major settlement of the cover system will be evaluated by an independent Texas Registered Professional Engineer and the appropriate corrective measures will be implemented.

Equipment at the leachate storage tank sites will include monitoring equipment, piping, valves, and a secondary containment system. Quarterly inspections of liquid levels in the tanks and monitoring equipment will be conducted. The exteriors of all tanks will be inspected quarterly for evidence of corrosion, damage and leakage. Damage and deterioration of the secondary containment system and the existence of stained soil or other indications of spills or leaks will also be checked on a quarterly basis. The condition and operation of all piping and pumps will be inspected quarterly.

Leachate tanks, pumps, and associated piping will be maintained in good working order. Pumps will be given regular maintenance as recommended by the manufacturer. Tanks found to be leaking will be taken out of service and repaired or replaced. Piping will be maintained in a leak free condition.

7.11 Landfill Cover

Clean soil from the landfill excavation will be used as intermediate cover, as needed. No daily cover will be used at the site since the waste is not subject to being wind-blown or an attraction for vectors.

All areas that have received waste, but will be inactive for longer than 180 days, may receive intermediate cover, at the discretion of the facility manager. If the facility manager determines that intermediate cover is needed, it will be graded to channel stormwater to the stormwater discharge system, and away from the working face of the landfill where it could be contaminated.

The intermediate cover, if used, will be inspected on a quarterly basis by the facility personnel for the erosional effects of rainfall. Any erosion will be promptly repaired and preventive measures will be initiated as needed. Preventive measures may include seeding or temporary erosion matting.

The facility manager will determine the timing for the initiation of the placement of final cover. It is anticipated that the final cover system will be installed by private contractors in accordance with approved plans and specifications. An engineer registered in the State of Texas will certify the installation in accordance with the Closure and Post-Closure Plan. The Final Cover will consist of the following components:

- 18 inches of vegetative topsoil;
- 40 mil geomembrane; and
- Three feet of compacted clay with a maximum permeability of 1 x 10^{-5} cm/sec.

Table 7-1

Inspection Tasks and Schedule

Facility Components		Type Inspection	Frequency
1.	**Drainage Control System**		
	Runon Controls inside LF units	Visual	Quarterly and Following Storms
	Runoff Controls inside LF units	Visual	Quarterly and Following Storms
	Runoff Controls on LF final cover	Visual	Following Storms
	Runoff Controls outside LF units	Visual	Following Storms
	Portable Pump Operation	Visual	Following Storms
2.	**Leachate Collection System**		
	Sump Levels	Visual	Quarterly and Following Storms
	Sump Riser	Visual	Quarterly and Following Storms
	Forcemain Piping and Appurtenances	Visual	Quarterly and Following Storms
3.	**Final Cover System**		
	Erosion	Visual	Quarterly
	Ponding	Visual	Quarterly
	Vegetation	Visual	Quarterly
	Settlement	Visual	Quarterly
4.	**Leachate Storage Tanks**		
	Tank Liquid Levels	Visual	Quarterly
	Monitoring Equipment	Visual	Quarterly
	External Leakage from Tanks	Visual	Quarterly
	Secondary Containment	Visual	Quarterly
	Stained Soil on Adjacent Areas	Visual	Quarterly
	Pumps, Piping	Visual, Test	Quarterly
5.	**General Facility Components**		
	Roads	Visual	Quarterly
	Gate, Locks, Fences, Signs	Visual	Quarterly
	Vehicles	Visual, Test	Prior to Use

ANALYTICAL RESULTS FOR WASTE TREATED USING RMT TECHNOLOGY

Appendix 7-A

GNB EMERGENCY CONTINGENCY PLAN

GNB™

FRISCO, TEXAS

EMERGENCY CONTINGENCY PLAN

MAY, 1994

DATE ISSUED	April 1, 1984
TEXAS REGISTRATION #	30516
EPA ID #	TXD006451090
LAST REVISION	May 1993

Frisco, Texas

HAZARDOUS WASTE MANAGEMENT PLAN

EMERGENCY CONTINGENCY PLAN

AUTHORIZED EMERGENCY RESPONSE COORDINATORS

Persons authorized to act as Emergency Response Coordinators and the order in which they are to be contacted are:

NAME	TITLE	PHONE # PLANT	PHONE # HOME
Larry G. Eagan	Plant Manager	21	214/540-2023
Carlos Liscano	Assistent Plant Manager	20	214/377-3497
Sam Kirchner	Oxide Superintendent	31	214/377-2877
Ed Davis	Maint. Superintendent	28	214/377-9488
Billy King	Production Manager	22	214/317-8947
James Messer	Manager Environmental and Quality Control	23	214/335-0219
Al Whitsell	Safety Supervisor	32	214/335-2494

AUTHORIZED SHIFT SUPERINTENDENTS

Persons authorized to act as Shift Superintendent to be contacted in emergencies are:

NAME	TITLE	PHONE # PLANT	# HOME
Domingo Elizondo	General Forman	27	214/377-4001
Edward Salazar	Shift Leadman	27	214/370-1591
Robert Garcia	Shift Leadman	27	214/548-1908
Ricky Gutierrez	Shift Leadman	27	214/377-2526
Ramon Rodriguez	Shift Leadman	27	214/377-9687
Louis SanMiguel	Refinery Leadman	27	214/347-2508
Wendell Carlile	Environmental Forman	23	817/686-2936

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Frisco, Texas

HAZARDOUS WASTE MANAGEMENT PLAN

EMERGENCY CONTINGENCY PLAN

I.1 SCOPE

This plan defines the actions to be taken in the event of any emergency within the operation of, or at the Hazardous Waste Management site.

The provisions of this plan must be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment.

The contents of this plan and its use will be part of each operator's training session and each emergency response coordinator's training session.

This plan is within the scope and parameters of the Texas Department of Water Resources (TDWR) Regulations for Industrial Solid Waste Rules, TAC 335.151 - 335.157, for CONTINGENCY PLAN AND EMERGENCY PROCEDURES.

I.2 RESPONSIBILITY FOR COMPLIANCE

Responsibility for compliance with the contents of this plan, and responsibility for its use will be maintained and controlled by the Manager of the Hazardous Waste Management Plan, or the acting Manager of the Hazardous Waste Management Plan, as designated by the plant manager.

I.3 POSTING

A copy of this plan must be maintained and posted at the following locations.

Office of the Manager of the Hazardous Waste Management Plan for this site.

Smelter Lunch Room

Oxide Lunch Room

In addition, a copy must be maintained at the office and home of each of the emergency response coordinators. Responsibility for compliance with this requirement will be assigned by the plant manager.

Frisco, Texas

HAZARDOUS WASTE MANAGEMENT PLAN

EMERGENCY CONTINGENCY PLAN

I.4 NOTIFICATION

In general, no notification to agencies is required as part of this plan.

However, it is required that arrangements for responding to an emergency be made, (or attempted to be made) with local police departments, fire departments, hospitals, contractors, and state and local emergency response teams. Record of providing (or attempting to provide) arrangements is maintained with the master copy of this plan at the waste management site.

I.5 DISTRIBUTION OF PLAN

Two copies of this plan have been provided to each of the Emergency Response Coordinators.

A copy of this plan is available for reference at each location as noted in POSTING.

A copy of this plan is required as a reference attachment to the submittal of this plan to several agencies as noted in Section I.4, NOTIFICATION.

Additionally, by choice of GNB, and while not admitting to any regulatory requirements, nor setting any precedent for continued distribution, a copy of this plan may be distributed to selected agencies.

Additionally, copies of all, or selected sections, of this plan may by furnished as the procedural authority to persons performing services to GNB. Such furnishing of information contained herein, by definition of this statement, does not constitute a distribution of this plan.

Likewise, it is required that each time this plan is significantly amended, new documentation attesting to distribution of the change must be maintained.

Copy of the distribution/submittal letters and written response is maintained with the master copy of this plan at the site.

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I.6 AMENDMENT TO PLAN

A. GNB Incorporated reserves the right to amend this plan by change, or by addition, or by deletion whenever so desired.

B. The record of the current documents, and the record of the amendments is maintained with the master copy of this plan at the waste management site.

C. The plan must be reviewed and/or amended yearly, or anytime conditions of the waste management site change such that this plan would be significantly affected.

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II.1 QUALIFICATIONS FOR THE EMERGENCY RESPONSE COORDINATOR

The Emergency Response Coordinator must be thoroughly familiar with all aspects of the facilities operation, functions of equipment, materials of construction for the facility, materials used in manufacturing and manufacturing processes, the location of and characteristics of the wastes handled, the location of all records within the site, the layout of the site; and be thoroughly familiar with all aspects of this plan.

In addition, the Emergency Response Coordinator must know how, and must have the authority, to commit the resources needed to carry out the responses required.

It is a requirement of this plan, and of the regulatory agencies that at least one of the individuals listed as Emergency Response Coordinators be either on the facility premise or on call at all times. (On call is defined as reachable and able to arrive at the waste management site within a short period of time.) Coordination of this requirement will be controlled by the plant manager.

II.2 PLAN IMPLEMENTATION

This manual must complement, but must not be superseded by , all other GNB manuals and specifications for response to emergency situations involving hazardous waste or hazardous material.

The procedures of this manual must be implemented:

Each time an event associated with hazardous material or hazardous waste presents a possible danger to human health or the environment.

Situation that occur entirely within the manufacturing plant, and where the situation is totally contained without the danger to personnel or to the environment, do not require the formal implementation of the Emergency Contingency Plan. However, this does not prevent the use of the procedures in this plan whenever they are appropriate.

The following paragraphs specify the procedures the owner or operator intends to use to respond to tank spills or leakage, including procedures and timing for expeditious removal of leaked or spilled waste and repair of the tank(s).

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Leaks/ruptures/discharges/fires/incidents/etc. involving a hazardous waste unit will be evaluated by the operator (or person finding the situation) at the time of the discovery. The operator shall make no attempt to correct the situation while alone.

The operator shall contact the appropriate Shift Superintendent or in his absence, call the Emergency Coordinator; report the emergency, and request a maintenance man (or crew) to report immediately to the site of the incident. Upon arrival of the maintenance man (or crew), appropriate action should be taken to terminate the contributing source, and to clean up any spills.

The Shift Superintendent (or in his absence, the operator) shall then immediately contact the Emergency Coordinator for further instructions. Unless specifically advised by the Emergency Coordinator, do not wait for the coordinator to arrive before beginning appropriate actions.

Whenever there is an imminent or actual emergency situation, the emergency coordinator (or his designee when the emergency coordinator is on call) will immediately notify the appropriate State and/or local agencies having designated response roles if their help is needed.

The appropriate agencies will be notified by telephone:

See Table B.2

A. Whenever there is a release, fire, or explosion, the emergency coordinator is responsible for ensuring that the character, exact source, amount, and extent of any released material is Immediately Identified. Indicated below are the procedures which accomplish this task.

Observation

Review of facility records

Chemical analysis, if sufficient time is available.

B. Whenever there is a release, fire, or explosion the emergency coordinator immediately assesses possible hazards to human health and/or the environment that may result from the release, fire, or explosion. This assessment considers both direct and indirect effects of the release, fire, or explosion and includes consideration of any effects of any toxic, irritating or asphyxiating gases that are generated, and the effects of any hazardous surface water runoffs from water or chemical agents used to control fire and heat-induced explosions. The following paragraphs describe the principle hazardous wastes likely to be involved in an environmental incident at the facility. The description summarizes the possible direct and indirect effects of each material on human health and the environment, and is included here to aid the emergency coordinator in his/her assessment. **Sub-Appendix E lists suggested procedural guidelines for responding to specific situations.**

This plan shall be executed for emergency events associated with hazardous materials or hazardous waste units involving any possible danger to personnel, equipment or the environment.

This plan shall be executed for any event involving hazardous waste tank leaks or overflows, hazardous waste transfer line breaks, sewer line overflows, (involving hazardous waste), acid tank overflows, acid tank ruptures, non-ordinary manufacturing procedures that will deliver non-ordinary flows to the waste treatment facility.

This plan shall be executed for any event involving lead oxide tank leaks, storage tank overflows, transfer line breaks, discharges from loading or unloading operations, discharges from transport vehicles, major lead oxide spills, dust collector fires, non-compliance dust collector discharges, non-ordinary manufacturing events or procedures that will release non-ordinary or unauthorized discharges to the air, soil or water.

NOTE: Situations that occur entirely within the manufacturing facility, and where the situation is totally contained without any danger to personnel or to the environment, do not require the formal implementation of the Contingency Plan.

C. If the emergency coordinator determines that the facility has had a release fire or explosion which could threaten human health or the environment outside the facility, he will immediately notify appropriate local authorities. He will also be available to help appropriate officials decide whether local areas should be evacuated. The appropriate local authorities will be notified by telephone.

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D. If the emergency coordinator determines that the facility has had a release, fire, explosion which could threaten human health or the environment outside the facility, he will immediately notify the TNRCC District Supervisor 214/298-6171 or 214/780-0799 according to the procedures set out in Section 007 of the State of Texas Oil and Hazardous Substances Spill Contingency Plan, Revised October 1981. The report will include:

(i) Name and telephone number of reporter;

(ii) Name and address of facility;

(iii) Time and type of incident (e.g., release fire);

(iv) Name and quantity of material(s) involved, to the extent known;

(v) The extent of injuries if any; and

(vi) The possible hazards to human health, or the environment, outside the facility.

When warranted, the owner or operator will also notify the National Response Center at 1-800/424-8802.

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TABLE B.2

EMERGENCY AGENCY CONTACTS

Agency or Discipline	Contact	Phone
Frisco Fire Dept. City of Frisco 414 Oak Street Frisco, TX 75034	Dispatcher	911 or 377-2667
Frisco Police Dept. City of Frisco McKinney St. Frisco, TX 75034	Dispatcher	911 or 377-9511
North Texas Medical Center Attn: Emergency Department 1800 N. Graves Street McKinney, TX 75069	Emergency	548-3000
Frisco Medical & Surgical Center Crestview Professional Center 1103 East Main Street Frisco, TX 75034	Dr. V. Davis Dr. E. Pink	24 hr. 347-2220 377-2447 (wk) 377-2949 (home)
Emergency Dispatching 414 Oak Street Frisco, TX 75034	Emergency	911
Frisco South Sewer Plant North Texas Municipal Water District P.O. Drawer C Wylie, Texas 75098		377-3918 214-442-5405
Texas Water Commission 24 Hour Emergency Number Answering Service (nights and weekends)		512/463-7727
Strawn Rentals Pumps, Loaders, Tools Compressors, & other Equip.	Wes Haynes	214-335-0011 (home)214-625-3624

TABLE B.2 (cont'd)

EMERGENCY AGENCY CONTACTS

Agency or Discipline	Contact	Phone
Texas Water Commission District 4 Supervisor 203 James Collins Boulevard Duncanville, TX 75116	Charles D. Gill	214/298-6171 or 214/780-0799
Environmental Protection Agency -- Region VI (Federal) (Dallas Office) 1445 Ross Avenue Dallas, TX 75270		
Office		214/655-2270
Emergency Response Number (24 hrs)		214/655-2222
National Response Number (24 hrs)		800/424-8802
Emergency Contact CHEMTREC		800/424-9300
OHM CORPORATION		800/537-9540

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EMERGENCY CONTINGENCY PLAN

E. During an emergency, the emergency coordinator will take all reasonable measures necessary to ensure that fires, explosions and releases do not occur, recur, or spread to other hazardous waste at the facility.

These measures include:

Stopping processes and operations
Collecting and containing released waste
Removing or isolating containers

F. If the facility (or a portion of the facility) stops operation in response to a fire, explosion or release, the emergency coordinator will monitor for the following:

Leaks

Pressure Build-up

Ruptures in:

Pipes and tanks

G. Described below are the actions the emergency coordinator would take to, immediately after an emergency, provide for storing, processing or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

All residues including soil-like materials, sludges or other solids will be placed in closed-top 55 gallon drums and stored in the Battery Storage Area. Representative samples of each material will be collected and analyzed for appropriate hazardous waste characteristics including TCLP Toxicity. Those wastes which do not exhibit any hazardous waste characteristics will be disposed of at a municipal landfill. Those wastes which exhibit one or more hazardous waste characteristics will be manifested, transported and disposed of in an approved secure landfill.

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H. The emergency coordinator is responsible for ensuring that the areas affected by an environmental incident are properly secured. The following procedures are employed to ensure that waste which may be incompatible with the released material will not be stored, processed or disposed of until cleanup procedures are completed:

Not applicable. There are no incompatible wastes at this facility. Therefore, in the event of a release, procedures to segregate materials are not required.

I. The emergency coordinator will ensure that, in the affected areas of the facility all emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed. The following paragraph describes the procedures employed to decontaminate affected emergency equipment. The description also includes a commitment to replace any needed equipment or supplies which cannot be reused.

All emergency equipment which comes in contact with hazardous waste constituents during the implementation of the contingency plan will be triple rinsed. All rinse water from decontamination of equipment will flow to the wastewater collection and treatment system for treatment prior to discharge. Any equipment item which cannot be reused will be replaced.

J. The owner or operator will notify the Executive Director and the TWC District Office that the facility is in compliance with Subsection II.c.1.m. before operations resume in the affected areas. 512/463-7830 and 214/298-6171

K. The owner or operator will note in the facility's operating record the time, date, and details of any incident that requires implementation of this contingency plan. Within 15 days after the incident, the owner or operator will submit a written report on the incident to the Executive Director and the District Office. The report will include:

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(i) Name, address and telephone number of the owner or operator;

(ii) Name, address, and telephone number of the facility;

(iii) Date, time, and type of incident (e.g., fire, explosion);

(iv) Name and quantity of material(s) involved;

(v) the extent of injuries, if any;

(vi) An assessment of actual or potential hazards to human health or the environment, where this is applicable; and

(vii) Estimated quantity and disposition of recovered material that resulted from the incident.

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GNB requests a waiver of all requirements specified in 40 CFR Part 264, Subpart C as follows:

- o Required Equipment
  - Internal Communications
  - External Communications
  - Fire Control Water

- o Required Aisle Space

- o Arrangements with Local Authorities

The basis for the request for a waiver is the nature of the hazards posed by the spent lead-acid batteries and the lead-acid battery scrap material. Each of these wastes exhibits primarily the characteristic of EP Toxicity due to lead. The wastes are inert solids and are not volatile or flammable. The battery acid (corrosivity, D002) is collected and treated in an on-site pretreatment system. The hazards posed by the characteristic of TCLP Toxicity and corrosivity clearly do not warrant the particular kinds of equipment, aisle space and arrangements specified in 40 CFR Part 264.32 through 264.37.

Emergency Coordinator's List

Persons qualified to act as emergency coordinator are listed below. The alternates are listed in the order in which they will assume responsibility. The emergency coordinator will be on the facility premises or on call (i.e., available to respond to an emergency by reaching the facility within a short period of time), with the responsibility for coordinating all emergency response measures. The emergency coordinator is thoroughly familiar with all aspects of the facility's contingency plan, all hazardous waste operations and activities at the facility, the location and characteristics of hazardous waste handled, the location of all hazardous waste records within the facility, and the facility layout. In addition, this person has the authority to commit the resources needed to carry out the contingency plan.

DATE ISSUED April 1, 1984
TEXAS REGISTRATION # 30516
EPA ID # TXD006451090
LAST REVISION May 1993

Frisco, Texas

HAZARDOUS WASTE MANAGEMENT PLAN

EMERGENCY CONTINGENCY PLAN

Emergency Coordinator's List

Name	Address	Office Phone(s) and/or pager	Home Phone(s)
Primary:			
Larry G. Eagan Plant Manger	1414 Lakewood Dr. McKinney, Tx. 75070	214/335-2121	214/540-2023
Alternates:			
Carlos Liscano Assistant Plant Manger	9131 Meadocrest Rd Frisco, TX 75034	214/335-2121	214-335-3497
Sam Kirchner Oxide Superintendent	312 Witt Lane Little Elm, TX 75034	(Same)	214-335-2877
Ed Davis Maintenance Superintendent	7981 Meadowbrook Rd Frisco, TX 75034	(Same)	214-377-9488
Billy King Production Manager	1891 Cliffview Lewisville, TX 75067	(Same)	214-317-8947
Al Whitsell Safty Supervisor	9020 Bison Trail Frisco, Tx 75034	(Same)	214-335-2494
James A. Messer Manager Environmental and Quality Control	8380 Christie Dr. Frisco, Tx 75034	(Same)	214-335-0219

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Frisco, Texas

HAZARDOUS WASTE MANAGEMENT PLAN

EMERGENCY CONTINGENCY PLAN

Emergency Equipment List

Included below is a list of all types of emergency equipment at the facility [such as fire-extinguishing systems, spill-control equipment, communications and alarm systems (internal and external), and decontamination equipment], if this equipment is required. The list includes the location and a physical description of each item on the list, and a brief outline of its capabilities.

TABLE B.3
EMERGENCY EQUIPMENT LIST

EQUIP. MAKE/MODEL	EQUIP. TYPE	LOCATION IN PLANT
Emergency lights	Built in	Reverb, Blast, OXIDE plant
Waldon 8500lb.	Front end loader	Blast furnace
Caterpillar 910	Front end loader	Reverbatory Furnace
Caterpillar 916	Front end loader	Yard Loader
Caterpillar 926	Front end loader	Material Storage Building
Caterpillar 6000lb.	Fork Lift	Blast Furnace
Caterpillar 6000lb.	Fork Lift	Reverbatory Furnace
Caterpillar 5000lb.	Fork Lift elec.	Shipping & Receiving
Caterpillar 6000lb.	Fork Lift	Battery Breaker
Caterpillar 5000lb.	Fork Lift w/Rotator	Refinery
Caterpillar 5000lb.	Fork Lift w/Rotator	Materials Storage Build
Caterpillar 4000lb.	Fork Lift w/Rotator	Maintenance Shop
Clark 4000lb.	Electric Fork Lift	Casting Dept.

Frisco, Texas

HAZARDOUS WASTE MANAGEMENT PLAN

EMERGENCY CONTINGENCY PLAN

TABLE B.3 (Cont'd.)
EMERGENCY EQUIPMENT LIST

EQUIP. MAKE/MODEL	EQUIP. TYPE	LOCATION IN PLANT
2 Caterpillar 5000lb.	Electric Fork Lift	Oxide Plant
International Truck	80,000lb. Tractor Trailer	Parking Area
MACK Truck	80,000lb. Tractor Trailer	Parking Area
1 Power Boss	Floor Scrubber	Maintenance Shop
1 Tennent Model 95	Sweeper	Maintenance Shop
1 Tennent Model 280	Sweeper	Maintenance Shop
Ford Pick-up Truck	3/4 ton Pickup	Parking Area
White 2-35 Tractor	Yard Tractor	Parking Area
Mobil Man Lift		Maintenance Shop
Portable Welder	400 Amp Welder	Maintenance Shop
5 Movable Welders	2-400 Amp, 1-350 Amp, 1-300 Amp, 1 MIG	Maintenance Shop
Cutting Torches	Portable	Maintenance Shop
Pallet Jack		Maintenance Shop
Oil Absorbent Booms		Rainwater Pond
Floor Dry	Oil Absorbent	Maintenance Shop
Hydrated Lime	50 lb. Bags	Refinery

Frisco, Texas

HAZARDOUS WASTE MANAGEMENT PLAN

EMERGENCY CONTINGENCY PLAN

TABLE B.3 (Cont'd.)
EMERGENCY EQUIPMENT LIST

EQUIP. MAKE/MODEL	EQUIP. TYPE	LOCATION IN PLANT
Sodium Carbonate	Bulk	Water Treatment
Safety Wearing Apparel	Gloves, Respirators, Aprons, First Aid, Boots, Safety Glasses, and Face Shields	Laboratory, and Lunch Room
Mobil Phone		Company Van
ChemTox	Chemical Data Base	Laboratory Office

DATE ISSUED April 1, 1984
TEXAS REGISTRATION # 30516
EPA ID # TXD006451090
LAST REVISION May 1993

Frisco, Texas

HAZARDOUS WASTE MANAGEMENT PLAN

EMERGENCY CONTINGENCY PLAN

III.1 EVACUATION PLAN

This contingency plan includes an evacuation plan for facility personnel where there is a possibility that evacuation could be necessary. The following paragraphs describe signals to be used to begin evacuation, evacuation routes, and alternate evacuation routes (in cases where the primary routes could be blocked by releases of hazardous waste or fires).

A. Any evacuation of the hazardous waste site will be by the normal emergency evacuation procedures as posted within the building. Should an evacuation be necessary, each department evacuated will perform a head count at the traffic circle in front of the facility office. See Figure 1 of this plan.

B. Any evacuation of the main manufacturing building will be by the normal emergency evacuation routes and procedures as posted within the building. Should an evacuation be necessary, each department evacuated will perform a head count at the traffic circle in front of the facility office. See Figure 2 and Figure 3 of this plan.

C. Any evacuation of the surrounding properties will be coordinated with the local fire and police departments.

Preparedness and Prevention Waiver Request

GNB requests a waiver of all requirements specified in 40 CFR Part 264, Subpart C as follows:

- o Required Equipment
    - Internal Communications
    - External Communications
    - Fire Control Water
- o Required Aisle Space
- o Arrangements with Local Authorities

Frisco, Texas

HAZARDOUS WASTE MANAGEMENT PLAN

EMERGENCY CONTINGENCY PLAN

EVACUATION PLAN cont.

The basis for the request for a waiver is the nature of the hazards posed by the spent lead-acid batteries and the lead-acid battery scrap material. Each of these wastes exhibits primarily the characteristic of EP Toxicity due to lead. The wastes are inert solids and are not volatile or flammable. The battery acid (corrosivity, D002) is collected and treated in an on-site pretreatment system. The hazards posed by the characteristic of EP Toxicity and corrosivity clearly do not warrant the particular kinds of equipment, aisle space and arrangements specified in 40 CFR Part 264.32 through 264.37.

TO: OPERATING RECORD/PLAN FROM: LOCATION:
DATE: (Date) COPIES TO: File (See Below)
Plant Manager
Mngr. Environ. Eng

SUBJECT: Record of Telephone Notification of Possible Incident, for:
GNB Battery Technologies EPA ID # TXD006451090 Texas ID # 30516
This letter provides a record of compliance for telephone notification of an incident possibly requiring the response of the EMERGENCY CONTINGENCY PLAN.

Agency(s):	TNRCC	TNRCC, Dist 4	TNRCC Air Program	Fire Dept	Other
Telephone:	________	________	________	________	________
Contact:	________	________	________	________	________
Date/Time:	________	________	________	________	________

Person reporting incident: ________________________________

Telephone Number: DURING incident: __________ Normal hours: __________

Emergency Response Coordinator: ________________________________

Telephone Number: DURING incident: __________ Normal hours: __________

Date/Time of Incident: ________________________________

Location of Incident: ________________________________

Address: ________________________________

Type of Incident: Spill Release Overflow Fire Explosion
Other: ________________________________

Affecting: Air Water Sanitary Sewer Storm Sewer
Other: ________________________________

Identity of the Hazardous Material: ________________________________

Quantity of Hazardous Material Involved: __________ Known or Estimated

Known Personal Injuries: ________________________________

Known Property Damage: ________________________________

Estimate of possible hazard to human health or to the environment:
RE: NON-Incident Report
INCORRECT Telephone Notification
NON-Implementation of EMERGENCY CONTINGENCY PLAN;

GNB Battery Technologies
EPA ID # TXD006451090
Texas ID # 30516

Gentlemen:

In compliance with the rules and regulations of the Texas Water Commission, Hazardous and Solid Waste Division, and as required by Texas Administrative Code 335.151 - 335.157; a telephone notification of a possible incident was given on

This letter confirms a subsequent telephone advisement that the earlier telephone notification of a possible incident at our site had been made pre-maturely and as a pre-cautionary measure; and that within the definitions of the above regulations, an incident has NOT occurred, and no other formal written report is required.

Our staff has been instructed that it is better to provide a pre- mature telephone notification than to delay providing notification at any time there is a question about the appropriateness of the notification; and then to re-evaluate the situation when more time is available. This time, notification was not required. We apologize if the pre-mature notification caused you any inconvenience.

As such, we are closing our file on this situation. Should you require additional information, please do not hesitate to contact the writer.

Very truly yours,

GNB Battery Technologies

Manager, Hazardous Waste Management Plan

cc: Plant Manager
Manager, Environmental Eng.

Enclosure

Sub-Appendix E

SUGGESTED PROCEDURES FOR SPECIFIC INCIDENTS

List of Exhibits for This Site

Exhibit 0	GENERAL PROCEDURES FOR ALL INCIDENTS
Exhibit 1	Wastewater/Chemical Treatment Plant Solids
Exhibit 2	Wastewater/Chemical Treatment Plant Liquids
Exhibit 3	Wastewater/Chemical Treatment Plant Surface Impoundment Breach.
Exhibit 4	Lead Oxide Spill; in Plant, Outside, from Storage Tank, from Transportation or Unloading Operation
Exhibit 5	Sulfuric Acid Spill; in Plant, Outside Plant, from Storage of Piping, from Transportation or Unloading Operation
Exhibit 6	Caustic Liquid Spill (Not Ammonia); in Plant, Outside Plant, from Storage or Piping, from Transportation or Unloading Operation
Exhibit 8	Caustic Solids Spill (Lime, Soda Ash, etc.); in Plant, Outside Plant, from Storage or Piping, from Transportation or Unloading Operation
Exhibit 9	General Solids (Not Otherwise Specified) Spill
Exhibit 10	General Liquid (Not Otherwise Specified) Spill; Waster Water Drainage Pipe Spill (Broken Soil Pipe, etc.); Sanitary Sewer Drainage Pipe Spill (Broken Soil Pipe,etc)
Exhibit 11	Release from fire.

Sub-Appendix E - Exhibit C

GENERAL PROCEDURES FOR ALL INCIDENTS

I. SAFETY THINKING COMES FIRST

DO NOT ENTER a potentially dangerous situation alone.

Sound an alarm by alerting management, guards and other workers.

A. Identify the potential emergency condition.

B. Obtain COMPETENT assistance to correct the potential emergence condition.

C. Request response by the Emergency Response Coordinator.

The Emergency Response Coordinator will determine if implementation of the Emergency Contingency Plan is required. IF required, the Emergency Response Coordinator will direct the abatement activities, and notify agencies as required.

D. Emergency medical treatment and First aid.

a. The phone number of the ambulance service or paramedics should be readily available.
b. The Emergency Coordinator will assure that first aid supplies are readily available, including fresh water for immediate washing off in the case of chemical spills.

E. Personal protective equipment.

a. Personal protective equipment will be supplied for all individuals exposed to chemicals during emergency response.
b. All employees working with an acid spill will be supplied with a face shield, rubber boots and impervious gloves, all of which are acid resistant.
c. In a lead oxide spill or other major lead contamination, the employee will be supplied with a respirator, gloves, faceshield or safety glasses, and protective clothing to be worn during clean up.
d. Personal protective equipment will be stored where it is readily accessible to employees.

F. See the Exhibit for the specific type of incident for additional information.

II. TERMINATE THE CONTRIBUTING SOURCE

A. Using the appropriate personnel safety equipments, terminate the contributing source, or redirect the flow to a control or containment area. Some general methods for doing this involve closing supply or emergency valves, turning off pumps or air pressure, decreasing of releasing air pressure, lowering liquid levels, sand-bagging or adding control dikes.

B. See the Exhibit for the specific type of incident for additional information.

III. CONFINE THE AREA AFFECTED

A. Determine the mobility capability of the material, for surface spread, for vaporizing into the atmosphere, for penetrating in to the soil.

B. Control area as required.

C. See the Exhibit for the specific types of incident for additional information.

IV. NEUTRALIZE HARMFUL EFFECTS

A. Consider effects on persons, animals, plants, soil and water.

B. Consider effects from clean-up or neutralizing material. Do not add materials that could leach lead, or other harmful elements from spill.

C. See the Exhibit for the specific types of incident for additional information.

V. CLEAN UP

A. Pick up material.

See the Exhibit for the specific type of incident for additional information.

B. Testing of the affected area.

If testing is required, soil samples can be taken from the areas under the spill, and if required, at various depths; and analyzed for pH, sulfate and lead, or other constituents as required. Background sampling will also be required for comparison as these items will also be present in most surface soils. Sampling and Analysis shall be done as defined in the SAMPLING AND TESTING MANUAL of the Hazardous Waste Management Plan for this site.

See Exhibit for the specific type of incident for additional information.

C. Testing of picked up material;

In general, no testing of this material will be required, as the material has already been analyzed and classified. See the STORAGE, SHIPPING and ANIFESTING MANUAL of the Hazardous Waste Management Plan for this site for the classification of this material.

See the Exhibit for the specific type of incident for additional information.

D. Disposition of picked up material;

Dispose of the material in the same manner as required for the original material. See the STORAGE, SHIPPING AND MANIFESTING MANUAL of the Hazardous Waste Management Plan for this site for shipping and manifest requirements.

See the Exhibit for the specific type of incident for additional information.

VI. ASSESS DAMAGE POTENTIAL TO HUMANS, OR THE ENVIRONMENT

The Emergency Response Coordinator shall assess the damage potential to humans, or to the environmental; and if required, shall direct the abatement activities, and notify agencies as required.

See the Exhibit for the specific type of incident for additional information.

VII. REPORTS AND FINAL REPORTS

As per Section II.2

Sub-Appendix E - Exhibit I

WASTERWATER/CHEMICAL TREATMENT PLANT SOLIDS

I. SAFETY THINKING COMES FIRST

DO NOT ENTER A potentially dangerous situation alone.

Sound an alarm by alerting management, guards and other workers.

See Exhibit 0 for additional instructions.

II. TERMINATE THE CONTRIBUTING SOURCE

A. Using appropriate personnel safety equipment, terminate the contributing source, or redirect the flow to control or containment area.

B. For this specific type of incident, close supply or emergency valves, turn off pumps, decreases or release air pressure, lower liquid levels, sand bag source or add control dikes as required.

III. CONFINE THE AREA AFFECTED

A. The solids have a limited amount of free liquid and will not readily flow without additional materials being added.

B. Control area by sand bags or diking with soil, lime, concrete blocks, boards, etc.

IV. NEUTRALIZE HARMFUL EFFECTS

A. The material is caustic, avoid direct skin contact.

B. The material may contain lead. Do not add liquid that could leach lead from material.

V. CLEAN UP

A. Pick up material;
Clean up the spilled material with a shovel, or other suitable tool. Scrap the area clean to remove all spilled material.

B. Testing of the affected area;
In general, no testing will be required for this type of spill unless the area has been subject to substantial quantities of free liquid during the time the spilled material was deposited on the area.

See Exhibit 0 for additional instruction if testing is required.

C. Testing of picked up material;

No testing is required, as the material has already been analyzed.

See Exhibit 0 for additional instructions.

D. Diposition of picked up material;

Dispose in the same manner as required for the original material.

See exhibit 0 for additional instructions.

VI. ASSESS DAMAGE POTENTIAL TO HUMANS, OR THE ENVIRONMENT

See Exhibit 0 for additional instructions.

VII. REPORTS AND FINAL REPORTS

As per Section II.2.

Sub-Appendix E - Exhibit 2

WASTEWATER/CHEMICAL TREATMENT PLANT LIQUID

I. SAFETY THINKING COMES FIRST

DO NOT ENTER a potentially dangerous situation alone.

Sound an alarm by alerting management, guards, and other workers.

See Exhibit 0 for additional instructions.

II. TERMINATE THE CONTRIBUTING SOURCE

A. Using appropriate personal safety equipment, terminate the contributing source, or redirect the flow to a control or containment area.

B. For this specific type of incident, close supply or emergency valves, turn off pumps or air pressure, decrease or release air pressure, lower liquid levels, sand bag source or add control dikes as required.

III. CONFINE THE AREA AFFECTED

A. Control the spilled area by diking with soil, sandbags, etc.

B. Do not add additional liquid to spill.

IV. NEUTRALIZE HARMFUL EFFECTS

A. The material will probably be mildly caustic or acidic. Avoid direct skin contact. Test solution to determined pH.

B. The material may contain lead. Flow to surface drainage, lakes, etc. must be prevented.

V. CLEAN UP

A. Pick up material;

Clean up the spilled material with pumps, vacuum, or other suitable tools.

The remaining wetted spill surfaces should be dried by spreading an absorbent material.

Remove absorbent material. If spill was on soil surfaces, also remove the wetted soil.

B. Testing of the affected area;

In general, no testing will be required for the type of spill unless the spilled material was deposited on soil surfaces.

See Exhibit 0 for additional instruction if testing is required.

C. Testing of picked up material;

No testing is required, as the material has already been analyzed.

See Exhibit 0 for additional instructions if testing is required.

D. Disposition of picked up material;

Dispose in the same manner as required for the original material.

See Exhibit 0 for additional instructions.

VI. ASSESS DAMAGE POTENTIAL TO HUMANS, OR THE ENVIRONMENT

See Exhibit 0 for additional instructions.

VII. REPORTS AND FINAL REPORTS

As per section II.2.

LEAD OXIDE SPILL; IN PLANT, OUTSIDE OF PLANT, FROM STORAGE TANK, FROM TRANSPORTATION OR UNLOADING OPERATIONS

*** CAUTION Lead Oxide is poisonous, use respirator protection ***

I. SAFETY THINKING COMES FIRST.

DO NOT ENTER a potentially dangerous situation alone.

Sound an alarm by alerting management, guards and other workers.

See Exhibit 0 for additional instructions.

Lead Oxide may weigh 1000 lbs in a 55 gallon drum.

II. TERMINATE THE CONTRIBUTING SOURCE.

A. Using appropriate personnel safety equipment, terminate the contributing source, or redirect the flow to a control or containment area.

B. For this specific type of incident, close supply or emergency valves, turn off feeders or air pressure, eliminate or decrease air flow in the area. If spill is form an oxide conveying device, shut down the conveying operation. If spill is from a storage device, provide pressure clamps or shoring as necessary to block the opening that is releasing oxide.

III. CONFINE THE AREA AFFECTED.

A. The material is a powder-like solid, that is easily conveyed by moving air. As possible, eliminate all air drafts that will spread the material beyond the spill site. An alternative may be to gently cover the spilled material with a tarpaulin.

B. If absolutely necessary to confine the material, liquid may be gently added to wet the spill area.

IV. NEUTRALIZE HARMFUL EFFECTS.

A. Remove all non-essential persons from the are to limit exposure to lead dust.

B. Provide respirators and protective clothing for persons involved in the clean up; and for persons that must remain in the area.

V. CLEAN UP.

A. Pick up material;

Clean up the spilled material with a vacuum, (use plant vacuum), floor scrubber, or other suitable tool. Scrap the area clean to remove all spilled material.

B. Testing of the affected area;

In general, no testing will be required for this type of spill that is confined within the building structure; or unless the area is over exposed soil, and the area has been subject to substantial quantities of free liquid during the time the spilled material was deposited on the area.

See Exhibit 0 for additional instructions if testing is required.

C. Testing of picked up material;

No testing is required, as the material has already been analyzed.

See Exhibit 0 for additional instructions.

D. Disposition of pickup at material;

Dispose in the same manner as required for the original material.

See Exhibit 0 for additional instructions.

VI. ASSESS DAMAGE POTENTIAL TO HUMANS, OR THE ENVIRONMENT.

See Exhibit 0 for additional instructions.

VII. REPORTS AND FINAL REPORTS

As per Section II.2.

SULFURIC ACID SPILL; IN PLANT, OUTSIDE OF PLANT, FROM STORAGE OR PIPING

**** CAUTION --- CONCENTRATED ACID SPILLS ARE VERY SLIPPERY! ****

I. SAFETY THINKING COMES FIRST

DO NOT ENTER a potentially dangerous situation alone.

Sound an alarm by alerting management, guards and other workers.

See Exhibit 0 for additional instructions.

II. TERMINATE THE CONTRIBUTING SOURCE

A. Using appropriate personal safety equipment, terminate the contributing source, or redirect the flow to a control or containment area.

B. For this specific type of incident, if spill is from a transporting device, such as a pipe, close off the supply to the pipe, and attempt to evacuate the pipe by opening a downstream or lower elevation, valve where the material can be accommodated.

If the spill is from a storage facility, and not controllable by vailing, an attempt should be made to empty the tank, or to decrease the liquid volume, in the storage facility, by flowing the liquid into a controllable area.

III. CONFINE THE AREA AFFECTED

A. Control the spilled area by diking with soil, sandbags, lime etc.

IV. NEUTRALIZE HARMFUL EFFECTS

A. The material will probably be acidic, and reactive with water and caustics. Avoid direct skin contact, avoid skin contact with vapors, and avoid breathing any vapors. Test solution to determining pH.

B. If material can not immediately be picked up or washed into a control system from the spill area, attempts should be made to neutralize the acid. Use extreme caution during any neutralization attempts as the spill may be quite reactive with caustics.

1. For small spills, lime or soda ash may be spread directly over the spilled material.

2. For large spills, dry soda ash or similar approved material should be introduced directly on the spilled material starting at the outer

edges. **CAUTION**: reactions during neutralization may cause spattering and heat release.

C. The material is acidic, and may contain lead. Flow to surface drainage, lakes, etc. must be prevented. Diking of outlets from the spill area may also be necessary.

V. CLEAN UP

A. Pick up material;

Clean up the spilled material with pumps, vacuum, washing into a controlled collection system, or other suitable tools. The remaining wetted spill surfaces should be dried by spreading an absorbent material.

Remove absorbent material. If spill was on soil surfaces, also remove the wetted soil.

B. Testing of the affected area;

In general, no testing will be required for this type of spill unless the spilled material was deposited on soil surfaces.

See Exhibit 0 for additional instructions if testing is required.

C. Testing of picked up material;

No testing is required, as the material has already been analyzed.

See Exhibit 0 for additional instructions.

D. Disposition of picked up material;

Disposal in the same manner as required for the original material.

Disposal may also be accomplished by rerouting the material through the wastewater/chemical treatment plant.

See Exhibit 0 for additional instructions.

VI. ASSESS DAMAGE POTENTIAL TO HUMANS, OR THE ENVIRONMENT

See Exhibit 0 for additional instructions.

VII. REPORTS AND FINAL REPORTS

As per Section II.2.

CAUSTIC LIQUID SPILL (NOT AMMONIA); IN PLANT, OUTSIDE PLANT, FROM STORAGE OR PIPING, FROM TRANSPORTATION OR UNLOADING OPERATIONS

*** CAUTION --- LIQUID CAUSTIC SPILLS ARE VERY SLIPPERY --- CONCENTRATED CAUSTIC IS HEAVY! ***

I. SAFETY THINKING COMES FIRST

DO NOT ENTER a potentially dangerous situation alone.

Sound an alarm by alerting management, guards and other workers.

See Exhibit 0 for additional instructions.

Concentrated liquid caustic may weigh 800 pounds in 55 gallons drums.

II. TERMINATE THE CONTRIBUTING SOURCE

A. Using appropriate personnel safety equipment, terminate the contributing source, or redirect the flow to a control or containment area.

B. For this specific type of incident, if spill is from a transporting device, such as a pipe, close off the supply to the pipe, and attempt to evacuate the pipe by opening a downstream, or lower elevation, valve where the material can be accommodated.

If a spill is from a storage facility, and not controllable by valving, an attempt should be made to empty the tank, or to decrease the liquid volume, in the storage facility, by flowing the liquid into a controllable area.

III. CONFINE THE AREA AFFECTED

A. Control the spilled area by diking with soil, sandbags, lime, etc.

IV. NEUTRALIZE HARMFUL EFFECTS

A. The material will probably be strongly caustic, and quite reactive with water and acids. Avoid direct skin contact, avoid skin contact with vapors, and avoid breathing any vapors. Test solution to determine pH.

B. If material can not immediately be picked up from the spill area, attempts should be made to neutralize the effects of the caustic. Use extreme caution during any neutralization attempts as the spill may be quite reactive with acid or water.

1. For small spills, absorbents may be spread directly over the spilled materials; or water may be added to dilute the spilled material.

2. For large spills, diluted acid may be introduced directly to the spilled material by using a long pipe as a "lance", with the lance placed directly into the spilled material. This system will allow dilute acid to be pumped by hose directly from a transport truck.

C. The material is caustic, and may contain lead. Flow to surface drainage, lakes, etc. must be prevented. Diking of outlets from the spill area may also be necessary.

V. CLEAN UP

A. Pick up material;

Clean up the spilled material with pumps, vacuum, or other suitable tools.

The remaining wetted spill surfaces should be dried by spreading an absorbent material.

Remove absorbent material. If spill was on soil surfaces, also remove the wetted soil.

B. Testing of the affected area;

In general, no testing will be required for this type of spill unless the spilled material was deposited on soil surfaces.

See Exhibit 0 for additional instruction if testing is required.

C. Testing of picked up material;

No testing is required, as the material has already been analyzed.

See Exhibit 0 for additional instructions.

D. Disposition of picked up material;

Dispose in the manner as required for the original material.

Disposal may also be accomplished by rerouting the material through the waste water/chemical treatment plant.

See Exhibit 0 for additional instructions.

VI. ASSESS DAMAGE POTENTIAL TO HUMANS, OR THE ENVIRONMENT

See Exhibit 0 for additional instructions.

VII. REPORTS AND FINAL REPORTS

As per Section II.2.

CAUSTIC SOLIDS SPILL (Lime, Soda Ash, Caustic etc.); IN PLANT, OUTSIDE PLANT, FROM STORAGE OR PIPING, FROM TRANSPORTATION OR UNLOADING OPERATIONS

I. SAFETY THINKING CONTINGENCY PLAN

DO NOT ENTER a potentially dangerous situation alone.

Sound an alarm be alerting management, guards and other workers.

Caustic flake weighs 400 pounds per 55 gallon drum.

See Exhibit 0 for additional instruction.

II. TERMINATE THE CONTRIBUTION SOURCE

A. Using appropriate personal safety equipment, terminate the contributing source, or redirect the flow to a control or containment area.

B. For this specific type of incident, close supply or emergency valves, turn off feeders or air pressure, eliminate or decrease air flow in the area. If spill is from a bag or small container, turn the bag or container to limit release from the bag or container. If spill is from a conveying device, shut down the conveying operation. If spill is from a storage device, provide pressure clamps or shoring as necessary to block the opening that is releasing material.

III. CONFINE THE AREA AFFECTED.

A. The material is generally a powder-like or flake solid, that is easily conveyed by moving air. Flake caustic will liquify with moisture in the air. As possible, eliminate all air drafts that will spread the material beyond the spill site. An alternative may be to gently cover the spill material with a tarpaulin. (Such tarpaulins must be approved for chemical use to avoid reaction with waterproofing compounds or similar organic material).

B. If absolutely necessary to confine the material, liquid may be gently added to wet the spill area. **DO NOT WET CAUSTIC FLAKE.**

C. Flow to surface drainage, lakes, etc. must be prevented. Diking of outlets from the spill area may also be necessary.

IV. NEUTRALIZE HARMFUL EFFECTS.

A. Remove all non-essential persons from the area to limit exposure.

B. Provide respirators and protective clothing for persons involved in the clean up; and for persons that must remain in the area.

C. The material will probably be STRONGLY CAUSTIC, and will be HIGHLY REACTIVE to EYES, NOSE, THROAT, and LUNGS; AVOID CONTACT to sensitive tissue areas. (The material will probably not be highly reactive to skin unless there is prolonged exposure or the presence of water; however, avoid direct skin contact as much as possible.)

D. The material will probably be strongly caustic, and probably quite reactive with water and acids. Test material to determine pH.

V. CLEAN UP

A. Pick up material;

Clean up the spilled material with a shovel , a vacuum, (use plant vacuum), floor scrubber, or other suitable tool. Scrape the area clean to remove all spilled material.

B. Testing of the affected area;

In general, no testing will be required for this type of spill that is confined within the building structure; or unless the area is over exposed soil, and the area has been subject to substantial quantities of free liquid during the time the spilled material was deposited on the area.

*** **NOTE**: In general, no testing will be required for this type of spill since the materials are naturally occurring, and a small residue left from clean- up would not be deleterious to the environment.

See Exhibit 0 for additional instructions if testing is required.

C. Testing of picked up material;

No testing is required, as the material has already been analyzed.

See Exhibit 0 for additional instructions.

D. Disposition of picked up material;

Dispose in the same manner as required for original material.

Disposal may also be accomplished by rerouting the material through the wastewater/chemical treatment plant.

See Exhibit 0 for additional instructions.

VI. ASSESS DAMAGE POTENTIAL TO HUMANS, OR THE ENVIRONMENT

See Exhibit 0 for dditional instructions.

VII. REPORTS AND FINAL REPORTS
As per Section II.2.

GENERAL SOLIDS (Not Otherwise Specified) Spill; IN PLANT, OUTSIDE PLANT, FROM STORAGE OR PIPING, FROM TRANSPORTATION OR UNLOADING OPERATIONS.

I. SAFETY THINKING CONTINGENCY PLAN

DO NOT ENTER A potentially dangerous situation alone.

Sound an alarm by alerting management, guards and other workers.

See Exhibit 0 for additional instruction.

II. TERMINATE THE CONTRIBUTION SOURCE

A. Using appropriate personnel safety equipment, terminate the contributing source, or redirect the flow to a control or containment area.

B. For this specific type of incident, close supply or emergency valves, turn off feeders or air pressure, eliminate or decrease air flow in the area. If spill is from a bag or small container, turn the bag or container to limit release from the bag or container. If spill is from a conveying device, shut down the conveying operation. If spill is from a storage device, provide pressure clamps or shoring as necessary to block the opening that is releasing material.

III. CONFINE THE AREA AFFECTED.

A. As possible, eliminate all air drafts or liquid flow that will spread the material beyond the spill site. An alternative may be to gently cover the spill material with a tarpaulin.

B. If absolutely necessary to confine the material, liquid may be gently added to wet the spill area.

C. Flow to surface drainage, lakes, etc. must be prevented. Diking of outlets from the spill area may also be necessary.

IV. NEUTRALIZE HARMFUL EFFECTS.

A. Remove all non-essential persons from the area to limit exposure.

B. Provide respirators and protective clothing for persons involved in the clean up; and for persons that must remain in the area.

IV. NEUTRALIZE HARMFUL EFFECTS.

C. The material may be neutral, or may be strongly acidic or caustic, and may be quite reactive with water and acids. Avoid direct skin contact, avoid skin contact with vapors, and avoid breathing any vapors. These solution to determine pH; and to identify the material.

D. If the material is strongly acidic, follow the procedures for acid spills. If the material is strongly caustic, follow the procedures for caustic spills.

E. The material may contain lead or other hazardous materials. Flow to surface drainage, lakes, etc. must be prevented. Diking of outlets from the spill area may also be necessary.

V. CLEAN UP

A. Pick up material;

Clean up the spilled material with a shovel, a vacuum, (use plant vacuum), floor scrubber, or other suitable tool. Scrape the area clean to remove all spilled material.

B. Testing of the affected area;

In general, no testing will be required for this type of spill that is confined within the building structure; or unless the area is over exposed soil, and the area has been subject to substantial quantities of free liquid during the time the spilled material was deposited on the area.

See Exhibit 0 for additional instructions if testing is required.

C. Testing of picked up material;

No testing is required, as the material has already been analyzed.

See Exhibit 0 for additional instructions.

D. Disposition of picked up material;

Dispose in the same manner as required for original material.

See Exhibit 0 for additional instructions.

VI. ASSESS DAMAGE POTENTIAL TO HUMANS, OR THE ENVIRONMENT

See Exhibit 0 for additional instructions.

VII. REPORTS AND FINAL REPORTS

As per Section II.2

GENERAL LIQUIDS (NOT OTHERWISE SPECIFIED) SPILL; WASTE WATER DRAINAGE PIPE SPILL (BROKEN SOIL PIPE, ETC.); SANITARY SEWER DRAINAGE PIPE SPILL (BROKEN SOIL PIPE ETC.)

I. SAFETY THINKING CONTINGENCY PLAN

DO NOT ENTER a potentially dangerous situation alone.

Sound an alarm by alerting management, guards and other workers.

See Exhibit 0 for additional instruction.

II. TERMINATE THE CONTRIBUTION SOURCE

A. Using appropriate personnel safety equipment, terminate the contributing source, or redirect the flow to a control or containment area.

B. For this specific type of incident, if spill is from a transporting device, such as a pipe, close off the supply to the pipe, and attempt to evacuate the pipe by pumping, or by opening a downstream, or lower elevation, valve to redirect the material into a controllable area.

If the spill is from a storage facility, and not controllable by valving, an attempt should be made to empty the tank, or to decrease the liquid volume, in the storage facility, by flowing the material into a controllable area

III. CONFINE THE AREA AFFECTED.

A. Control the spill area by diking with soil, sandbags, lime, etc.

IV. NEUTRALIZE HARMFUL EFFECTS.

A. The material may be neutral, or may be acidic or caustic, and may be reactive with water and acids. Avoid direct skin contact, avoid skin contact with vapors, and avoid breathing any vapors. Test solution to determine pH; and to identify the material.

B. If the material is acidic, follow the procedures for acid spills. If the material is caustic, follow the procedures for caustic spills.

C. The material may contain lead or other hazardous materials Flow to surface drainage, lakes etc. must be prevented. Diking of outlets from the spill area may also be necessary.

V. CLEAN UP

A. Pick up material;

Clean up the spilled material with pumps, vacuum, or other suitable tools.

The remaining wetted spill surfaces should be dried by spreading an absorbent material.

B. Testing of the affected area;

In general, no testing will be required for this type of spill unless the spilled material was deposited on soil surfaces.

See Exhibit 0 for additional instructions if testing is required.

C. Testing of picked up material;

No testing is required, as the material has already been analyzed.

See Exhibit 0 for additional instructions.

D. Disposition of picked up material;

Dispose in the same manner as required for original material.

For selected materials, disposal may also be accomplished by rerouting the material through the wastewater/chemical treatment plant.

See Exhibit 0 for additional instructions.

VI. ASSESS DAMAGE POTENTIAL TO HUMANS, OR THE ENVIRONMENT

See Exhibit 0 for additional instructions.

VII. REPORTS AND FINAL REPORTS

As per Section II.2

RELEASE FROM FIRE

I. SAFETY THINKING CONTINGENCY PLAN

DO NOT ENTER a potentially dangerous situation alone.

Sound an alarm by alerting management, guards and other workers.

See Exhibit 0 for additional instruction.

II. TERMINATE THE CONTRIBUTION SOURCE

A. Terminating the fire will be the first priority. During the course of the fire, water, chemicals and solids may be released by fire, or may flow from the fire. Material that is airborne released can not be controlled, but all persons should be advised of any potential hazard the airborne materials may present to the environment. Material that surface drains from the area should be contained by diking, or redirected to a control or containment area.

Use appropriate personnel safety equipment.

III. CONFINE THE ARE AFFECTED.

A. Control the surface drain from the area by diking with soil, sandbags, etc.

IV. NEUTRALIZE HARMFUL EFFECTS.

A. Material released because of fire may be neutral, or may be strongly acidic or caustic, and may be quite reactive with water and acids. Avoid direct skin contact, avoid skin contact with vapors, and avoid breathing any vapors. Test solution to determine pH; and to identify the material.

B. If the material is acidic, follow the procedures for acid spills. If the material is caustic, follow the procedures for caustic spills.

C. The material may contain lead or other hazardous materials. Flow to surface drainage, lakes, etc. must be prevented. Diking of outlets from the spill area may also be necessary.

V. CLEAN UP

A. Pick up material;

Clean up the spill material with pumps, vacuum, or other suitable tools.

The remaining wetted spill surfaces should be dried by spreading an absorbent material.

Remove absorbent material. If spill was on soil surfaces, also remove the wetted soil.

B. Testing of the affected area;

In general, no testing will be required for this type of spill unless the spilled material was deposited on solid surfaces.

See Exhibit 0 for additional instructions if testing is required.

C. Testing of picked up material;

No testing is required, as the material has already been analyzed.

See Exhibit 0 for additional instructions.

D. Disposition of picked up material;

Dispose in the same manner as required for the original material.

See Exhibit 0 for additional instructions.

VI. ASSESS DAMAGE POTENTIAL TO HUMANS, OR THE ENVIRONMENT

See Exhibit 0 for additional instructions.

VII. REPORTS AND FINAL REPORTS

As per Section II.2.

Appendix 7-B

Appendix 7-B

FACILITY STORMWATER MANAGEMENT PLAN

STORM WATER POLLUTION PREVENTION PLAN

GNB TECHNOLOGIES, INC.
FRISCO, TEXAS

JUNE 1995

JONES & NEUSE

GULF COAST REGION OF RMT

RMT/JONES & NEUSE, INC. – DALLAS, TX
12655 NORTH CENTRAL EXPRESSWAY SUITE 323 75243-1717
214/490-8696 214/490-8695 FAX

50-01459.01:DA9500003 0613

STORM WATER POLLUTION PREVENTION PLAN

GNB TECHNOLOGIES, INC.
FRISCO, TEXAS

JUNE 1995

50-01459.01:DA9500003 0612

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Section 1.0
INTRODUCTION

The GNB Technologies, Inc. (GNB) facility is located at 7471 South Fifth Street in Frisco, Texas (Figure 1-1). The facility recycles lead acid batteries and occupies approximately 264 acres of land. The industrial activities are conducted on only 55.5 acres of the site; the remaining acreage is undeveloped. The GNB facility receives spent lead acid batteries from automotive and industrial uses as well as other lead feed material including scrap material from the production of lead acid batteries. The facility consists of a battery storage building, battery breaking operation, raw material storage, on-site laboratories, blast furnace, reverbatory furnace, oxide production facility, refining operations, on-site landfills, wastewater treatment plant (WWTP), and storm water retention pond. Batteries are accepted at the facility either whole or crushed. Once the batteries are crushed, the lead bearing material and plastic are separated in a water bath. The recovered lead bearing material is processed in furnaces to produce lead and lead alloys. Some of the lead produced is used in the production of lead oxide. The plastics recovered from the separation process are sent to the GNB facility in Los Angeles, California for reclamation. The spent acid from the batteries (i.e., battery breaker effluent) is used as a treatment reagent in the GNB wastewater pretreatment system.

The GNB facility is required to develop a storm water pollution prevention plan (SWPPP) due to its primary standard industrial classification (SIC) code of 3341 (primary metals industry) and the presence of Emergency Planning and Community Right-to-Know (EPCRA) Section 313 water priority chemicals. The Section 313 chemicals present at the site are antimony, arsenic, sulfuric acid, and lead and other lead compounds. Antimony is released as a constituent in air, wastewater, and slag. Arsenic is present in slag material and sulfuric acid is emitted from the stack through the scrubber. Lead and lead compounds are present in numerous mediums. The SWPPP identifies potential sources of storm water contamination, response and preventative measures utilized to reduce the risk of storm water contamination, and ongoing management practices designed to prevent storm water pollution at the facility.

The development of an SWPPP is one step in obtaining a General Permit to discharge under the National Pollution Discharge Elimination System (NPDES) which monitors and sets limitations on the quantity and quality of discharge into waterways. For the GNB Frisco facility, the General Permit and the SWPPP will set the regulatory standards for drainage from the site that are outside the production areas. Most of the drainage from the GNB Frisco facility is controlled under an Individual Permit. The Individual Permit covers most of the production areas including the battery storage area, wastewater treatment plant, slag stabilization area, raw material storage area, battery breaking operation, fuel storage areas, blast and reverb furnace areas, oxide building, weigh station, and the truck staging area. Runoff from these areas is controlled by sloped pavement and a concrete berm that encompasses all production operations. Any operation or discharges associated with activities covered under the Individual Permit are exempted from the General Permit and discussions in the SWPPP.

1.1 Regulatory Background

The EPA developed the storm water regulatory program through the authority of the Clean Water Act amendments of 1987, to reduce discharges of contaminated storm water associated with industrial facilities. The NPDES program is the means by which the EPA regulates discharges of potentially contaminated wastewater and storm water into waters of the U.S. through the issuance of permits applicable to specific sources. General Permits are available for coverage of certain industrial facilities which have a relatively low potential for releasing pollutants into storm water. For states without NPDES delegation, such as Texas, EPA has promulgated one General Permit for Discharges Associated with Industrial Activity. The General Permit should be reviewed and consulted as needed for specific questions of compliance. [Note: The requirements for NPDES permits for storm water discharges associated with industrial activity is also outlined in the Wednesday, September 9, 1992 Federal Register.]

All facilities subject to the General Permit must prepare, maintain, and implement a SWPPP. The GNB facility is regulated under this program due to its primary activity as a battery reclaimer which is classified under the SIC 3341. In addition, arsenic, antimony, sulfuric acid, and lead and its compounds are reported under the EPCRA Section 313 Toxic Release

Inventory (TRI) requirements and are classified as EPCRA Section 313 water priority chemicals. Specific storm water control measures for facilities subject to EPCRA Section 313 reporting requirements are addressed in the facility SWPPP.

1.2 Plan Objectives

The SWPPP focuses on two major objectives: 1) identification of sources of pollution potentially affecting the quality of storm water associated with industrial activity; and 2) identification of practices to be implemented which minimize and control pollutants in storm water run-off in order to comply with the terms of the General Permit. The implementation of the SWPPP relies primarily on traditional storm water management, pollution prevention, and best management practices (BMPs) which have been tailored to pollutants with the potential for contacting storm water discharges at the GNB facility.

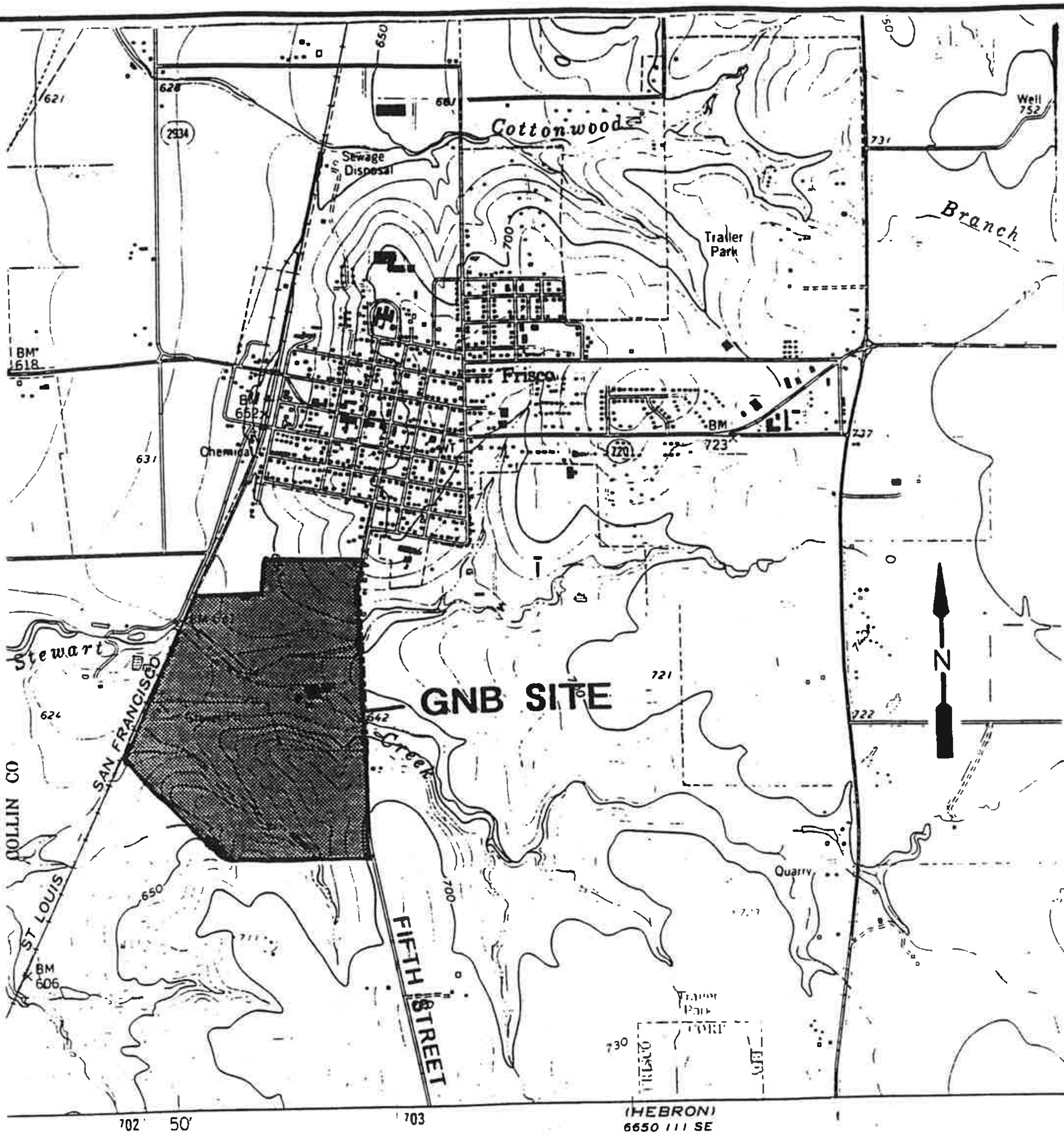
1.3 Plan Availability

A copy of the SWPPP must be maintained at the GNB Frisco facility at all times and must be made available to representatives of the EPA in order to comply with the General Permit.

1.4 Plan Compliance and Modifications

Initial compliance with the implementation of the SWPPP is required before October 1, 1993. This plan is required to be updated and amended whenever there is a change in design, construction, operation, or maintenance which may impact the potential for pollutants to be discharged through storm water. In addition, if the plan is found to be ineffective in controlling the discharge of pollutants, it must be amended to correct the identified deficiencies. Blank forms and tables that can be used to update or modify the plan are provided in Appendix B through G.

If the EPA or its authorized representative provides notification that the SWPPP does not meet the minimum requirements of the General Permit after an inspection of the facility and plan, then the SWPPP must be modified accordingly within 30 days and written certification that the changes have been made must be provided.



SCALE 1:24 000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

FIGURE 1-1
FACILITY LOCATION MAP
GNB FACILITY, FRISCO, TEXAS

JONES AND NEUSE, INC.
Environmental and Engineering Services

1.5 Consistency with Existing Environmental Management Plans

Environmental management plans other than the SWPPP may contain provisions for managing storm water. To some extent, it may be possible to build on elements of these plans that are relevant to storm water pollution prevention. The storm water pollution prevention team coordinator has the responsibility to incorporate these provisions into the SWPPP. The final version of the SWPPP must be a comprehensive stand alone document. Examples of compatible environmental plans include:

- NPDES Best Management Practices;
- Resource Conservation and Recovery Act (RCRA) Preparedness, Prevention and Contingency Plan;
- Spill Prevention, Control and Countermeasure (SPCC) Plan;
- NPDES Toxic Organic Management Plan; and
- Occupational Safety and Health Act (OSHA) Emergency Action Plan.

Of the plans noted above, the only one applicable to the GNB Frisco facility is an Emergency Contingency Plan. The Emergency Contingency Plan was reviewed for consistency with the SWPPP and there were no conflicts with the General Permit. If any of the additional plans are required or developed for GNB in the future, their provisions must be compatible with the requirements of the General Permit and this SWPPP.

Section 2.0
GENERAL PERMIT REQUIREMENTS FOR SWPPP

A review of the General Permit requirements and the organizational development of the GNB SWPPP is provided in this section of the report. Although some of the SWPPP provisions described in the General Permit do not currently apply to the GNB facility as it is now operated, they are discussed to account for possible operational modifications in the future. This section should be reviewed when revisions to the plan are warranted due to major changes affecting storm water handling at the facility or during annual plan evaluations. As regulations change regarding the SWPPP, this section should also be revised to reflect current requirements outlined in amendments to the General Permit and the Code of Federal Regulations (CFR)(40 CFR 122.28).

2.1 Storm Water Discharges Associated with Industrial Activity

Certain industrial facilities are required to obtain coverage under NPDES storm water permits for the protection of surface waters from storm water contamination associated with industrial activity. The facilities include industrial categories representing a risk of pollution to surface waters due to typical stock inventories of significant materials and/or typical materials storage and handling practices. General permit coverage is offered to the facilities with less risk of storm water contamination compared to facilities required to obtain Individual Permits.

"Storm water associated with industrial activity" includes but is not limited to storm water discharges from industrial plant yards, immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility; material handling sites; refuse sites; sites used for the application or disposal of process waste waters (that which, during manufacturing or processing comes into direct contact with, or results from, the production or use of any raw material, intermediate product, finished product, by-product, or waste product); sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and intermediate and finished products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to storm water. The definition excludes areas located on plant property separate from the plant's industrial activities, such as office buildings and accompanying employee parking lots as long as the drainage from the excluded areas is not mixed with storm water drained from the areas associated with industrial activity.

2.2 Assessment of Potential Contamination Sources

The assessment phase of the plan is used to identify the most important pollution sources potentially exposed to storm water during the previous three years for which corrective and/or preventative action may be taken. In general, potential sources of pollution include materials storage or handling areas, historical leaks or spills, and non-storm water discharges. The SWPPP must provide a description of potential sources which may have contributed to storm water contamination or may be reasonably expected to add significant amounts of pollutants to storm water discharges in the event of an accident. The SWPPP must also describe sources which may result in the discharge of pollutants during dry weather from non-storm water discharges draining from the facility.

2.2.1 Significant Materials Inventory

Facilities subject to the regulations of the General Permit must assess all potential sources of contamination from significant materials that could contact storm water run-off. Each must be identified by name, location, and amount stored and evaluated in terms of the likelihood of exposure. Significant materials include, but are not limited to:

- Raw materials;
- Fuels;
- Solvents;
- Detergents;
- Plastic pellets;
- Finished products;

- Hazardous substances listed in Section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA);
- Compounds required to be reported pursuant to Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA);
- Fertilizers;
- Pesticides; and
- Waste products.

An inventory of significant materials treated, stored or disposed of which currently or in the past three years may have been exposed to storm water must be maintained in order to develop and maintain a system of BMPs tailored to the facility. Information contained in the inventory should include material names and locations, as well as the type, size and number of associated storage units. In the event that the on-site inventory changes frequently, information such as number and type of containers may be specified as a range that reflects a reasonable representation of the normal inventory. Location information for stored materials that are relocated frequently should be reported as to reflect each area where they may be exposed to storm water. Information contained in the plan regarding inventories of significant materials must be updated at least once a year but more frequently if necessary to reflect current conditions.

2.2.2 Non-Storm Water Discharges

Most non-storm water discharges must be covered by a NPDES permit for process wastewater or non-process wastewater. These discharges include flows not generated by run-off which exit the facility property via storm water outfalls. Common non-storm water flows include process wastewater, condensate, non-contact cooling water, vehicle wash water, or sanitary wastes. A determination that no non-storm water discharges occur at the facility must be made and a signed certification attached to the SWPPP.

Only the following non-storm water flows are authorized for discharge through storm water outfalls under the terms of the General Permit:

- Discharges from fire fighting activities;
- Fire hydrant flushings;
- Potable water sources including waterline flushings;
- Irrigation drainage;
- Lawn watering;
- Uncontaminated ground water;
- Foundation or footing drains where flows are not contaminated with process materials;
- Discharges from springs;
- Routine exterior building washdown which does not use detergents or other compounds;
- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred and where detergents are not used; and
- Air conditioning condensate.

An inspection of facility drainage areas for non-storm water discharges is required in order to certify that only storm water or authorized non-storm water flows enter surface waters adjacent to the facility through outfalls subject to the General Permit. Normally, methods of checking for non-storm water discharges involve dry weather tests. Three methods commonly used to certify the type of flows are described below:

(1) Visual Inspection of each storm water outfalls during dry weather conditions. This should be done on three separate occasions following a period of time sufficient for storm water run-off from any previous storm event to end.

(2) Review of plant schematics to determine if there are any interconnections into the storm water collection system. This method is useful only if accurate, up-to-date schematics are available. If not, an examination of

pathways of process wastewater, non-contact cooling water, condensate lines, sanitary wastewater lines, and any other conveyance systems handling flows other than storm water may be used.

(3) Dye testing can be performed by releasing a dye into each non-storm water conveyance system and examining the discharge points for discoloration. Specially manufactured dyes are available for this type of testing. The local sewer authority should be contacted prior to conducting these tests since certain dyes may be damaging to biological treatment units.

Signed certification must be included in the plan verifying that an evaluation for non-storm water discharges has been conducted which summarizes the results of the evaluation. The certification must include the following:

- Evaluation criteria or test methods used;
- Date of testing or evaluation;
- On-site drainage points directly observed during test/evaluation; and
- Signed certification.

Generally except for flows from fire fighting activities, all non-storm water connections identified at the facility, whether exempt from permitting or covered under a separate permit must be identified in the SWPPP. Where necessary to reduce pollutants in these discharges, pollution prevention measures should be adopted and implemented.

2.2.3 Historical Leaks and Spills

A listing of leaks or spills of reportable quantities of petroleum based products occurring during the last three years must be developed and updated in the plan. Reportable quantities of oils and fuel are those that could produce a sheen on receiving waters or result in the deposition of sludge. In the event of a reportable spill, the Duncanville office of the Texas Natural Resource Conservation Commission (TNRCC) must be contacted.

A listing of significant leaks or spills of toxic or hazardous materials occurring during the last three years must also be developed and updated in the plan. EPA defines "significant spills" to include but not be limited to releases occurring within a 24-hour period, of hazardous substances in excess of reportable quantities as listed in Section 311 of the Clean Water Act and Section 102 of the CERCLA. Reportable quantities are set amounts of specific substances as listed in 40 CFR Parts 117 and 302. If releases of these substances occur in excess of the reportable quantities, the **National Response Center** at (800) 424-8802 must be contacted as soon as possible. Releases are defined to include any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment.

2.3 Best Management Practices

BMPs described in the SWPPP are control measures utilized to reduce the potential for pollutants to contaminate storm water. These may involve diversion of storm water away from contaminants, removal of pollutants from storm water which has come in contact with contaminating sources, or maintenance activities that prevent contaminants from being released from containment structures.

BMPs are selected based on an assessment of on-site sources of contamination. Control measures can be divided into baseline and advanced BMPs. Baseline BMPs are inexpensive, relatively simple measures that are applicable to a wide variety of industrial applications. Advanced BMPs use more complex methods tailored to specific pollutant sources at a particular site. All industrial facilities covered by a General Permit are required to implement, at a minimum, the following baseline BMPs where appropriate:

- Good housekeeping;
- Preventative maintenance;
- Visual inspections;

- Spill prevention and response;
- Sediment and erosion control;
- Management of run-off;
- Employee training; and
- Record keeping and reporting.

2.4 Spill Response

In the event that spill prevention measures are inadequate, a quick and appropriate response may prevent the contamination of storm water. The spill response plan should be based upon site-specific spill potential scenarios, reflecting the potential magnitude and frequency of spills, the types of materials spilled, and the variety of spill locations. Specific procedures should be developed to correspond to the particular chemicals utilized on-site. At all times, personnel with the appropriate training and authority should be available to respond to spills.

The spill response plan should address the following:

- Identification of spill response personnel;
- Safety measures;
- Procedures to notify appropriate authorities and regulatory agencies;
- Spill containment, diversion, isolation, cleanup;
- Spill response equipment; and
- Procedures for evaluating the success of the plan following response actions.

2.5 Record Keeping and Reporting

Record keeping and internal reporting must be performed for spills, leaks and other discharges, inspections, and maintenance activities. Documentation of these events aids in the tracking of the progress of pollution prevention efforts and the reduction of waste generated. Records are intended to help the facility operators minimize incident recurrence, respond with appropriate cleanup activities, and comply with legal requirements. Future incidents of spill events may be alleviated through the examination of records of past events which may help identify a particular practice that should be modified or eliminated. Maintenance records enable the facility to evaluate the effectiveness of the inspection program by correlating repair records with incidents of leaks and spills over time. Historical records may be used to better design BMPs through the identification of repeating patterns.

Record keeping required in the General Permit is to be maintained on-site for at least one year beyond the expiration date of the General Permit. The General Permit expires October 1, 1997; however, a general permit continues to be enforceable until a new general permit is issued. Specific records which must be kept include documentation of reported spills and other contaminated discharges, any available information describing the quality and quantity of contaminated storm water discharges (usually involving observations or voluntary monitoring data), and inspections and maintenance activities.

2.6 Employee Training

Employee training programs must inform personnel at all levels of operation of their responsibilities in implementing the components and goals of the plan. Each component of the plan must be addressed during training to include methods to be used and the purpose behind each method. The goal of the training program is to enable personnel to prevent spills through the use of BMPs, respond safely and effectively to accidents, and to recognize and control situations that could lead to storm water contamination.

The EPA General Permit requires employee training in spill prevention and response, good housekeeping, and material management practices. All employees involved in industrial activities at the facility should be trained in response procedures allowing them to assist the team if necessary. On-site contractors and temporary personnel associated with plant operations should also be informed of plant operations and design features as they relate to spills.

The General Permit includes additional training requirements for employees and contractor personnel that work in areas where the EPCRA, Section 313 water priority chemicals are used or stored. These individuals must be trained in several specific areas at least once per year.

The General Permit for industrial storm water requires that the SWPPP specify the scheduling of employee training. The training schedule should be tailored to the complexity of the facility management practices and the nature of the staff. High staff turnover rates and changes in job assignments require individualized training of new personnel and of those that take on new responsibilities at the facility. The effectiveness of training efforts should be regularly evaluated. This may require simply speaking to employees to verify that information has been communicated effectively and through inspections of work areas by supervisory personnel.

2.7 Storm Water Monitoring

Under the EPA's General Permit, certain classes of facilities are required to conduct storm water sampling either annually or semi-annually, including the parameters for which analysis is required and the sampling frequency. Prior to implementing major changes at the facility, the General Permit should be consulted to determine if the proposed changes will impact the monitoring status of the facility. Any storm water data collected should be included in the plan with a summary of the analytical results. Sample collection procedures used must be included in the summary.

2.8 Annual Plan Evaluation

The SWPPP must be continually updated through annual evaluations (inspections) of potential pollution sources, BMPs, employee training program, and spill response procedures. The evaluation should include an annual site inspection of BMPs and the updating of inventories of significant materials and spill response equipment. All records regarding plan provisions will be maintained for a period of at least one year following the expiration of the current General Permit. Revisions to the plan will be made based on the results of the evaluation. Following the reissuance of the EPA General Permit, any new provisions affecting the plan must be incorporated.

The EPA General Permit requires the following evaluation actions to be conducted annually:

- Inspection of storm water drainage areas for evidence of pollutants entering the drainage system;
- Determination of the effectiveness of installed BMPs and whether additional measures are needed;
- Observation of structural measures, sediment controls, and other storm water BMPs needed to ensure proper operation;
- Inspection of equipment needed to implement the plan, such as spill response equipment;
- Plan revision as needed within two weeks of the annual inspection of potential pollutant sources and BMPs;
- Implementation of necessary changes within 12 weeks of the inspection, but in as timely a manner as practical;
- Preparation of an inspection summary report which includes results and follow-up actions, date of inspection, names of personnel conducting the inspection, identification of incidents of non-compliance or certification that the facility is in compliance with the plan; and
- The evaluation report must be signed and attached to the plan.

Annual plan evaluations are comprehensive inspections performed by individuals who are specifically designated in the plan as having responsibility for conducting inspections. Chosen personnel must be familiar with facility industrial operations, plan goals and requirements. Inspectors should have the ability and authority to make necessary management decisions or have direct access to management.

2.9 Plan Certification

Upon its completion, the SWPPP must be signed by an authorized facility representative. This may include a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation.

Any of the previously mentioned persons may designate a duly authorized representative to sign for them. The representative should have either overall responsibility for the operation of the facility or environmental matters for the company. If an authorized representative is appointed, the authorization must be put in writing by the responsible signatory and submitted to the EPA Director. Any change in an authorized individual or an authorized position must be made in writing and submitted to the EPA. In signing the plan, the corporate officer is attesting that the information is true and this signature provides a basis for an enforcement action against the person signing the plan and related reports.

EPA's General Permit contains additional certification requirements for facilities subject to reporting under EPCRA, Section 313 for water priority chemicals. The plan must be reviewed and certified by a Registered Professional Engineer and recertified every three years or as practicable after significant modifications are made at the facility.

2.10 Special Requirements

In addition to the minimum requirements outlined in the previous discussions, the General Permit requires that certain types of facilities be subject to additional requirements. In particular, facilities subject to EPCRA, Section 313 reporting requirements for water priority chemicals are required to implement specific control structures and BMPs in those areas where the priority chemicals are stored, handled, processed, or transferred. Because the operations at the GNB facility are subject to the EPCRA reporting requirements, GNB must implement the BMPs which are outlined in the General Permit.

In addition, because of the nature of operations at the GNB facility, the facility must also comply with the specific monitoring requirements that have been established for battery reclaimers. Under these special provisions, the GNB facility must include certain analytes in their monitoring program which are not necessarily tested by other Section 313 facilities.

Recommendations have also been developed by the North Central Texas Council of Governments (NCTCOG). These recommendations are outlined in the Storm water Quality Best Management Practices for Industrial Activities BMP Manual. This manual was prepared with guidance from the seven governmental entities in the NCTCOG service area which are required to maintain MS4 permits. The manual includes the majority of the BMP's found in the EPA guidance document along with some additional guidance on BMP implementation.

Section 3.0

STORM WATER POLLUTION PREVENTION TEAM

The storm water pollution prevention team consists of a coordinator and team members who are responsible for implementing the SWPPP. Plan implementation includes ongoing assessment of potential sources of contamination and associated BMPs, response to spill events, employee training, and the annual plan evaluation. The current team roster including areas of responsibility is provided in Table 3-1.

3.1 Team Coordinator

The storm water pollution prevention team coordinator has the ongoing responsibility for ensuring the provisions of the plan are implemented. Specifically, this includes implementation of inspection schedules, preservation of records, coordinating responses to spill emergencies, employee training, and annual plan updates. The coordinator serves as a point of contact for plant personnel and for those outside the facility (such as regulatory officials) who may wish to discuss aspects of the plan or obtain information concerning spill events. The coordinator will oversee the re-evaluation and modification of the plan both annually and following major spill events. These modifications may include relocation or alteration of material storage or handling areas, revision of BMPs, alteration of drainage patterns, addition of structural control measures, or documentation of significant leaks or spill events.

For the initial permit term lasting until October 1, 1997, Mr. Larry Eagan is the Storm Water Pollution Prevention Team Coordinator. In the event that a new coordinator must be assigned, their replacement will be equally qualified and installed as soon as practicable.

Table 3-1

POLLUTION PREVENTION TEAM MEMBER ROSTER

GNB FRISCO FACILITY

Coordinator: Billy King

Title: *Environmental Manager*

Office Phone: 214-335-2121

Emergency Phone: Same as above

Responsibilities: *Coordinate development of SWPPP, plan revisions, annual plan evaluation, training program, records maintenance, and reporting. Serve as Alternate Emergency Response Coordinator*

Member: James Messer

Title: *Laboratory Manager*

Office Phone: 214-335-2121

Emergency PhoneSame as above

Responsibilities: *Coordinate inspections, maintain structural BMP's, recordkeeping, develop additional maintenance BMP's, Serve as Primary Emergency Response Coordinator.*

Member: Carlos Liscano

Title: *Assistant Plant Manager*

Office Phone: 214-335-2121

Emergency Phone: Same as above

Responsibilities: *Spill Response Chief, coordinate spill control and response, ready spill response equipment, coordinate personnel training for spill response, containment, and cleanup procedures*

Member: Larry Eagan

Title: *Plant Manager*

Office Phone: 214-335-2121

Emergency Phone: Same as above

Responsibilities: *Management representative, oversight of SWPPP compliance, company signatory, BMP funding authorization*

3.2 Team Members

The SWPPP team or its authorized agent has the responsibility for conducting inspections, maintaining BMPs, conducting annual employee training and new employee training, and responding to spill events. Additionally, the management representative of the team is responsible for communications and funding for the pollution prevention efforts. Team members will meet with the coordinator annually and following spill events to re-evaluate and modify the plan as needed. In the event that individual team members must be replaced, equally qualified personnel will be assigned by the coordinator to take over their responsibilities. In the event that this can not be accomplished immediately, the current team members will be assigned to these responsibilities during the interim.

Section 4.0

DESCRIPTION OF POTENTIAL POLLUTANT SOURCES

Potential sources of storm water contamination at the GNB facility include: 1) the equipment storage area north of the plant; 2) grassy area around the truck staging area; and 3) waste disposal areas north and south of the plant. A layout of the site is provided in Figure 4-1. All potential sources of storm water contamination that have been active during the previous three years are included in the review in order to comply with the General Permit. The majority of the industrial activities that operate in the raw material storage area, battery breaker facility, and furnace and oxidation buildings are all contained within a concrete facility berm. Storm water within this berm is directed to the storm water retention pond via a conduit that passes over Stewart Creek. The outfall from the pond discharges to Stewart Creek at Outfall 001 which falls under the provisions of an existing individual NPDES permit. Outfall 001 and the storm water associated with the activities within the contained areas are therefore exempted from the provisions of this General Permit and have been excluded from the following discussion.

The review process includes an evaluation of site drainage and outfalls, significant materials stored on-site, the testing performed for certification that no non-storm water discharges are made to the storm water outfalls, the history of leaks and spills of significant materials, and a description of potential contact zones (PCZs) where storm water may contact significant materials before discharge. In this section, the results of the site inspection and the review of design plans provided by GNB are used to identify potential risks to storm water discharge quality.

4.1 Site Drainage and Outfalls

The GNB Frisco site is located between two intermittent tributaries. The southern tributary is mapped as Stewart Creek while the northern tributary is unnamed. For this report, the northern tributary will be designated the North tributary. The North tributary has been recently diverted and rechannelized slightly north of its original location. The Stewart Creek confluence of these tributaries is located west of the facility buildings and north of the storm water retention pond. Stewart Creek is the only natural surface water body at the site.

The production area of the site, which includes the permitted storm water flow, is relatively flat. However, the adjacent areas which include the disposal areas have a moderate relief. Most areas are well stabilized with vegetation. Runoff from these areas flows into either Stewart Creek, the North tributary, or drainage ditches.

Three outfalls have been identified at the GNB Frisco facility which must meet the requirements of this General Permit (Figure 4-1). These outfalls control drainage from areas of industrial activity such as material storage areas and disposal areas. Outfall GP-1 is a small concrete swale in the meridian located at the main entrance to the plant along 5th Street. This outfall discharges into Stewart Creek. Outfall GP-2 is a pipe that goes underneath the access road on the south side of Stewart Creek. This outfall discharges directly into Stewart Creek. Outfall GP-3 is an earthen drainage ditch that discharges into the North tributary. This outfall is located at the confluence of the tributary and the drainage ditch to the north. The facility also has one NPDES permitted outfall (Outfall 001) which discharges into Stewart Creek from the storm water retention pond. Because this outfall is associated with an existing NPDES permit, it is not included it in this General Permit.

The outfall for spring water that discharges along the access road south of Stewart Creek is exempted from the General Permit. There is no industrial activity associated with this area of the site. No monitoring is recommended for the discharges at this outfall.

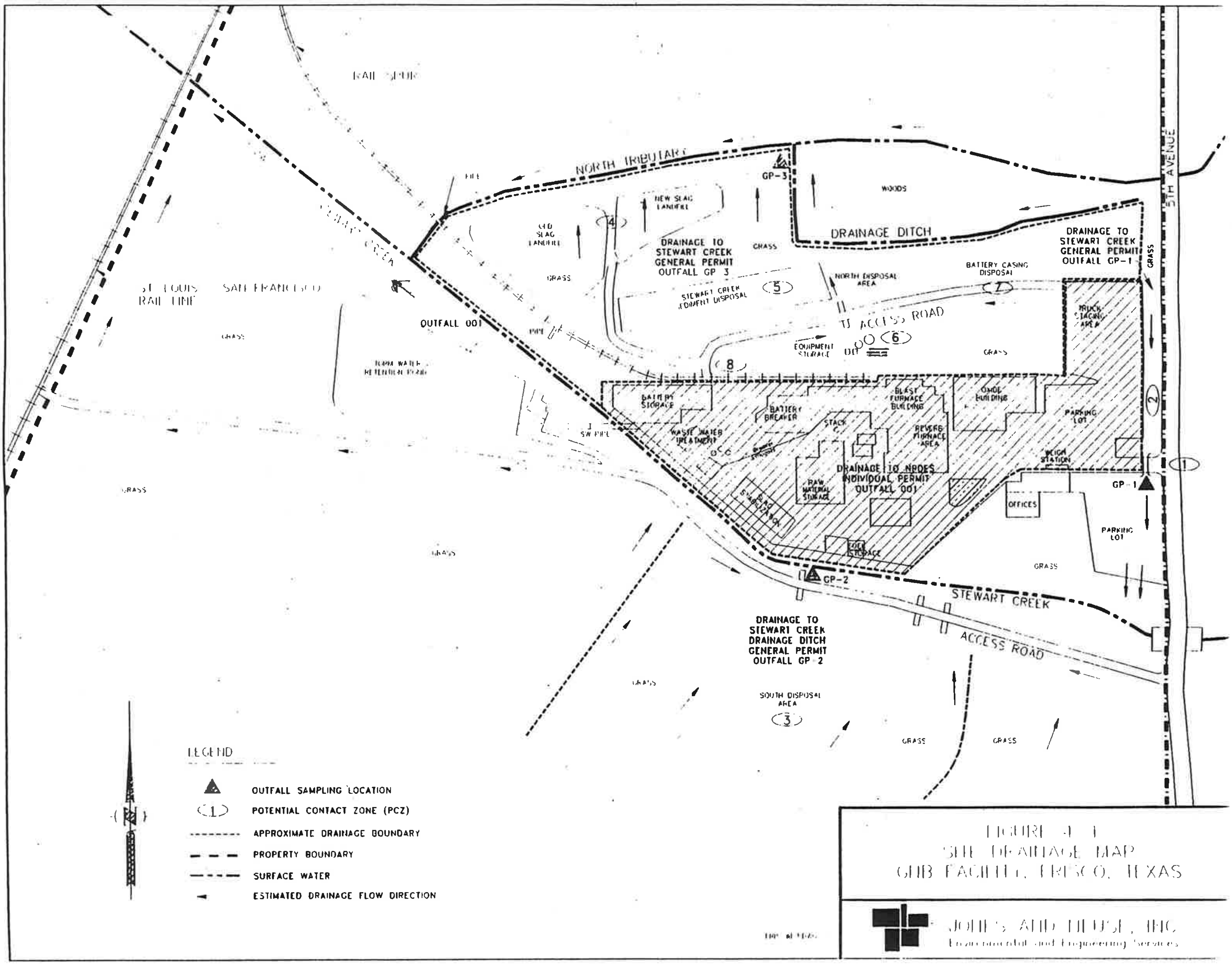


FIGURE 4-1
SITE DRAINAGE MAP
GNB FACILITY, FRISCO, TEXAS

JONES AND NEUSE, INC.
Environmental and Engineering Services

4.1.1 Outfall GP-1

The drainage area of Outfall GP-1 includes the easternmost portion of the GNB site. This area is smaller in comparison to the drainage areas of outfalls GP-2 and GP-3. The main operation of interest controlled by Outfall GP-1 is the storm water flow across the plant entrance and over the office parking lot. Because this drainage area is potentially impacted from raw materials and batteries as they are transported into the plant and receives storm water flow from the grassed area around the truck staging area, the requirement of the SWPPP rules apply to the discharge of Outfall GP-1.

Drainage in the form of sheet flow enters Outfall GP-1 from the grassed area east of the truck staging area. Runoff from the staging area, however, is unlikely since the curb would prevent runoff into the grassed area. The grassed swale on the east side of the staging area is moderately sloped and grassed. The swale runs north-south, conveying flows over the facility entrance driveway discharging into the south parking lot next to the offices. The drainage ultimately discharges in sheet flow from the parking lot into Stewart Creek.

4.1.2 Outfall GP-2

The drainage area of Outfall GP-2 includes the area on the south side of Stewart Creek. The main operation of interest in this area is the South Disposal area. Previously, iron oxide slag was transferred to this area for disposal. Disposal activities in this area ended approximately ___ years ago. An access road is located north of the disposal area and provides access for vehicles to the retention pond. Because this drainage area is associated with disposal activities, the requirements of the SWPPP rules apply to the discharge of Outfall GP-2 into Stewart Creek.

Drainage enters Outfall GP-2 predominantly from the south from the slag landfill. Outfall GP-2 is one of three culverts south of Stewart Creek.. The outfall goes under the access road along the south side of Stewart Creek. The culvert designated as Outfall GP-2 is closest to the slag landfill and is believed to carry storm water with the greatest potential for contact with slag material. The slag landfill is currently capped and is no longer active. The sides of the landfill are moderately sloped and well stabilized with vegetation.

However, some erosion was observed in the proximity of the drainage culvert and at the crest of the landfill.

4.1.3 Outfall GP-3

The drainage area of Outfall GP-3 includes the northern area of the site, north of the processing and storage facilities. The main operations that may impact storm water quality in this area are the waste disposal operations and equipment storage. The majority of the drainage that reaches Outfall GP-3 originates from runoff across the slag and sediment landfills. There are two slag landfills. The western landfill, which is closed and capped, contains untreated slag material (i.e. prior to 1993). The new landfill is still active and is used for the disposal of treated slag material. Both landfills are located south of the North tributary. During the site inspection, the active area of the new landfill appeared to be clean. According to plant personnel, the area is sprayed with water periodically to prevent fugitive dust emissions.

To the south of the slag landfills is the sediment disposal deposit. Because of previous operations at the plant, slag materials were discovered along Stewart Creek. These sediments were then dredged from Stewart Creek in 19____ and disposed of on-site. A rail spur north of the plant is still in operation. The rail spur is used for rail cars carrying pure soft lead to the plant. Soft lead is unloaded from the rail cars with forklifts. The rail spur lies outside of the facility berm and allows for contact with storm water that drains to Outfall GP-3. Further south, adjacent to the rail spur is the equipment storage area. Several containers, equipment parts, and construction materials were observed in this area. These containers have been washed before they were set out in the storage area. In this area potential storm water contact can lead to the transmission of oxidized metal particles from this area into the North tributary. The access road that connects the staging area to the battery storage area lies between the sediment disposal landfill and the equipment storage area. This one lane road is frequently used by operators hauling raw materials into the facility.

The north disposal area has a history of activities that may impact storm water quality. In the 1960s, this area was used for disposal of mixed industrial and municipal wastes. More recently, battery casing chips were disposed of just west and adjacent to the truck staging area. These casing chips are now capped under a layer of earth and vegetation. In the proximity of the chip disposal area is a concrete building. This structure is used for fire rescue and drills. Charred materials were apparent on the grounds and soot from smoke was visible at the windows of the building. Because of current and historical disposal, transporting, and storage activities in the northern portion of the site, the requirements of the SWPPP rules apply.

Drainage enters Outfall GP-3 predominantly from the landfill areas and the equipment storage area. All the landfills with the exception of the new slag landfill are capped and protected from erosion with moderate vegetation. The only indications of erosion were noted by the banks of the North tributary and the drainage ditch. The landfills have relatively steep slopes that could allow storm water to run directly into the tributary and ditches, however because of the grass cover, erosion into the landfill cover is minimized.

Other areas in the northern portion of the site are relatively flat. Because of the low slope and the mature vegetation in this area, runoff from the equipment storage area and the battery casing chip disposal area are not expected to contribute large flows to Outfall GP-3. During a significant storm event, storm waters in contact with these areas are likely to be mixed with runoff from the access road.

4.2 Inventory of Significant Materials

Significant materials that have been handled, treated, stored, or dispose at this facility are itemized in Table 4-1 in accordance with the General Permit. These are materials that may have had exposure to storm water within the past three years. These materials include treated and untreated iron oxide slag, plastic battery casing chips, Stewart Creek sediment, used batteries, and discarded equipment parts. These materials are identified by material description, use, location, approximate amount of material used, containment methods, and likelihood of exposure to storm water. Most of the significant materials used in the production process are located inside the GNB facility or within the containment berm that is part of the Individual NPDES Permit for Outfall 001. Materials described in Table 4-2 are cross-referenced to locations on the Site Map (Figure 4-1).

4.3 Identification of Non-Storm Water Discharges and Illicit Connections

The initial on-site visual inspection of the GNB Frisco facility was conducted May 18, 1995 by Mr. Frank Huang of RMT, Inc. A copy of the certification identifying non-storm water discharges for the GNB facility is presented in Table 4-2. Once the listed discharges are addressed, the certification may be signed. During the initial inspection and the following inspections performed by RMT, each of the outfalls and overland flow areas identified in Figure 4-1 were examined during dry weather conditions for any indications of non-storm water discharges. No non-storm water discharges were observed.

4.3.1 Outfall GP-1 Drainage Area

No flowing water or discharges off-site were observed at the time of the inspection. There was no areas of stained soil observed on the GNB property during the survey. Non-storm water discharge were absent in the area of Outfall GP-1.

TABLE 4-1
SIGNIFICANT MATERIALS INVENTORY

Material Description	Location (PCZ) *	Quanity Stored On-site (Avg)	Container	Quantity Exposed in Last 3 Years	Likelihood of Contact with Stormwater If yes, describe reason.	Past Significant Spill or Leak	
						Yes	No
IRON OXIDE SLAG	SOUTH DISPOSAL		Landfill	none	None, landfilled with vegetated cap		X
SEDIMENT	SEDIMENT DISPOSAL		Landfill	none	None, landfilled with vegetated cap		X
UNTREATED IRON OXIDE SLAG	SLAG LANDFILLS		Landfill	none	None, landfilled with vegetated cap		X
TREATED IRON OXIDE SLAG	SLAG LANDFILLS		Operating Landfill	no discharge	Routine Contact, bermed to prevent discharge		X
BATTERY CASING CHIPS	BATTERY CASING DISPOSAL		Landfill	none	None, landfilled with vegetated cap		X
VARIOUS EQUIPMENT ITEMS	EQUIPMENT STORAGE		Above Ground Storage	none	None, landfilled with vegetated cap		X

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TABLE 4-2
NON-STORM WATER DISCHARGE ASSESSMENT AND CERTIFICATION

Date of Test or Evaluation (month/day/year)	Outfall No. Directly Observed During Test	Method Used to Test or Evaluate Discharge	Describe Results from Test for the Present Non-Storm water Discharge	Identify Potential Significant Sources	Name of Person Who Conducted the Test or Evaluation
May 18, 1995	All Outfalls	Visual Inspection	No non-storm water discharges observed from GNB	Plant Entrance	Frank Huang - RMT, Inc.
	& Perimeter			Truck Staging Area	James Messer - GNB Technologies, Inc.
	of Property			North Slag Landfills	
				Sediment Disposal Area	
				Equipment Storage Area	
				South Disposal Area	
				Battery Casing Disposal	

CERTIFICATION

I certify under penalty of law that the outfall(s) covered by this Storm Water Pollution Prevention Plan have been tested or evaluated for the presence of nonstormwater discharges, and that all nonstormwater discharges from these outfall(s) are identified in either a Form 2C or Form 2E application for the outfall submitted to EPA.

A. Name & Official Title (type or print) Larry Eagan, Plant Manager	B. Area Code and Telephone No. (214) 336-2121
C. Signature	D. Date Signed

4.3.2 Outfall GP-2 Drainage Area

Outfall GP-2 receives storm water flow from the south disposal area. There are no other PCZs in this area. Standing water was visible at the inlet to the culvert leading to Outfall GP-2. This water is most likely the result of heavy rains over the days prior to the site inspection. The water did not appear to be increasing in volume over time and no flows were observed from the outlet of the culvert. No sheen or signs of discoloration were apparent on the water surface or surrounding soils. Based on the site investigation, non-storm water discharges to Outfall GP-2 were not present.

4.3.3 Outfall GP-3 Drainage Area

Ponding was evident in the area of the drainage ditch due to heavy rains prior to the inspection. Small areas of standing water were noted in the new slag landfill which were attributed to dust control activities. However, no flows were identified in association with the standing water. No sheen, discoloration, or sediment transport were observed in any section of the drainage ditch. In addition, no flows were seen entering the ditch except back flow from the North tributary. Since no outlets or flowing water were observed, non-storm water discharges were not present in this drainage area.

4.4 Historical Spills and Leaks

According to plant personnel, no spills or leaks have occurred at the GNB facility over the previous three years (Table 4-3). Maintenance personnel perform response and cleanup activities off small leaks (less than the reportable quantity) on an as needed basis. Since no liquid containers are stored or maintenance activities performed outside the containment berm of the facility, the risk of spills or leaks to outfalls identified in this general permit are highly unlikely.

According to a transmittal from the TNRCC Pollution Cleanup Division, no spills or leaks were noted in the files of the TNRCC. The Hazardous Materials Spill database did not contain any reference to the GNB Frisco facility. No complaint files or enforcement action files indicating spill problems were recorded at the TNRCC.

TABLE 4-3
HISTORICAL SIGNIFICANT LEAKS AND SPILLS

Incident Date (month/day/yr) & Time	Location	Description					Response Procedure		Response and Preventative Measures Taken
		Type of Material	Quantity Spilled	Duration (HRS)	Source, If Known	Reason for Release	Amt Material Recoverd	Material No Longer Exposed to Stormwater (true/false)	
FIRST YEAR PRIOR									
None reported for this site									
SECOND YEAR PRIOR									
None reported for this site									
THIRD YEAR PRIOR									
None reported for this site									

4.5 Potential Contact Zones

PCZs are defined in this plan as localized areas or activities within the facility which have a higher potential for contact of storm water with significant materials and that allow consolidated management of a potential source of storm water contamination. Only those areas of the facility representing a potential source of storm water run-off contamination are considered PCZs in this plan. The PCZs were identified based on a review of facility operations and records, interviews with plant personnel, and the site inspection. The following sections present descriptions of the individual sources of potential contamination occurring within each PCZ as required in the General Permit. BMPs utilized in these areas to minimize the potential for contamination are discussed in Section 5.0.

4.5.1 Outfall GP-1

There were two PCZs identified within Outfall GP-1. These PCZs were the entrance to the plant and the grassed area around the truck staging area.

PCZ 1 - Entrance to Facility

A significant amount of truck traffic occurs at the entrance to the facility. Trailers loaded with raw materials such as broken and intact batteries and scrap lead material routinely enter the facility. Loaded trailers carrying waste materials also pass through the entrance gate after being inspected and weighed at the weigh station. Because of the trafficking activities of carriers of raw materials and waste by-products there is potential for contact of materials with storm water.

PCZ 2 - Grassed Area Adjacent to Truck Staging Area

Several box trailers are typically parked in the truck staging area of the site. The staging area, however, is a PCZ associated with the existing Individual NPDES permit. Because of the proximity of the grassed area to the staging area, there remains a potential that materials contained in the box trailers may be washed into Outfall GP-1. These materials may be residuals from batteries, battery scraps, lead or lead oxide materials.

4.5.2 Outfall GP-2

Only one area was noted during the inspection as having potential contact of storm water that drains from Outfall GP-2.

PCZ 3 - South Disposal Area

The south disposal area was utilized for on-site disposal of iron oxide slag. Disposal activities in this area were completed in 19__ and the area was capped and vegetated. Exposure of the buried slag material to storm water is unlikely as long as the landfill cover is maintained. Some indications of minor erosion have been observed in the area during the site investigation. The bulk of this erosion is along the north face of the landfill. The erosion appears to be the result of periodic mowing.

4.5.3 Outfall GP-3

Four areas were noted as having potential contact of storm water that drains from Outfall GP-3. These areas were the slag landfills, Stewart Creek sediment disposal area, equipment storage area, battery casing chip disposal area, and the rail spur.

PCZ 4 - Slag Landfills

Two slag landfills were constructed south of the North tributary. The western landfill, which is closed and capped, was a disposal site for untreated slag material. Untreated slag material is molded from the furnace. To the east of the old slag landfill is the active landfill which is used for disposal of treated slag. The treatment process includes the mixing of the slag material with various stabilizing compounds to produce a Class II nonhazardous waste. The land disposal procedure involves spreading of the slag material over exposed landfill areas and routine spraying of the material with water to prevent dust generation.

During the site inspection, the active landfill was surveyed for pathways for slag material to enter the drainage ditch or tributary. The potential contact with storm water is apparent since the landfill is left exposed. However earthen berms around the landfill prevent storm water runoff. With both landfills, indications of natural erosion were observed especially along the banks of the tributary.

PCZ 5 - Stewart Creek Sediment Disposal Area

In the 19___, sediments were dredged from Stewart Creek. The dredged materials were disposed on-site in the area south of the new slag landfill (north of main plant). Following completion of the dredging, the sediment disposal pile was capped and covered with vegetation. The integrity of the grass cap is routinely inspected and maintained. There were no signs of slope instability or erosion during the site inspection. The potential risk in this area is storm water contact with the disposed sediments. This risk of exposure is greatly lessened with the well maintained landfill cover.

PCZ 6 - Equipment Storage Area

An uncovered equipment storage area is located between the north access road and the rail spur north of the production area. Equipment observed in this area include items such as pipes, polyplastic and metallic containers, old processing units, and various construction materials. Many of these items lie exposed to the weather. According to plant personnel, these items have been washed prior to being set in the storage area. These items will eventually be shipped for disposal or delivered to the furnace. The old equipment storage area is relatively flat and moderately vegetated with patches of exposed earth. The potential risk is storm water contact with oxidized equipment or residuals in containers. Since the area is flat, large flows are not anticipated to discharge to Stewart Creek. Contaminants carried by storm water from the equipment storage area is expected to enter the storm drain of the access road which will eventually drain to the North tributary.

PCZ 7 - Battery Casing Chip Disposal Area

According to plant personnel, the area northwest of the truck staging area was used for the disposal of battery casing chips. Municipal solid waste from the City of Frisco, Texas was also disposed in this area. Battery casing chips are now directly blown into trailers from the battery breaking operations. The chips are then shipped off-site for disposal or reclamation. During the site investigation, no mounds were observed in this area, but battery chips were present on the soil surface. The area was relatively flat and covered with grass. Storm water from this area is expected to flow either westward along the access road curbing or north to the drainage ditch. Storm water in the access road would be captured by the storm drain adjacent to the old equipment storage area. Since disposal and storage activities have been abandoned in this area, the potential risk of contact with storm waters is greatly minimized. However, since these activities have been practiced within the three years prior to the issuance of the General Permit this area must be included in the discussion.

PCZ 8 - Rail Spur

The rail spur north of the main plant services rail cars containing pure soft lead which is used in the production process. Forklifts are used to unload the lead material from the rail cars. The unloading area and the rail spur both lie outside the facility containment berm in an uncovered area. The unloading and transporting operations with this Section 313 chemical creates a source for potential contact with storm water. Contaminants carried by storm water from the rail spur is expected to enter the storm drain of the access road which will eventually drain to the North tributary.

Section 5.0
MEASURES AND CONTROLS

BMPs are described for general plant-wide operations and for each of the PCZs. These BMPs are designed to prevent accidental releases of materials used or handled at the site into the environment. BMPs include measures and controls implemented to promote good housekeeping, runoff management, and preventative maintenance. Additional controls and measures such as spill prevention techniques, inspections, employee training, and record keeping are addressed in separate sections. The BMP's were recommended in the EPA's publication for Storm Water Management for Industrial Activities (EPA 832-R-92-006, September 1992).

A number of baseline BMPs are utilized on a plant-wide basis at the GNB facility in the areas not under NPDES permit. These items are consistent with the baseline BMPs discussed in the General Permit and the NCTCOG BMP manual.

5.1 Good Housekeeping

- Garbage, trash, and waste material are collected for temporary storage in dedicated containers located indoors. Wastes are regularly collected from these containers and transferred to a covered container for transport to an off-site disposal.
- In the event a spill or release is detected, immediate action is taken in accordance with the procedures outlined in Section 5.6.
- Materials are stored away from direct traffic routes.
- Raw materials are not stored in the office parking lot.
- Materials and containers are stored in dry locations within the NPDES permitted area.
- All material packages and containers are properly labeled to show the type and name of material or substance.
- Batteries coming into the plant are covered with stretch wrap and other raw materials such as lead charge materials are brought into the plant in steel drums.

- Access into the plant is limited to prevent intentional or accidental intrusions which may result in storm water contamination.

5.2 Preventative Maintenance

- Heavy machinery, such as front end loaders, is routinely inspected by employees. Leaks or potential problems are reported to the plant manager and repairs are promptly scheduled.
- When machinery is found to be in need of repair, defective, or in any way unsafe, it is taken out of service until it has been restored to a safe operating condition.
- All repairs to machinery are made by trained, authorized personnel.
- Repairs and routine servicing to machinery are performed within the facility containment berm.
- Inspect all transport vehicles to ensure that materials are secured within or on the carrier and will not be lost in transit.

5.3 Prohibited Activities

- No liquids of any kind are dumped onto paved or grassed areas of the facility where they would discharge along with storm water.
- Hosing or spraying down pavement or floors is prohibited unless the rinse water can be collected and diverted to the sanitary sewer or a containment area for off-site disposal.
- Outdoor storage of significant materials is prohibited.
- Storage of open containers is prohibited in all areas of the facility.

5.4 PCZ-Specific Best Management Practices

In addition to the overall plant baseline BMPs outlined in the previous section, more advanced BMPs are utilized for many of the PCZs identified in Section 4.5. BMPs can be differentiated into four categories: 1) source reduction; 2) containment/diversion; 3) recycling; and 4) treatment. When selecting BMPs, EPA recommends that a practice that eliminates or reduces the amount of pollutants generated be selected (i.e., source reduction). Secondly, when it is possible, select options that recycle or reuse the storm water in the industrial process. Treating storm water is the next best option.

5.4.1 Outfall GP-1 Area BMPs

PCZ 1 - Entrance to Facility

- Sweep or remove any debris in the swale or parking lot that can be washed out by storm water.

PCZ 2 - Grassed Area Adjacent to Truck Staging Area

- Park trucks so that spills or leaks would be contained by the curbing of the concrete staging area.
- All material handling activities should be limited to within the facility containment berm.
- If loading/unloading must occur in this area, it is recommended that materials be covered with a tarp.

5.4.2 Outfall 002 Area BMPs

PCZ 3 - South Disposal Area

- Stabilize eroded soils either chemically or with vegetation.

5.4.3 Outfall 003 Area BMPs

PCZ 4 - Slag Landfills

- Stabilize eroded soils either chemically or with vegetation.
- Apply water over new fill material to control dust production, if necessary.

- This procedure is recommended at the end of each day material is disposed.

- Maintain the integrity of the berm between the drainage ditch and the active landfill.

PCZ 5 - Stewart Creek Sediment Disposal Area

- Stabilize eroded areas either chemically or with vegetation.

PCZ 6 - Equipment Storage Area

- Remove and properly dispose all unused materials in this area as soon as possible.

- Any stained soils should be removed, sampled to determine the waste classification, and properly disposed.

- All usable equipment or materials should be moved within the containment of the production area.

- Prohibit the storage of materials in this area in the future.

PCZ 7 - Battery Casing Chip Disposal Area

- Stabilize eroded areas with geotextile, clean fill, and vegetation.

PCZ 8 - Rail Spur

- Cover the loading/unloading area to reduce exposure to rain.
- Regrade loading area to allow runoff to enter the facility containment berm or construct an earthen berm around the loading/unloading area.
- Sweep or remove any residuals that spilled from loading/unloading operations or transport before it can be washed out by storm water.
- All fork lift operators should be properly trained.

5.5 Implementation of Best Management Practices

Proposed BMPs are summarized along with a schedule for implementation in Table 5-1.

Table 5-1
BEST MANAGEMENT PRACTICES IMPLEMENTATION SCHEDULE

Completed by: ______________
Title: ______________
Date: ______________

Instructions: Develop a schedule for implementing each BMP. Provide a brief description of each BMP, the steps necessary for implementation, the schedule for implementation (list dates), and the person(s) responsible for implementation.

BMPs Description	Description of Actions Required for Implementation	Scheduled Completion Dates for Required Action	Person Responsible for Action	Notes

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5.6 Spill Response

Spills of significant materials is highly unlikely outside the main facility and outside of the area controlled by the NPDES permitted outfall. However, materials may be lost in transport to or from the facility. Established procedures are to be used by facility personnel in the event of spills of significant materials. All facility personnel should be aware of these procedures in the event of an emergency. Facility personnel who may be involved in spill events should become familiar with the response procedures to the extent that during a spill emergency they can act without the need to refer to the plan for procedural guidance.

5.6.1 Spill Response Equipment Inventory

All spill response equipment must be maintained in a state of readiness at all times. A list of spill response and cleanup equipment and materials maintained onsite is provided in Table 5-2. Forms for updating the Spill Response Materials Inventory are included in Appendix C.

5.6.2 Spill Response Procedures

The following procedures should be implemented in the event of a release of significant materials. Common sense based on knowledge gained through the employee training program should be used when necessary to modify the procedures listed below when unforeseen circumstances occur.

(1) Notify the Emergency Coordinator - The first person on the scene should immediately notify the Emergency Coordinator. In the event that the Emergency Coordinator is not available, an alternate Pollution Prevention Plan Team Member should be contacted. Spill notification contact information is provided in Table 5-3.

Table 5-2

SPILL CONTACT INFORMATION

GNB FRISCO FACILITY

Pollution Prevention Team Members (GNB staff)
Plant Manager: Larry Eagan Office: (214) 335-2121 Home: ( )
Assistant Emergency Coordinator: Billy King Office: (214) 335-2121 Home: ( )
Texas Natural Resource Conservation Commission
Duncanville Office: 214-298-6171 Daily:
Office of Waste Management and Pollution Cleanup Daily: (512) 908 - 2508 (Austin) After Hours: (512) 463-7727 (Austin)
City of Frisco
Fire Department: (911) Emergencies Only

TABLE 5-3
SPILL RESPONSE MATERIALS INVENTORY

Inspector ______________________

Date ______________________

Location	Materials Description	Amount Required in Stock	Check	Amount Required Restocked	Check
Production Area	Shovels				
	Brooms				

GNBS 3 XLS

(2) Assess the spill - The Emergency Coordinator will immediately determine the character, exact source, and amount of any released materials. Response personnel will determine the need for notification of authorities and regulatory agencies and make a determination regarding steps required to safeguard personnel (i.e., evacuation, personal protection, etc.).

(3) Stop the flow at the source - After all required safety-related measures have been implemented, and if the potential for a further release still exists, then steps will be implemented to prevent further releases to the extent possible by cutting off the flow at the source. This may simply require the righting of a drum. In some instances, more extensive repairs may be necessary in which case outside contractors may be contacted to stop the flow.

(4) Spill containment - Immediately after determination of what safety precautions and containment equipment are required, then containment procedures will be implemented. Containment points include those perimeter outfalls that may be affected by the spill. In addition, portable booms, sand bags, and sorbent may be place around storm drains to prevent contaminants from entering storm sewers.

(5) Spill cleanup - To the extent practicable, spilled material should be retrieved and stored in leak-proof containers until proper disposal may be accomplished. Cleanup equipment includes pads, booms, and absorbent material. Contaminated equipment should be properly decontaminated or properly disposed. Depending upon the nature and extent of the release, the following procedures will be utilized:

- Whenever possible, dry clean-up methods, such as sweeping and sorbents should be utilized.
- When dry clean-up methods are not practicable or when the spilled substance is a liquid, booms and sandbags are used to prevent the release of the substance to the storm sewer system.

(6) Dispose of contaminated material - Contaminated material shall be disposed of off-site in accordance with all federal, state, and local regulations. Disposal will depend upon the nature and volume of the contaminated material.

(7) Record spill event information - The storm water pollution prevention team coordinator shall record the spill event as soon as practicable after. The record should include the location of the spill, spill time and date, weather conditions, duration of the incident, a description of the type and amount of material spilled and recovered, a brief description of the cause of the spill and any environmental damage, a list of parties notified, and a description of response procedures. In addition, an evaluation should be conducted to determine measures which can be implemented to prevent a repeat of the incident. Forms for completing the spill report are included in Appendix H.

(8) Update the SWPPP - Historical leaks and spills records should be updated to include information from the event. The spill description report should be filed in Appendix H if the spill resulted in the potential for storm water contamination. The plan will also be revised to reflect any changes in facility modifications or operating procedures resulting from the evaluation of the incident.

(9) Replace used spill equipment - Following each spill event, the inventory of response will be assessed and restocked as necessary.

5.7 Employee Training

Employee training programs have been established to inform personnel at all levels of responsibility at the plant of the components and goals of the SWPPP. Training methods include a review of appropriate plan sections and a demonstration in which proper materials handling procedures are explained at each of the identified PCZs. This training must be completed by new employees within one week of employment and by all employees annually through the use of refresher reviews for those employees that will come in contact with or handle significant materials. Temporary employees and contractors must be instructed as appropriate on proper materials handling procedures associated with each area they will be working in prior to beginning work. The schedule for pollution prevention training (Table 5-4) lists those personnel who must attend each portion of the training program and tentative dates when each are scheduled to occur.

Employee training for individuals whose work involves handling EPCRA Section 313 water priority chemicals must be trained at least once per year. The training must include pollution control laws and regulations related to storm water, provisions of this SWPPP, and features of the facility designed to minimize exposure of Section 313 materials to storm water.

5.7.1 SWPPP Review

Separate sections of the SWPPP address each of the components of the pollution prevention training program in detail. These should be reviewed and understood by all employees as scheduled in Table 5-4. The following list references each of the appropriate sections:

- Storm Water Pollution Prevention Team - Section 3.0;
- Description of Potential Contamination Sources - Section 4.0;
- Best Management Practices - Section 5.0;
- Spill Response - Section 5.6; and
- Inventories and Inspections Record Keeping - Section 6.0.

5.7.2 Storm Water Pollution Prevention Demonstration

During each annual or new employee training session, a walk through of the plant areas where the employee will be working should be conducted. Each of the PCZs where significant materials and spill response equipment are located should be identified and BMPs demonstrated. Each employee must become familiar with the following items within his assigned work area:

- Location of all spill response materials;
- Use of absorbents and spill containment dikes;
- Use of reporting forms and contacts; and
- Disposal of materials used during spill cleanup.

TABLE 5-4
EMPLOYEE TRAINING SCHEDULE

Training Topics	Brief Description of Training Program/Materials	Schedule for Training (list dates) *	Attendees
Spill Prevention and Response	Review Section 3.0 Storm Water "Pollution Prevention Team" Review Section 4.0 "IDescription of Potential - Pollutant Sources" Review Section 5.0 "Measures and Controls"	July 1995	All Personnel
Good Housekeeping & Material Management Practices	Review Section 5.0 "Measures and Controls"	July 1995	All Personnel
Inventories, Inspections & Record Keeping	Review Section 6.0 "Inventories and Inspections Record Keeping"	July 1995	Pollution Prevention Team Members
EPCRA Section 313 Materials Handling Practices and Containment	Review Section 5.0 "Measures and Controls"	July 1995	Rail Car Unloading and Landfill Personnel
Stormwater Discharge Regulations	Review Section 2.0 "General Permit Requirements"	July 1995	All Personnel Handling Significant Materials

* After this date, training must be completed within six months of employment for new employees.

Section 6.0

INVENTORIES AND INSPECTIONS RECORD KEEPING

Periodic inspections and inventory assessments should be conducted to maintain a record that may be used to recognize areas for improvement in pollution prevention and identify materials that must be restocked. Inspections should be conducted for each of the PCZs. Inventory procedures are used for significant materials stored on-site as well as for spill control and clean-up equipment. Deficiencies revealed during inventory and inspection procedures which require further action, such as purchasing parts or replacement equipment, should be communicated to the SWPPP coordinator. Once the required actions are taken, the inventory forms should be updated.

6.1 Significant Materials Inventory Procedures

Updating the inventory of significant materials is an ongoing task that should be conducted at least once every six months or any time materials management areas are altered by changing the location or type of material stored. The procedures in the inventory update will be as follows:

(1) Obtain a blank "Significant Materials Inventory" form from Appendix B.

(2) Fill out all sections of the form as appropriate for any significant materials stored on-site.

(3) For new materials, provide any known specific constituents listed on the material safety data sheets (MSDS) as a subcategory of the main material description.

(4) Initial and date the form in the space provided in the upper right corner.

(5) Replace the updated inventory list (Table 4-1, Section 4.2) in the master plan copy, place the old copy in Appendix I.

6.2 Spill Response Equipment Inventory

Inventory records for spill response materials and equipment should be updated at least every six months and following each spill event. Information must include a description of available equipment and its location. The following procedures will be followed when conducting the spill response equipment inventory:

(1) Obtain a blank copy of the "Spill Response Materials Inventory" (Appendix C).

(2) Verify that the required number of each item is available and in the designated location.

(3) Indicate the amounts of each material that must be restocked in the right column.

(4) If restocking is required, make arrangements for ordering the required materials.

(5) Check off each item as it is restocked.

(6) Replace the updated Spill Equipment Inventory (Table 5-3) in the master plan copy, place a photocopy in the reading plan copy, and place the old copy in Appendix I.

6.3 Inspection Procedures

Periodic inspections are required to ensure good materials handling practices are followed, required spill response equipment is maintained in a state of readiness, and good condition of landfill cover is maintained such that releases of contaminants and waste materials are prevented. "Inspection Checklists" specifically prepared for each PCZ area are provided in Appendix G.

Inspection schedules are presented in Table 6-1. All inspections shall be performed by SWPPP team members under the supervision of the team coordinator. Blank inspection checklists for each of the areas are presented in Appendix G. The following inspection procedure should be followed:

Table 6-1
Inspection Schedule

Area of Inspection	Frequency	Assigned Personnel
Facility Entrance	Monthly (minimum)	
Grassed Area Adjacent to Staging Area	Monthly (minimum)	
South Disposal Area	Monthly (minimum)	
Landfill Areas	Monthly (minimum)	
Sediment Disposal Area	Monthly (minimum)	
Equipment Storage Area	Monthly (minimum)	
Battery Casing Disposal Area	Monthly (minimum)	
Rail Spur and Unloading Operations	Monthly (minimum)	

(1) Obtain a copy of the appropriate inspection checklist from Appendix G.

(2) Enter the inspection date and your initials at the top of the checklist.

(3) In the left column, check off each of the items listed as passing or failing.

(4) If a violation is found that cannot be corrected immediately, such as those requiring replacement parts that are not available, note the recommended corrective action in the right column of the form refer the form to the SWPPP coordinator.

(5) When recommended actions have been completed, indicate the date in the space to the right of the "recommended action" column.

(6) When each of the recommended actions on the inspection checklist have been resolved, place the form in Appendix I.

Section 7.0
STORM WATER MONITORING

7.1 Monitoring Requirements

Three points of storm water discharge are present at the GNB site - Outfalls GP-1, GP-2, and GP-3 (Figure 4-1). Samples should consist of a representative grab and composite of the discharge from each of the three outfalls.

Based on the current and historical operations of the GNB facility, there is a potential for contact of storm water with arsenic, lead, and sulfuric acid which are an EPCRA Section 313 water priority chemicals. The facility also has a SIC code of 3341, land disposal units, and is a battery reclaimer. Under the General Permit, GNB is, therefore, required to conduct semi-annual monitoring of storm water discharges.

The sampling program (Table 7-1) should be conducted to satisfy the requirements listed for a water priority chemical facility, industry with an SIC code of 33, industry with land disposal units, and a battery reclaimer. Since some of the parameters overlap, the GNB facility is required to monitor for the following:

- Oil and grease (mg/l);
- Five day biological oxygen demand (mg/l);
- Chemical oxygen demand (mg/l);
- Total suspended solids (mg/l);
- Total dissolved solids (mg/l);
- Total organic carbon (mg/l);
- Total Kjeldahl nitrogen (mg/l);
- Total phosphorus (mg/l);
- Total sulfuric acid (mg/l);
- pH;
- Acute whole toxicity; and
- Total recoverable lead, arsenic, antimony, barium, cadmium, chromium, copper, cyanide, magnesium (total and dissolved), mercury, selenium, and silver.

Acute whole effluent toxicity can be replaced with analysis of pollutants identified in Tables I and II of Appendix D of 40 CFR 122 that the discharger knows or has reason to believe are present at the site. For the GNB Frisco site, these parameters should include antimony, aresenic, lead, and phenols. Since antimony, arsenic, and lead are already included in the sampling requirements, only phenols would need to be added.

7.2 Storm Water Sampling Procedures

The storm water sampling procedures outlined in the General Permit will be utilized at the GNB site. These procedures include:

- Collection of both composite and grab at Outfalls GP-1, GP-2, and GP-3. The composite samples will be analyzed for all of the parameters listed in Table 7-1 except for pH, oil and grease, and whole effluent toxicity.
- The analytical laboratory should be contacted to determine the volume of sample necessary to conduct all analytical tests. More than 1,000 ml aliquot samples may be necessary to obtain sufficient volumes for the composite sample. Bottles, coolers, preservatives, and chain-of-custody (COC) forms should be obtained from the laboratory prior to collection of storm water samples.
- Storm events suitable for sampling must be greater than 0.1 inches in magnitude and at least 72 hours must have passed since the previous storm event of 0.1 inches or more.
- Grab samples shall be collected within the first 30 minutes of discharge.
- The pH of grab samples must be measured and recorded in the field.
- Composite samples may be either flow-weighted or time-weighted. Samples may be collected with a continuous sampler or as a combination of a minimum of three sample aliquots taken in each hour of the discharge for the entire discharge or for the first three hours of the discharge. Aliquots must be separated by a minimum of 15 minutes.
- Each time samples are prepared for shipment to the laboratory, a COC must be completed and accompany the shipment. Whenever custody of the samples is transferred, the individuals relinquishing and receiving them must sign, date, and note the time of transfer on the form. The original COC form must accompany the shipment of samples to the laboratory and, upon receipt, will be returned to the GNB to document that the chain was unbroken.

- The acute whole effluent toxicity test shall be conducted on a grab sample and will utilize both of the following tests in accordance with standard TNRCC testing procedures:

(1) Acute static 24-hour definitive toxicity test using Daphnia pulex. A minimum of four replicates with a minimum of five organisms per replicate shall be utilized.

(2) Acute static 24-hour definitive toxicity test using fathead minnow. A minimum of four replicates with a minimum of ten organisms per replicate shall be utilized.

7.3 Storm Water Monitoring Data

As monitoring is performed, laboratory data sheets with analytical results for all storm water samples collected will be placed in Appendix I. In addition, any other analytical data which may be indicative of the storm water quality in the areas covered by this SWPPP will also be included in Appendix I. The following information must also be gathered to describe the nature of the sample:

- Date and duration (in hours) of the storm event(s) sampled;
- Rainfall measurement or estimates (in inches) of the storm event;
- Duration between the storm event sampled and the end of the previous measurable storm event; and
- Estimate of total volume (in gallons) of the discharge sampled.

As monitoring is performed, annual summaries of the results of the sampling and biomonitoring shall be submitted to the EPA by the following January 28 of each year on Discharge Monitoring Report (DMR) Forms. A separate DMR form should be submitted for each sampling period. Signed copies of the DMRs shall be submitted to the following address:

United States EPA, Region VI
Water Management Division (6W-EA)
Storm Water Staff
First Interstate Bank Tower at Fountain Place
1445 Ross Avenue, Suite 1200
Dallas, TX 75202

Copies of the DMRs should also be provided to the TNRCC.

7.4 Submission of Historical Storm Water Monitoring Data

The General Permit requires that the SWPPP include the results of any available storm water monitoring data obtained in the past regardless if storm water monitoring is performed as a requirement of the General Permit. From discussion with plant personnel, no storm water monitoring has been performed to date at the GNB Frisco facility.

Table 7-1

GENERAL PERMIT MONITORING REQUIREMENTS

GNB FRISCO FACILITY

Type of Facility	Parameters	Sampling Periods	Report Data
EPCRA Section 313 Facilities	Oil and grease pH Total Kjeldahl Nitrogen Total Suspended Solids Biochemical Oxygen Demand Chemical Oxygen Demand Total Phosphorous Acute Whole Effluent Toxicity Total Recoverable Lead[2] Total Recoverable Arsenic[2] Total Recoverable Antimony[2] Total Sulfuric Acid[2]	January - June July - December	January 28
Primary Metal[1] Industries (SIC code 33)	Total Recoverable Cadmium Total Recoverable Copper Total Recoverable Chromium	January - June July - December	January 28
Landfill Units [1]	Magnesium (total) Magnesium (dissolved) Total Dissolved Solids Total Organic Carbon Total Recoverable Barium Total Recoverable Cadmium Total Recoverable Chromium Total Recoverable Cyanide Total Recoverable Mercury Total Recoverable Selenium Total Recoverable Silver	January - June July - December	January 28
Battery Reclaimer[1]	All analytes are included under the requirements for Section 313 facilities, landfill units, and primary metal industries.	January - June July - December	January 28

[1]Parameters not included under 313 Facilities.

[2]EPCRA 313 water priority chemical at facility.

Section 8.0
ANNUAL PLAN EVALUATION

An evaluation should be conducted annually by the storm water pollution prevention team under the supervision of the team coordinator (or authorized agent) to provide a basis for determining the overall effectiveness of the SWPPP and to update the plan with changes dictated by changes in facility operations and/or alternative BMPs. The evaluation should be used to verify that sources of potential storm water contamination, site drainage map features, and BMPs accurately reflect current on-site conditions. The results of the evaluation should be used to revise the plan as needed. In addition, a summary report should be prepared which details the revisions to the plan.

8.1 Steps in Conducting the Plan Evaluation

The following steps are offered as guidance for the annual evaluation. They cover all aspects of the plan that are subject to revision as materials storage and handling practices change and as better methods are found to implement the SWPPP.

Table 3-1 - Pollution Prevention Team Member Roster

- Revise Table 3-1 as needed to reflect the current list of pollution prevention team members.

Figures 1-1 and 4-1 - Site Maps

- Obtain a copy of the site maps from files or contact RMT, Inc. at (214) 490-8696.
- Revise drainage area boundaries, outfall locations and discharge flow paths included within each drainage area as needed.
- Revise structures shown on the base site map to reflect current conditions.
- Incorporate each PCZ area described in Section 4.5 on the base site map.

Section 4.1 - Site Drainage and Outfalls

- Revise Section 4.1 as needed to reflect current discharge flow paths affected by existing potential contaminant sources.

Section 4.2 - Significant Materials Inventory

- Update Table 4-1 as appropriate to include current information concerning significant materials stored on-site. If changes are required, initial and date the table in the upper right corner. Procedures for conducting the inventory are included in Section 6.1.

- Revise the subsections of Section 4.5 (PCZs) to reflect current sources of contamination to storm water.

Section 4.3 - Identification of Non-Storm Water Discharges Associated with Industrial Activity

- If any new, potential sources of non-storm water discharges have been added at the facility since the previous plan amendment, conduct a new certification as outlined in Section 2.2.2.

Section 4.4 - Historical Leaks and Spills

- Update Section 4.4 as needed to describe recent spill events.

Section 5.0 - "Best Management Practices"

- Rate the effectiveness of in-place BMPs by reviewing spill investigation reports, visual inspections checklists, significant material inventory records, historical leaks and spills records, and interviews with facility operating personnel.

- Inspect each storm water drainage area for evidence of pollutants entering the drainage system.

- Based on review of the above sources, consider the benefit of adding and/or removing existing BMP's.

- Revise each subsection of Section 5.0 as appropriate to describe current BMPs.

- Obtain a copy of "Best Management Practices Implementation Schedules" from Appendix F and list all planned BMP additions and modifications with their respective implementation date. This information should be incorporated into the plan evaluation summary report developed later as described in Section 8 below. Revise Section 5.4 and Table 5-1 as appropriate. Planned modifications to BMPs must be completed within 12 weeks of the plan evaluation.

Section 5.6 - Spill Response

- Review spill event reports to identify deficiencies in the inventory of spill response equipment. Revise Table 5-2 "Spill Response Materials Inventory" as appropriate to reflect any changes to the list of available equipment.

- Revise Section 5.6 to reflect any changes made in spill response procedures. The specified procedures should be checked against GNB's Contingency Plan to verify agreement between the two plans.

Section 5.7 - Employee Training

- Evaluate the effectiveness of the employee training program by reviewing spill investigation reports and inspection records. If more frequent scheduling of refresher courses is warranted, revise Table 5-4 "Employee Training Schedule" as appropriate.

Section 6.0 - Record Keeping and Inspections

- Review Appendix I to ensure that records and inspection forms have been properly completed and filed as required. Revise record keeping procedures to eliminate any deficiencies.

- Review completed inspection forms and other records to evaluate the effectiveness of the frequency and scope of the inspection program. Revise Table 6-1 as appropriate.

Section 7.0 - Storm Water Monitoring

- Review the terms of the current General Permit and the activities of the plant to determine if storm water monitoring is now required and which parameters should be sampled at what frequency.

8.2 Plan Evaluation Summary Report

A report summarizing the results of the annual evaluation must be developed and kept with the revised plan. The report should contain details of the site evaluation and any modifications to be made to the plan. An implementation schedule must be included for any planned changes to BMPs that are not in place at the time of the summary report. Additional requirements include the inspection date, names of personnel conducting the inspection, either identification of incidents of noncompliance or a certification of plan compliance, and a certification signature. The certification must be signed by an authorized facility representative who has been delegated the authority to sign and certify this type of document. Normally, this would be someone in upper management such as the president, vice president, or production manager. Section 309 of the Clean Water Act provides for significant penalties where information is false or the permittee violates, either knowingly or negligently, its permit requirements. A suggested format for the annual plan evaluation summary report format is provided in Appendix H.

8.3 Finalization of Plan Revisions

Print the updated version of the plan to serve as the new master copy, and file the outdated master copy as required for records. Revisions to the plan must be final within two weeks of the evaluation.

REGISTERED PROFESSIONAL ENGINEER'S CERTIFICATION

FOR FACILITIES REPORTING UNDER EPCRA SECTION 313:

I certify that this plan and all attachments were prepared under my direction or supervision in accordance with good engineering practices.

Name and Title ______________________________

Signature ____________________ Date __________________

Section 9.0

STORM WATER POLLUTION PREVENTION

PLAN CERTIFICATION

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 gathered and evaluated 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 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.

Name and Title ______________________________

Signature ____________________ Date ____________________

APPENDIX A

GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY

APPENDIX B

SIGNIFICANT MATERIALS INVENTORY DATA FORMS

APPENDIX B
SIGNIFICANT MATERIALS INVENTORY
(CONTINUED)

Material Description	Location (PCZ) *	Quanity Stored On-site (Avg)	Container	Quantity Exposed in Last 3 Years	Liklihood of Contact with Stormwater If yes, describe reason.	Past Significant Spill or Leak	
						Yes	No

APPENDIX C

SPILL RESPONSE MATERIALS INVENTORY BLANK FORMS

APPENDIX C
SPILL RESPONSE MATERIALS INVENTORY

Inspector ____________________

Date ____________________

Location	Materials Description	Amount Required in Stock	Check	Amount Required Restocked	Check

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APPENDIX D

SPILL REPORT BLANK FORMS

Spill Investigation Form

Date and Time of Incident: ____________________

Weather Conditions: ____________________

Duration of Incident (hours) : ____________________

Type of Material Spilled: ____________________

Amount Spilled (include units): ____________________

Amount Recovered: ____________________

Cause of the Spill: ____________________

Environmental Damage: ____________________

Response: ____________________

Spill Investigation Form
(continued)

Parties Notified: ____

Evaluation of Plan Effectiveness in Directing Spill Response

BMP Program: ____

Operating Procedures: ____

Spill Investigation Form
(concluded)

Spill Response Equipment: ______________________________

APPENDIX E

HISTORICAL LEAKS AND SPILLS BLANK FORMS

APPENDIX E
HISTORICAL SIGNIFICANT LEAKS AND SPILLS

Incident Date (month/day/yr) & Time	Location	Description					Response Procedure		Response and Preventative Measures Taken
		Type of Material	Quantity Spilled	Duration (HRS)	Source, If Known	Reason for Release	Amt Material Recovered	Material No Longer Exposed to Stormwater (true/false)	

** Location description corresponds to locations shown on facility site map.

APPENDIX F

BEST MANAGEMENT PRACTICE IMPLEMENTATION SCHEDULE FORMS

APPENDIX F
BEST MANAGEMENT PRACTICES IMPLEMENTATION SCHEDULE

Completed by: ____________
Title: ____________
Date: ____________

Instructions: Develop a schedule for implementing each BMP. Provide a brief description of each BMP, the steps necessary for implementation, the schedule for implementation (list dates), and the person(s) responsible for implementation.

BMPs Description	Description of Actions Required for Implementation	Scheduled Completion Dates for Required Action	Person Responsible for Action	Notes
	1.			
	2.			
	3.			
	1.			
	2.			
	3.			
	1.			
	2.			
	3.			
	1.			
	2.			
	3.			
	1.			
	2.			
	3.			
	1.			
	2.			
	3.			
	1.			
	2.			
	3.			
	1.			
	2.			
	3.			
	1.			
	2.			
	3.			

APPENDIX G

INSPECTION CHECKLIST FORMS

DAILY INSPECTION LOG

Inspector's Name/Title: ______________________________

Date of Inspection: ______________________________

Time of Inspection: ______________________________

Specific Item	Types of Problems	Status (x) If OK ( ) If Not	Observations	Date and Nature of Repair/ Remedial Action
Plant Entrance/Office Parking Lot	Spillage, vehicle leaks			
Slag Landfill (north)	Erosion, slag discharge in drainage ditch, dust production			
Slag Landfill (south)	Erosion, slag discharge in drainage ditch			
Equipment Laydown Area	Stained soils, liquid accumulation			
Rail Spur	Stained soils, residue of materials			

WEEKLY INSPECTION LOG

Inspector's Name/Title: ______________________________

Date of Inspection: ______________________________

Time of Inspection: ______________________________

Specific Item	Types of Problems	Status (x) If OK ( ) If Not	Observations	Date and Nature of Repair/ Remedial Action
Grassy Area Adjacent to Truck Staging Area	Stains, spills			
South Disposal Area	Erosion, accumulation of water			
Old Slag Landfill	Erosion			
New Slag Landfill	Erosion, dust, migration of slag material			
Sediment Disposal Area	Erosion			
Equipment Storage Area	Accumulation of liquids, stained soils, leaks or spills			
Battery Casing Chip Disposal	Accumulation of water, erosion, exposed casing chips			
Access Roads and Facility Entrance	Stains or spills, dust			

APPENDIX H

PLAN EVALUATION SUMMARY REPORT FORMAT

PLAN EVALUATION SUMMARY REPORT FORMAT

A. Evaluation Procedures

1. Inspection Date
2. Personnel Conducting Inspection
3. Describe

B. Incidents of Non-Compliance (or indicate the plan was in compliance)

C. Modifications to the Storm Water Pollution Prevention Plan

1. Potential Sources of Storm Water Contamination

   a. Materials Inventory
   b. Potential Contact Zones
   c. Non-Storm Water Discharges
   d. Historical Leaks and Spills
   e. Storm Water Discharge Flow Paths

2. Best Management Practices

3. Inventory Procedures

   a. Significant Materials
   b. Spill Response Equipment

4. Inspection Procedures

5. Spill Response Procedures

6. Employee Training

Attachment A. Non-Storm Water Discharge Evaluation Certification

Attachment B. Planned Implementation Schedule

Attachment C. Signed Summary Report Certification

APPENDIX I

RECORD KEEPING FOR SWPPP ACTIVITIES

Section 8
GROUND-WATER MONITORING PLAN

8.1 Purpose and Scope

A ground-water monitoring system is proposed at the GNB facility landfill in order to effectively monitor the quality of ground water present at the landfill. The monitoring system will be designed to monitor the upgradient (background) and downgradient ground-water quality from the shallow, unconfined, aquifer present at the landfill. The system will effectively monitor any changes to the quality of the ground water that could be attributable to potential releases from the landfill. This plan will be followed during the active life of the landfill, and throughout the Post-Closure period. This program has been designed to provide the following elements:

- Sample monitoring wells to assess the ground-water quality below the base of the landfill;
- Implementation of a routine monitoring program that will develop, compare, and report data from landfill monitoring wells from an on-going basis during the active life of the facility (30 years) and the Post-Closure Care Period for the purpose of detecting chemical changes to the ground water;
- Development of procedures to evaluate the ground-water data collected during the routine monitoring program and report apparent changes in the chemical quality of ground water to the TNRCC; and
- Response to changes in the chemical quality of the ground water which might be attributable to a possible release from the landfill.

8.2 Monitor Well System

Ground water at the landfill is present in the unconsolidated soils at depths of approximately 10 feet below ground surface. Ground water generally flows in a southwesterly direction toward Stewart Creek. The monitoring system will be designed to utilize as many of the existing monitoring wells as construction allows, however some new wells will need to be constructed. Figure 8-1 indicates the approximate locations of the proposed monitoring system. In order to effectively monitor ground-water quality, the proposed monitoring system will consist of four shallow ground-water monitoring wells. The system will utilize two existing wells, LMW-5 and LMW-17, and two proposed wells. The two existing wells are located down-gradient of the proposed landfill and an additional monitoring well will be installed west of the landfill. The location of these wells, shown in Figure 8-1, will monitor the ground-water quality exiting the landfill. A monitoring well will be installed in the northeast corner of the site to monitor background water quality. Due to construction design of the proposed landfill, two existing wells (LMW-7 and LMW-10) will be plugged according to the requirements of 30 TAC Chapter 338 (Water Well Drillers Rules). The remaining landfill wells (LMW-1 through LMW-4 and LMW-8 and LMW-9) at the site will be utilized as piezometers, providing water level data during each sampling event.

The soil borings for the two proposed monitoring wells will be drilled by a State of Texas licensed monitoring well driller using hollow-stem augers. As the augers are advanced, continuous soil samples will be obtained for lithologic description using a five-foot-long inner-auger core-barrel sampler. Soils will be logged in the field by a geologist using the Unified Soil Classification System. This description will be used to select the depth of well construction and material settings.

The monitoring wells will be constructed with two-inch I.D. schedule 40 poly vinyl chloride (PVC) casing with flush-threaded connections and will conform to the standards of 30 TAC Chapter 338 (Water Well Drillers Rules). No solvents or glue will be used for construction. The screen will consist of two-inch I.D. schedule 40 PVC with 0.010-inch wide mill-slotted openings, and will be equipped with a threaded bottom cap. A clean, rounded, silica sand filter pack material will be poured between the casing and the hollow stem auger as the auger is slowly removed from the borehole. The filter pack material will extend approximately two feet above the top of the screen. A bentonite seal with a thickness of at least two feet will be placed above the filter pack material and hydrated. After allowing sufficient time for the bentonite to hydrate, a bentonite and cement grout will be poured to within two to three feet of the ground surface. A steel protective casing, having minimum diameter of four inches, will be lowered into the borehole over the well casing and concrete will be poured around the protective casing to the ground surface. A concrete pad having minimum dimensions of three feet by three feet by six inches will be constructed at the surface around the protective casing. The well will also be protected with guard posts set approximately one foot beyond the corners of the concrete pad. A typical well construction diagram is presented in Figure 8-2.

Following construction, the monitoring wells will be developed by either bailing, swabbing, surging, or submersible pump until discharge is relatively clear and free of sediment. Well development will be documented in the field on development forms.

The PVC well casing will be capped with a vented, slip or threaded cap to allow for equalization inside the well to atmospheric conditions. The protective casing will be equipped with a locking lid and lock to prevent tampering. The location of the well will be surveyed by a Registered Surveyor to within 0.1 foot horizontally and 0.01 foot vertically.

The monitoring wells will be inspected semi-annually for signs of damage. Damage to a well will be repaired promptly and the date of the repair will be noted. Records of monitoring well inspections, damages, and repairs will be maintained.

8.3 Ground-Water Monitoring Program

The ground-water monitoring program will be designed to assess the quality of ground water present beneath the landfill. The program will allow for the detection of any releases of constituents to the ground water from the landfill should they occur.

8.3.1 Water Level and Well Depth Measurement

The monitoring wells will be checked semi-annually with an electric water-level probe (E-line) for the presence of water by lowering the E-line to the static water. The depth to the ground water will be measured from the surveyed point on the top of the well casing. The water level will be recorded to the nearest 0.01 foot on the field data sheet.

The total depth of the monitoring well will be measured annually to assess for the presence of silt settling in the bottom of the well. The total depth of the well will be measured from the surveyed point on the top of the well casing and recorded to the nearest 0.01 foot on the field data sheet.

The E-line and the equipment used for measuring well depth will be the only pieces of non-dedicated equipment which enter the monitoring wells. This equipment will be decontaminated between measurements. Decontamination will include a low phosphate detergent wash with a distilled water rinse.

8.3.2 Ground-Water Monitoring Schedule and Parameters

Ground water samples will be collected from the four monitoring wells on a semi-annual basis. The sampling events will take place during the second (April through June) and the fourth (October through December) quarters of each year. The monitoring program will be initiated in the subsequent second or fourth quarter following the start-up of landfill operations. The monitoring program will continue throughout the operation of the landfill and during the Post Closure period.

The ground-water samples collected during each sampling event will be submitted to a laboratory for analysis of the parameters listed in Table 8-1. The samples will be analyzed for dissolved cadmium and lead. The parameters pH and specific conductance will be analyzed both in field during purging procedures and in the laboratory.

8.3.3 Sampling Preparation

Sample containers will be prepared and shipped from the laboratory. Table 8-2 lists the sample containers, preservation, and holding times associated with each parameter.

All equipment required for the sampling event (i.e. E-line, pH meter, conductivity meter, gloves, labels, etc.) will be assembled and inspected prior to the monitoring event to ensure proper operation. The pH meter and conductivity meter will be calibrated before collection of the first sample, with the results of this calibration recorded on the monitoring record sheet. Calibration procedures will be in accordance with the manufacturers' recommendations. Calibration will be repeated as necessary during the monitoring event.

8.3.4 Well Purging

After determination of the depth of water, purge volumes will be calculated on the monitoring record sheet. Prior to sampling, the concrete pad or the ground surrounding the wells will be covered by disposable plastic sheeting to prevent contamination of sample equipment during purging of the wells. The wells will be purged by either pumping or bailing depending on the recharge rate for each well, the chosen purge method will allow for a ground-water sample that best represents the true aquifer conditions at that well. Monitoring wells will be purged until three well volumes have been removed or until the well is purged dry. The purge water will be contained for subsequent proper disposal.

Initial conductivity, temperature, and pH measurements will be obtained prior to purging each well. If the well recovers rapidly enough to permit additional purging, the measurements will be repeated at each well volume. If at the end of three well volumes, the indicator parameters are still changing, and recovery rates permit, purging will continue until stabilization occurs. When stabilization occurs, the pH, temperature, and conductivity will be measured and recorded on the monitoring record sheet.

8.3.5 Sample Collection

Each monitoring well will be sampled following purging procedures. After removal of the purge water, the wells will be sampled providing the well has recovered enough ground water to fill the sample containers. If ground-water recovery is slow, then ground-water samples will be collected as soon after the well has recovered sufficient volume. The clarity, color, and odor for each ground-water sample will be recorded on the monitoring record sheet. Field conditions such as weather and air temperature will also be noted and recorded on the monitoring record sheet. At the time of sampling, the label of the sample container will be completed with the following information: the date, time, facility name, sampler's name, sample identification, and analyses requested. After the sample bottles have been filled, sealed, and labeled, the sample bottles will be placed in sealed plastic bags and placed on ice in a cooler. Samples will be kept on ice until they are received at the laboratory.

8.3.6 Sample Handling, Shipping, and Chain-of-Custody

Once an ice chest becomes full of samples, the excess melted water will be drained and the chest repacked with ice. If samples are shipped to a laboratory by commercial carrier, the completed chain-of-custody form (minus the sampler's copy) for the samples contained in each cooler will be sealed in a plastic bag and taped to the inside top of the cooler. The ice chest will then be taped shut with either packing tape or strapping tape. The samples will then be shipped or transported to the analytical laboratory.

A chain-of-custody record will be maintained to trace possession and handling of individual samples from the time of field collection through laboratory analysis. Whenever custody of the samples is transferred, the individuals relinquishing and receiving them will sign, date and note the time on the form. The original will accompany the shipment to the laboratory and, upon receipt, will be returned to the project office to document that the chain was unbroken. The chain-of-custody record will contain the following information:

- Site identification;
- Signatures of sample collectors;
- Sample identification number;
- Date and time of sample collection;
- Type of sample;
- Number of sample containers;
- Analysis requested;
- Sample preservation procedures;
- Signatures of persons involved in sample possession; and
- Dates and times of sample relinquishment.

8.3.7 Field QA/QC Procedures

The quality objective for field sampling is to obtain data which accurately represent the parameters of variations at each monitor well. This data must be comparable to allow each sampling event to be compared to another. The following field quality control procedures will be implemented for the monitoring program.

1. All sample containers will be new and clean containers. Sampling equipment will be thoroughly cleaned prior to sampling.

2. Disposable protective gloves will be used while collecting each sample.

3. To the extent possible, the quantity and types of samples and the sample locations will be determined before the actual fieldwork.

4. All samples will be collected in similar fashion to minimize the random error associated with sampling.

5. Replicate water samples will be collected to provide confidence that representative values are being reported.

6. An appropriate volume of sample will be collected to provide a good representation of the water being sampled.

7. As few people as possible will handle the samples.

8. Samples will be placed in glass or polyethylene containers with non-metallic Teflon ® lined caps as provided by the laboratory.

9. A pH meter will be used for performing field analytical measurements. The meter will be calibrated in accordance with the manufacturer's specifications and re-calibration will be performed as necessary depending on field conditions. To assure quality control for field pH analyses, duplicate samples and check standards will be analyzed.

10. A conductivity meter will be used for performing field analytical measurements. To assure quality control for field specific conductance analyses, duplicate samples and check standards will be analyzed. The meter will be calibrated in accordance with the manufacturer's specifications and re-calibration will be performed as necessary depending on field conditions.

11. A bound field notebook will be maintained to provide records of significant events and observations. Pertinent data collected from the monitoring and/or sampling of the wells will be recorded on the monitoring record sheets. All entries will be dated and kept as a permanent record. All entries will be made using a pen or indelible marker.

8.3.8 Laboratory QA/QC Program

Prior to implementation of the plan, a laboratory or laboratories will be selected. Only laboratories with an established and written QA/QC plan and adequate documented proof of adherence to the plan will be considered in the selection process. The laboratory will be required to provide a copy or copies of its QA/QC Plan and QA/QC documentation for the project files.

8.4 Ground-Water Data Evaluation

8.4.1 Reporting Procedures

Within 30 days of the receipt of the final ground-water analytical results from the laboratory, GNB will complete a Semi-Annual Ground-Water Monitoring Report. This report will be included in the facility operating record. The following information will be provided in the report:

- Date of the ground-water sample event;
- Ground-water elevation in individual monitor wells;
- Analytical measurements reported by the laboratory; and
- Evaluation of the ground-water data.

The results of each set of water-level measurements and analysis of ground-water samples obtained during facility ground-water monitoring will be reported in accordance with the requirements of the permit.

8.5 Response to Indication of a Subsurface Release

8.5.1 Verification of Indications of a Subsurface Release

If evaluation of the results of ground-water monitoring indicates that a subsurface release from the landfill may have occurred, a verification procedure will be implemented to confirm the findings. The procedure will provide for the following actions:

1. Ground-water confirmation samples will be obtained from the affected monitoring well or wells for analytical testing for the parameters of interest.

2. A comparison will be performed between the analytical results obtained from the confirmation samples and the results of the analyses of the previous sampling.

3. If a difference which is determined to be significant is verified, GNB will notify the Executive Director of the TNRCC in writing.

4. If the comparison indicates that the difference in analytical data was caused by some other source, such as sample collection, GNB will notify the Executive Director of the TNRCC and ground-water monitoring will continue on a semi-annual basis.

8.5.2 Reporting Confirmation of Indications of a Subsurface Release

If indications of a subsurface release is confirmed as a result of monitoring, GNB will report the following to the Executive Director of the TNRCC:

1. Notification that an indication of a subsurface release has been confirmed will be provided within 30 days of confirmation; and

2. Results of monitoring carried out to confirm the indication of a subsurface release will be reported within 30 days of receipt of completed laboratory analytical data.

8.5.3 Response to Contamination

If a subsurface release or an indication of a release is confirmed as a result of specific monitoring carried out for this purpose, GNB will take the following course of action:

1. Ground-water monitoring of specific monitor wells will be instituted on a quarterly basis. The specific monitoring wells chosen for quarterly monitoring will be approved by the Executive Director of the TNRCC.

2. An investigation plan will be submitted by GNB within 90 days following confirmation notification described above. This investigation plan will describe a proposed ground-water monitoring program similar to a Ground-Water Quality Assessment Plan required for hazardous waste facilities. Upon TNRCC approval of the plan, GNB will implement the program in accordance with the schedule proposed in the plan.

If the monitoring data obtained during the investigation indicates that corrective action is appropriate, GNB will submit a report with prepared plans to the TNRCC.

Table 8-1

Ground-Water Monitoring Parameters

Parameter	SW-846 Test Method	Method Detection Limit	Ground-water Protection Standard
Cadmium	7131	0.3μg/L	5μg/L
Lead	7421	3μg/L	15μg/L
pH	9040	—	—
Specific Conductance	9050	10μmohs/cm	—

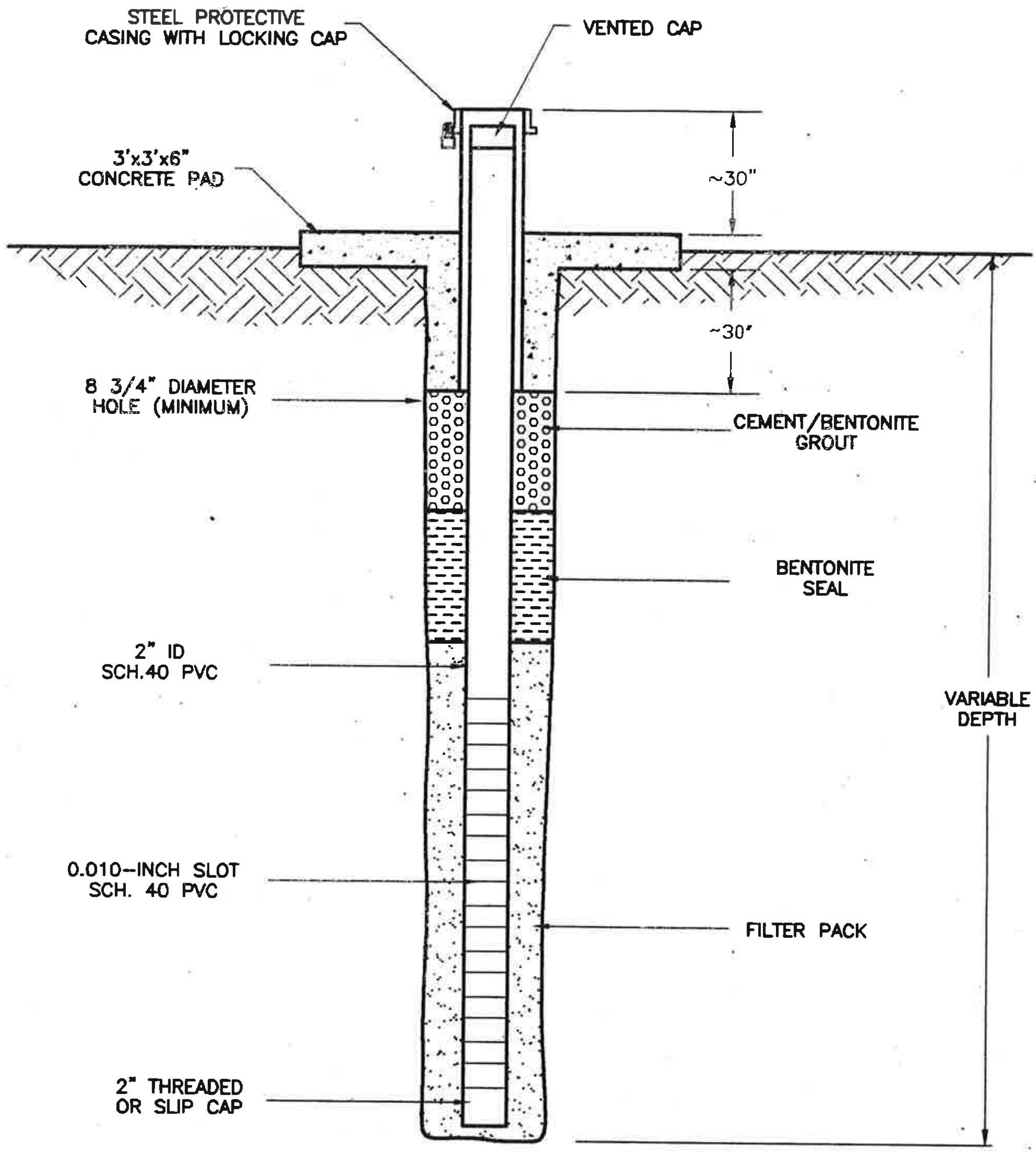
Table 8-2

Ground-Water Sample Containers, Preservative, and Holding Times

Indicator Parameter	Analysis	Container	Preservative	Holding Time
Cadmium	EPA SW-846 Method 7131	Plastic 500 mL	HNO_3 to pH<2 Cool to 4°C.	6 Months
Lead	EPA SW-846 Method 7421	Plastic 500 mL	HNO_3 to pH<2 Cool to 4°C	6 Months
Specific Conductance	EPA SW-846 Method 9050	Plastic 100 ml	None(1)	28 Days
pH	EPA SW-846 Method 9040	Plastic 50 ml	None	ASAP
Temperature	NA	Plastic or Glass	None	NA1

Note:

(1) Preservation and holding times not applicable. Measurements will be made in the field at the time of sample collection.



GNB Technologies, Inc.

FRISCO, TEXAS

50-01518.10 8/24/95 D950353

FIGURE 8-2

TYPICAL MONITOR WELL CONSTRUCTION DIAGRAM

JONES & NEUSE

GULF COAST REGION OF RMT

15181007.DWG

Section 9

CLASS II LANDFILL CLOSURE AND POST-CLOSURE PLAN

STATE OF TEXAS
MARY B. ADRIAN
64338
REGISTERED
PROFESSIONAL ENGINEER

Mary B. Adrian
9/1/95

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Senior Project Engineer

Section 9

CLASS II LANDFILL CLOSURE AND POST-CLOSURE PLAN

9.1 Introduction

The purpose of this Closure and Post-Closure Plan is to provide for final closure of the landfill and post-closure monitoring and maintenance. The Closure and Post-Closure Plan includes the following information:

- A description of the final cover system;
- A final contour map depicting the proposed final contours, the top and side slopes, and the final surface drainage features;
- A description and schedule for final closure; and
- A schedule for post-closure monitoring and maintenance.

Ground-water monitoring will continue throughout the post-closure period and is described in detail in the Ground-Water Monitoring Plan, which is provided in Section 8. A Soils and Liner Quality Control Plan, provided in Appendix 6-B, describes the methods and procedures to be used to install the cover.

9.2 Landfill Closure

The landfill will receive final cover in phases, as the elevation of deposited waste in each 1- to 2-acre cell reaches the proposed final waste elevation, as depicted on Attachment 4 in the engineering design section. Cover material will consist of a well-graded, fine-grained, clay-rich soil having good workability and compaction characteristics. This material should be available at the site from the landfill excavation.

9.2.1 Cover Design

Final cover design details are provided on Attachments 4 and 6 of Section 6. The cover design consists of the following layers, from the bottom upwards:

- Three feet of compacted clay with a coefficient of permeability no greater than 1×10^{-6} cm/sec;

- A smooth 40 mil geomembrane liner on the top slopes and textured 40 mil geomembrane on the side slopes; and

- Eighteen inches of uncompacted, fertile topsoil that is stabilized with native, self-sustaining grasses.

Cover material will be placed in lifts not less than six inches nor greater than nine inches, compacted with a fully-penetrating footed roller to 95% of maximum density at or slightly above optimum water content, as determined by ASTM Standard Method D-698. It will be scarified to a minimum depth of two inches prior to the placement of the following lift. Details of the final cover installation methods and procedures are presented in the Soil and Liner Quality Control Plan (Appendix 6-B).

9.2.2 Closure Schedule

A sequence of steps will be taken to provide for the orderly final closure of the landfill and/or landfill cells. These steps are outlined below:

- The facility manager will determine that final closure of the cell(s) is needed when that portion of the landfill has reached its final elevation and will initiate the appropriate contracts for installation of the final cover;

- The closure will be completed within 270 days of initiation of the cover installation; and

- Post-closure monitoring will begin upon the completion of closure activities and will continue for a period of 25 years.

9.2.3 Final Surface Drainage Features

The final contour map for the landfill is provided in the engineering design figures (Attachment 4). This map provides the final contours, the top and side slopes, and the surface drainage features of the closed landfill. The final cover of the landfill will have a top slope of three percent with 4:1 slopes to the perimeter containment dike. Since Class II industrial waste will be placed above grade, the landfill will be surrounded by containment dikes. The perimeter containment dikes will be constructed of clay soils from the landfill excavation and will be vegetated with native grasses. The waste will be placed at least two feet below the dike crest at the outer edge of the waste. The containment dikes will direct runoff into the facility's stormwater drainage ditches.

9.3 Post-Closure

This post-closure section includes the following information:

- A description of the landfill monitoring and maintenance activities and the frequency at which these activities will be performed; and

- The name, address, and telephone number of the office responsible for overseeing and/or conducting the post-closure care maintenance activities at the closed landfill during the post-closure period.

The Class II industrial waste landfill will be owned and operated by GNB Technologies Inc. (GNB). GNB will maintain responsibility for overseeing the post-closure care maintenance activities at the landfill. GNB will perform activities required by this Closure and Post-Closure Plan using personnel employed by GNB or contracted to them. The contact office for post-closure care maintenance is:

Director, South Central Region
GNB Technologies, Inc.
Recycling Division
7471 South 5th Street
Frisco, TX 75034
Telephone (214) 335-2121

The following sections discuss the post-closure care period, and post-closure maintenance activities and frequencies.

9.3.1 Post-Closure Care Period

The length of the post-closure care period is 25 years from the date the final closure requirements are completed, in accordance with TNRCC's Technical Guidance Document No. 3.

9.3.2 Activities and Frequencies

GNB will maintain the integrity and effectiveness of the final cover, site vegetation, and the drainage control system(s) during the post-closure period. GNB will correct any effects of settlement, subsidence, ponded water, erosion, or other events detrimental to the integrity of the closed unit. The company will also take any actions necessary to prevent surface water run-on and run-off from eroding or otherwise damaging the final cover. The leachate collection system will be operated and maintained, and ground water will be monitored during the post-closure period. The following sections identify those activities which will be performed during the post-closure periods and the frequency of inspections, monitoring, and maintenance.

9.3.2.1 General

The facility's fence and gates will be secured to prevent unauthorized entry into the site. Fencing and security will be inspected semi-annually. Damage to the fence or gates will be repaired as quickly as possible. The area within the fence will be observed for any indications of unauthorized entry.

The on-site access road will be inspected semi-annually and maintained so that routine inspections can be performed. Any potholes or washouts of the road will be repaired and the road will be graded, as needed.

GNB will maintain the right of entry to the closed landfill and will maintain all right-of-ways to allow access for monitoring, maintenance and any remediation activities, should they be necessary.

9.3.1.2 Final Cover

The final cover over the waste fill consists of the following components listed from the bottom upward:

- three feet of compacted low permeability soil;
- a 40 mil geomembrane; and
- 18 inches of topsoil vegetated with native grasses.

The final cover on the landfill slopes downward from the crest at a five percent nominal slope. The five percent slope increases to a 4H:1V (horizontal:vertical) slope and terminates at the perimeter berm.

The landfill cover will be inspected semi-annually for evidence of erosion, subsidence, ponded water, animal burrows, cracks along the cover, and loss of soil. Any excessive erosion will be identified and corrected. Erosion over large areas will be backfilled and revegetated.

The covers will be inspected to confirm positive drainage from the cover to the perimeter drainage channels. Any subsidence which significantly alters drainage from the cover will be corrected. Any areas which allow water to pond on the cover will be backfilled and revegetated.

9.3.1.3 Leachate Collection System and Leachate Evaporation Unit

The leachate collection system (LCS) on the bottom and sides of the landfill will consist of a HDPE geonet bonded with geotextile filter fabric. The bottom and side slope LCS of each cell conveys liquid through perforated pipes to the leachate collection sump in each cell.

Liquid is removed from the leachate collection sump using a submersible pump installed at the bottom of each sump. The pump and its discharge hose are housed in a one-foot diameter HDPE sideslope riser pipe. A curbed concrete pad surrounds each sideslope riser pipe where it penetrates the final cover system at the edge of the landfill. Each sump has a pressure transducer to measure the leachate level.

Inspections will be conducted semi-annually and will include checking the leachate level in each sump and the conditions of the riser, concrete pad, piping and electrical controls. An inspection form to be used by landfill personnel during inspections of the LCS is provided in Table 9-1. A maintenance list indicating the specific actions to be performed in response to various conditions which may be encountered during inspections is presented in Table 9-2.

The LCS will remain in operation throughout the post-closure care period. Leachate will be stored in a tank and will either be reused in the process or treated at the facility's wastewater treatment unit. The sumps will be pumped as necessary to maintain a leachate level less than or equal to 30 cm over the liner system. With placement of final cover over a cell, leachate production should decrease significantly.

9.3.1.4 Ground-Water Monitoring System

The ground-water monitor wells are installed around the landfill to allow a quantitative determination of whether the waste in the landfill is impacting the ground-water quality. A complete description and design drawings of the ground-water monitor wells are included in Section 8 - Ground-Water Monitoring Plan. The ground-water well sampling procedures, testing parameters, and reporting requirements are also described in the Ground-Water Monitoring Plan.

Post-Closure inspections will include visual checks of the physical integrity of the ground-water monitor wells. Inspections of each well will be performed semi-annually and will include checks of the protective casing, padlock, and concrete pad. If the protective casing appears to be damaged, a qualified geologist or engineer will inspect the damage to determine the appropriate actions to be taken. Any missing padlocks will be replaced and the losses will be recorded. The well will be inspected for evidence of tampering or vandalism. If cracks wider than 1/4-inch develop in a concrete pad which are the cracks will be repaired or the concrete base replaced.

Table 9-1

Inspection Form for Post-Closure Monitoring

GNB Technologies, Inc.
CLASS II INDUSTRIAL WASTE LANDFILL
POST-CLOSURE MONITORING RECORD

DATE:__________ INSPECTOR'S NAME:__________
WEATHER CONDITIONS: __________

MONITORING			DATE MAINTENANCE COMPLETED
STRUCTURE	OKAY?	IF NOT OKAY, DESCRIBE MAINTENANCE REQUIRED	
FINAL COVER			
Vegetation Coverage			
Erosion			
Oversize Vegetation			
Positive Drainage			
DRAINAGE SYSTEM			
Diversion Berm Erosion			
Sediment in Interceptor Berm			
Drainage Flume Entrance			
Flume Integrity			
Drainage Geocomposite into Perimeter Drainage Channel			
Perimeter Drainage Channel Erosion			
Oversize Vegetation			
Sediment in Perimeter Drainage Channel			
Channel Discharge Structure			
LEACHATE COLLECTION SYSTEM			
LCS Enclosure			
Liquid Level Indicator			
Leachate Level			
Pump			
GROUND-WATER MONITORING WELLS Use Inspection Form from Attachment 1 - Ground-Water Monitoring Plan			

COMMENTS: __________

Table 9-2

Summary of Observations, Inspections, and Maintenance Actions
GNB Class II Industrial Waste Landfill

Observations and Inspections	Maintenance Action
1. Landfill Drainage Systems	
• Erosion	Fill with Topsoil and Reseed
• Excessive Vegetation Height	Mow
• Ponded Water	Scarify, Fill, Compact, and Reseed
• Pipe Culvert Blockage	Clear Blockage
2. Leachate Collection System	
• Sump Riser and Leachate Pipe Connections	Repair or Replace
• Leachate Level Deeper than Sump	Pump
• Pump Inoperative	Repair or Replace
• Liquid Level Indicator Inoperative	Repair or Replace
• Riser Cap Missing	Replace
• Riser Cracked	Contact Professional Engineer for Evaluation
3. Final Cover Systems	
• Erosion	Add Topsoil and Re-vegetate
• Ponded Water	Scarify, Fill, Compact and Add Topsoil
• Burrowing Animals	Fill in Burrows and Limit Animal Access
• Leachate Seeps	Contact Professional Engineer for Evaluation
• Minor Cover Settlement (Less than 6 in. over 20 ft.)	Scarify, Fill, Compact and Add Topsoil

Table 9-2 (continued)

Summary of Observations, Inspections, and Maintenance Actions
GNB Class II Industrial Waste Landfill

• Major Cover Settlement (Greater than 6 in. over 20 ft.)	Contact Professional Engineer for Evaluation
4. Ground-Water Monitor Wells	
See Attachment 1 - Ground-Water Monitoring Plan	
5. General Facility Components	
• Missing Lock	Replace
• Fence Damage	Replace
• Gate Damage	Repair or Replace
• Pavement Damage	Repair

Notes

- Final cover systems, landfill drainage systems, and the general facility components will be inspected on at least an annual basis. If a problem is identified, the required maintenance action may be followed by one or more additional inspections to insure the correct action has been taken to alleviate the problem.
- The leachate collection system will be inspected on at least a quarterly basis to insure that the landfill leachate is being pumped at a rate determined by the operating conditions at the time of the inspection.
- Ground-water monitor wells will be inspected as specified in the Ground-Water Monitoring Plan.

ATTACHMENT B

LCS TECHNICAL MEMORANDUM

Golder Associates

TECHNICAL MEMORANDUM

Date:	October 20, 2016	**Project No.:**	1302086
To:	Brad Weaver	**Company:**	Exide Technologies
From:	Jeff Fassett, PE		
cc:	Anne Faeth-Boyd		

RE: LEACHATE COLLECTION SYSTEM
CELLS 13-15
CLASS 2 LANDFILL CORRECTIVE ACTION MANAGEMENT UNIT
FORMER EXIDE FRISCO RECYCLING FACILITY

Golder Associates Inc. has designed a leachate collection system (LCS) for the final cells within the existing Class 2 Landfill at the Exide Recycling Center in Frisco, Texas. This memorandum describes the system.

1.0 LEACHATE COLLECTION SYSTEM

The LCS is designed to collect and remove leachate from the floor of the landfill in accordance with 40 CFR §264.552.

The LCS will be placed above the composite liner system and will comprise:

- A geocomposite drainage layer
  - A 200-mil high density polyethylene (HDPE) geonet
  - A nonwoven geotextile on both sides
- A leachate collection trench containing
  - A perforated HDPE pipe
  - Gravel
  - Nonwoven geotextile filter
- A 10-foot by 10-foot sump

The LCS system is designed to limit the maximum leachate depth to less than 30-cm, in accordance with 40 CFR §264.552(e)(3)(i). A demonstration of the LCS performance was conducted and is included with this technical memorandum.

Calculations were prepared to determine the depth of leachate on the liner during the life of the landfill cell. The analyses show that for the maximum drainage path, the leachate head does not exceed the thickness of the geocomposite drainage layer (200 mils).

Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA
Tel: (281) 821-6868 Fax: (281) 821-6870 www.golder.com

A perforated 4-inch diameter HDPE leachate collection pipe will be installed in a gravel-filled trench along the southern portion of the cell floor. The invert of the leachate collection trench will be 1 foot below the surrounding liner to allow the geocomposite drainage layer to freely drain and will extend to the top of the protective cover layer. The leachate collection pipe will discharge into a sump located near the toe of the western sideslope. A cleanout riser is provided to allow access for cleaning the leachate collection pipe.

Calculations have been prepared to demonstrate that the capacity of the leachate collection trench is adequate to convey the maximum anticipated leachate volume.

Leachate entering the drainage layer and collection pipe discharges into a collection sump, which is approximately 2.5 feet below the surrounding liner surface to allow accumulation of leachate. Leachate collected in the sump will be removed using a submersible pump placed in an 18-inch diameter, SDR-11 sideslope riser pipe, and transported in a dual-contained HDPE force main to the existing holding tank located west of the landfill.

The leachate sideslope riser and leachate collection cleanout pipe will daylight within a small prefabricated structure. The pump controls will be located within the structure.

2.0 PROTECTIVE SOIL COVER

The requirements for the Protective Soil Cover within the Soils and Liner Quality Control Plan (SLQCP) for the facility, included in the 1995 Notification, are summarized in Table 1.

Table 1: Protective Soil Cover Requirements

Item	Requirement
Description (Sec. 3 of SLQCP)	"A thick layer of soil used to protect the liner FML and LCS without clogging the geotextile component of the LCS."
Material Requirements (Sec. 5 of SLCQP)	In-place density ≥ 90% Standard Proctor Maximum Dry Density
	Laboratory Permeability – Not required for cell with leachate collection trench
	The lower 1 foot of the 2-foot thick layer shall have a gradation such that it is retained by the geotextile of the LCS.
Pre-Construction Testing (Sec. 6 of SLQCP)	Standard Proctor; Full Sieve (with hydrometer)

The protective soil cover for cells 13-15 will be obtained from stockpiles of soils excavated from the landfill footprint during cell formation. The material consists of weathered shale.

2.1 Geotextile Filter Criteria

A properly designed geotextile filter is a prerequisite for a proper functioning geocomposite drainage layer. The geotextile layer must have openings large enough to allow water to pass (the permeability criterion), but small enough to prevent soil to pass (retention criterion).

Calculations showing that the proposed geotextiles in contact with the Protective Cover Soil meet these criteria are included to this technical memorandum.

3.0 CONSTRUCTION DRAWINGS AND SPECIFICATIONS

Golder has prepared drawings illustrating the layout and details of the LCS for the remaining cell. The drawings are attached to the CAMU Engineering Report.

Specifications are provided for each component of the LCS. A separate specification is provided for the submersible pump and controls.

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Registration Number F-2578

CALCULATIONS

CALCULATIONS

Date: 10/20/2016		**Made by:**	VK
Project No.: 1302086		**Checked by:**	JBF
Subject: LCS Drainage Media Evaluation		**Reviewed by:**	JAW
Project Short Title: Exide/Frisco/TX			

OBJECTIVE

Evaluate the leachate drainage layer for the proposed design of the final Class II landfill cells at the Former Exide Recycling Facility in Frisco, Texas (Site).

DISCUSSION

Both the leachate production (impingment) rate and the capacity of the leachate collection system (LCS) drainage layer will change during cell operation; therefore, we will evaluate three separate conditions during the life of the cell. The three conditions modeled are: (OP) open condition, (FU) full condition, and (FC) final cover condition.

The OP is a short-term condition and a represents conditions at the time of initial waste placement. The flow into the leachate collection layer (the impingement rate) is conservatively estimated assuming that the protective cover soil layer is fully saturated.

The FU is modeled represents the condition when the cell has been filled, but prior to placement of the final cover.
The FC condition represents conditions after placement of the final cover.

GIVEN

Leachate Collection Layer

The proposed leachate drainage layer is double-sided geocomposite, consisting of a 200-mil geonet, a 6-oz/sq. yard nonwoven geotextile heat-laminated to both sides. Transmissivity values measured at differing loads and gradients are shown in Figure 1 (Ref. 1).

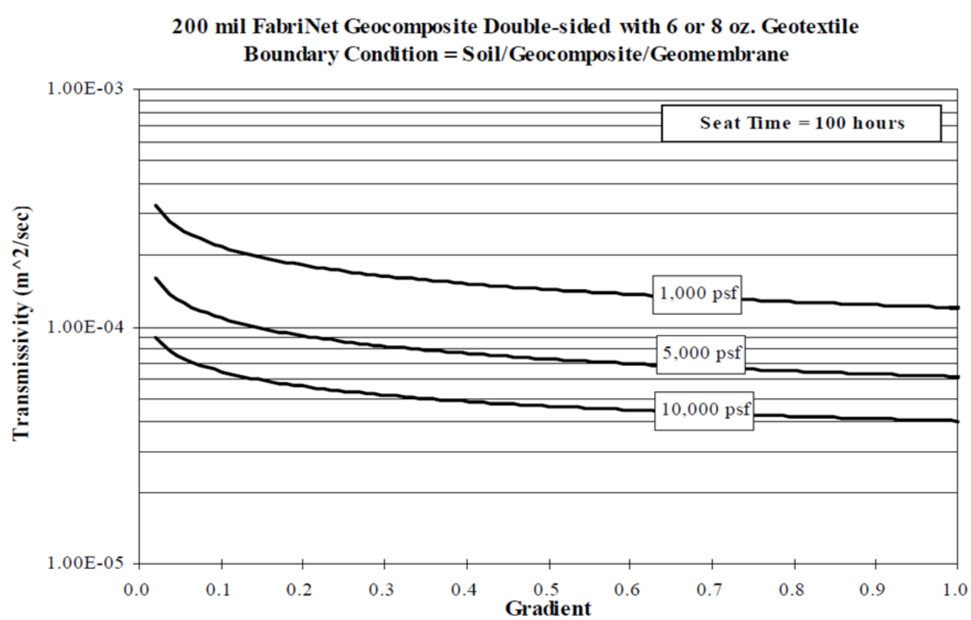

Figure 1: Performance transmissivity of a 200 mil FabriNet Geocomposite under soil - After GSE 2007 (Ref 1)

Date: 10/20/2016 | **Made by:** VK
Project No.: 1302086 | **Checked by:** JBF
Subject: LCS Drainage Media Evaluation | **Reviewed by:** JAW
Project Short Title: Exide/Frisco/TX

Reduction factors are applied to the laboratory-measured geocomposite transmissivity ($\Theta_{measured}$) to reflect the decreased flow capacity of the in-place geocomposite. The resulting value is referred to as the "long-term-in-soil transmissivity" (Θ_{LTIS}) (Giroud et al., 2000a, Ref. 2)

$\Theta_{LTIS} = \Theta_{measured} / (RF_{IN} * RF_{CR} * RF_{CC} * RF_{BC})$, where:

RF_{IN} = Reduction Factor for intrusion of geotextile or geomembranes into geonet
RF_{CR} = Reduction Factor for geonet creep or covering geosynthetics
RF_{CC} = Reduction factor for chemical clogging of geonet
RF_{BC} = Reduction factor for biological clogging of geonet

The product of all the reduction factors = Π(RF)

The long-term-in-soil hydraulic conductivity can be determined uing the following equation (Giroud, et al., 2000a, Ref. 2)

$k_{LTIS} = \Theta_{measured}/t_{virgin}/(\Pi(RF))$

where: t_{virgin} = thickness of drainage layer under no compressive stress = 0.2 in

The long-term-in-soil transmissivity and hydraulic conductivity values for the proposed geocomposite layer are shown below.

Parameter	Open	Full	Final		
Waste Unit Weight (pcf)	110	110	110		
Protective cover unit weight (pcf)	110	110	110		
Load curve used on Figure 1*(psf)	1000	5000	5000		
$\Theta_{measured}$ (Figure 1) (m^2/sec)	3.1E-04	1.8E-04	1.8E-04		
RF_{IN}	1.0	1.1	1.2	From Giroud et al. 2000, Ref. 2	Note: the waste in the cell consists of soil; therefore, chemical clogging and biological clogging will be minor
RF_{CR}	1.1	1.5	1.6		
RF_{CC}	1.0	1.7	1.7		
RF_{BC}	1.2	1.2	1.2		
Combined Reduction, Π(RF)	1.3	3.4	3.9		
Θ_{LTIS} (m^2/sec)	**2.3E-04**	**5.3E-05**	**4.6E-05**		
k_{LTIS} (cm/sec)	**3.62**	**0.83**	**0.71**		

METHOD

Estimate the liquid impingment rate for the three conditions during the life of the cell.

Using the impingment rate, determine the maximum thickness of flow within the geocomposite drainage layer for the given slope conditions. The critical condition comprises two different slopes; therefore, use the procedured presented in Giroud, et al, 2000b, Ref. 3

$t_{down,max} = q_h(L_{up} + L_{down}) / (k_{down} * \sin\beta_{down})$

where:

$t_{down\ max}$ = maximum liquid thickness in downstream section of geocomposite (must be ≤ thickness of geosynthetic layer, 0.2 in)
q_h = impingement rate expressed per unit surface area measured horizontally.
L_{up} = flow length on sideslope
L_{down} = flow length on cell floor
k_{down} = hydraulic conductivity of geocomposite on cell floor - **use k_{LTIS}**
β_{down} = grade on cell floor

Date: 10/20/2016		**Made by:**	VK
Project No.: 1302086		**Checked by:**	JBF
Subject: LCS Drainage Media Evaluation		**Reviewed by:**	JAW
Project Short Title: Exide/Frisco/TX			

The critical case occurs at the longest slope length, consisting of a 50-ft long 3H:1V slope and a 111-ft long ~1.5% slope.
Compare the maximum liquid thickness to the allowable thickness (i.e. 0.2 in)

(I) Leachate Flow (Impingment) Rate

Estimate the leachate flow (impingment) rate into the geocomposite leachate collection drainage layer using analytical equations and the Hydrologic Evaluation of Landfill Performance (HELP) Model (Ref. 4)

The OP is a short-term condition and a represents conditions at the time of initial waste placement. The flow into the leachate collection layer (the impingement rate) is conservatively estimated assuming that the protective cover soil layer is fully saturated.

q_h = ki = 1E-06 cm/s

where:

q_h = impingement rate expressed per unit surface area measured horizontally.

k = hydraulic conductivity of the protective cover layer = 1. x 10-6 cm/sec (based on technical specification for protective cover soil, and available lab data of clayey soils on site)

i = hydraulic gradient = 1.0

The FU is modeled using HELP with a waste height of 25 ft, prior to the placement of the final cover, conservatively assumed to be open for 5 years.

1) Climate data synthetically generated using coefficients for Dallas, TX, and historic temperature and rainfall data synthetically generated using coefficients for Dallas, TX.
2) Layers on soil model (top to bottom):
   - 12 inch of daily cover soil (HELP material texture no. 14)
   - 25 ft of waste with k = 1 x 10^{-6} cm/sec (assumed based on available lab data of clayey soils on site)
   - 24 inch of protective cover soils with k = 1 x 10^{-6} cm/sec - (assumed based on technical specification for protective cover soil, and available lab data of clayey soils on site)
3) Initial soil and waste moisture contents were calculated by model assuming steady-state conditions.
5) General design and evaporative zone data:
   - Bare ground
   - 0% of area allowed to have runoff
   - 5 year simulation period

From the HELP model output (see Attachment 1)

q_h = ki = 6E-08 cm/s

The FC is a long-term condition modeled using HELP with 25 ft of waste and a final cover in place during a 30-yr period.

1) Climate data synthetically generated using coefficients for Dallas, TX, and historic temperature and rainfall data synthetically generated using coefficients for Dallas, TX.
2) Layers on soil model (top to bottom):
   - 12 inch of vegetative top soil (HELP material texture no. 25)
   - 0.2 inch geocomposite drainage layer
   - 40 mil HDPE geomembrane
   - 36 inch of compacted clay with k = 1 x 10^{-7} cm/sec
   - 25 ft of waste with k = 1 x 10^{-6} cm/sec - HELP model default (material texture no. 15 corresponding to Clayey soils)
   - 24 inch of protective cover soils with k = 1 x 10^{-6} cm/sec
3) Initial soil and waste moisture contents were calculated by model assuming steady-state conditions.
5) General design and evaporative zone data:
   - Grass cover
   - Maximum leaf area index = 4.50
   - Evaporative zone depth = 22 inch (recommended by HELP model for Dallas, TX)
   - 100% of area allowed to have runoff
   - 30 year simulation period

Date: 10/20/2016 | **Made by:** VK
Project No.: 1302086 | **Checked by:** JBF
Subject: LCS Drainage Media Evaluation | **Reviewed by:** JAW
Project Short Title: Exide/Frisco/TX

From the HELP model output (see Attachment 1)

q_h = ki = 0E+00 cm/s

(II) Liquid Level Within Geocomposite

Condition Modeled	q_h (cm/s)	L_{up} (ft)	L_{down} (ft)	k_{LTIS} (cm/s)	β_{down} (%)	**$t_{down\ max}$ (in)**	**FS**
Open	1E-06	50	111	3.62	1.5	0.036	5.6
Full	6E-08			0.83		0.01	20.9
Final Cover	0E+00			0.71		0	-

5.0 CONCLUSION

I) Based on the above results, the proposed geocomposite drainage layer has adequate drainage capacity to convey the collected leachate into the leachate collection pipe. The leachate head on the liner is kept within the thickness of the geocomposite. This is considered acceptable based on general practice.

10/25/16

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED
PROFESSIONAL ENGINEER

Professional Engineering Firm
Registration Number F-2578

6.0 REFERENCES

1) The GSE Drainage Design Manual, GSE Lining Technology Inc. June 2007.

2) Giroud, J.P, Zornberg, J.G., and Zhao, A., "Hydraulic Design of Geosynthetic and Granular Liquid Collection Layers", Geosynthetics International, Vol. 7, Nos. 4-6, 2000a.

3) Giroud, J.P. , J.G. Zornberg, and J.F. Beech, "Hydraulic Design of Geosynthetic and Granular Liquid Collection Layers Comprising Two Different Slopes", Geosynthetics International, Vol 7, Nos. 4-6, 2000b.

4) Hydrological Evaluation of Landfill Performance (HELP) Model, Version 3.07, U.S. EPA and U.S. Army Engineering

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE              **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)               **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY             **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:    C:\Exide\EXFU.D4
TEMPERATURE DATA FILE:      C:\Exide\EXFU.D7
SOLAR RADIATION DATA FILE:  C:\Exide\EXFU.D13
EVAPOTRANSPIRATION DATA:    C:\Exide\EXFU.D11
SOIL AND DESIGN DATA FILE:  C:\Exide\EXFU.D10
OUTPUT DATA FILE:           C:\Exide\EXFU.OUT


TIME:  10:23     DATE:   4/22/2015


******************************************************************************

     TITLE:

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                    TYPE 1 - VERTICAL PERCOLATION LAYER
                        MATERIAL TEXTURE NUMBER  14
           THICKNESS                 =     12.00   INCHES
           POROSITY                  =      0.4790 VOL/VOL
           FIELD CAPACITY            =      0.3710 VOL/VOL
           WILTING POINT             =      0.2510 VOL/VOL
           INITIAL SOIL WATER CONTENT  =      0.3325 VOL/VOL
           EFFECTIVE SAT. HYD. COND.   =  0.249999994000E-04 CM/SEC
```

```
NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  5.00
         FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                          LAYER  2
                          --------

               TYPE 1 - VERTICAL PERCOLATION LAYER
                   MATERIAL TEXTURE NUMBER   0
  THICKNESS                    =    300.00   INCHES
  POROSITY                     =      0.4750 VOL/VOL
  FIELD CAPACITY               =      0.3780 VOL/VOL
  WILTING POINT                =      0.2650 VOL/VOL
  INITIAL SOIL WATER CONTENT   =      0.3763 VOL/VOL
  EFFECTIVE SAT. HYD. COND.    =  0.999999997000E-06 CM/SEC


                          LAYER  3
                          --------

               TYPE 1 - VERTICAL PERCOLATION LAYER
                   MATERIAL TEXTURE NUMBER   0
  THICKNESS                    =     24.00   INCHES
  POROSITY                     =      0.4520 VOL/VOL
  FIELD CAPACITY               =      0.4110 VOL/VOL
  WILTING POINT                =      0.3110 VOL/VOL
  INITIAL SOIL WATER CONTENT   =      0.4106 VOL/VOL
  EFFECTIVE SAT. HYD. COND.    =  0.999999997000E-06 CM/SEC


             GENERAL DESIGN AND EVAPORATIVE ZONE DATA
             ----------------------------------------

NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
         SOIL DATA BASE USING SOIL TEXTURE #14 WITH BARE
         GROUND CONDITIONS, A SURFACE SLOPE OF  1.% AND
         A SLOPE LENGTH OF  180. FEET.

SCS RUNOFF CURVE NUMBER            =     96.40
FRACTION OF AREA ALLOWING RUNOFF   =      0.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =      1.000  ACRES
EVAPORATIVE ZONE DEPTH             =     22.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE  =      7.318  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =     10.498  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE  =      5.662  INCHES
INITIAL SNOW WATER                 =      0.000  INCHES
INITIAL WATER IN LAYER MATERIALS   =    126.739  INCHES
```

TOTAL INITIAL WATER = 126.739 INCHES
TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
DALLAS TEXAS

STATION LATITUDE	=	32.85 DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50
START OF GROWING SEASON (JULIAN DATE)	=	63
END OF GROWING SEASON (JULIAN DATE)	=	329
EVAPORATIVE ZONE DEPTH	=	22.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.65	1.93	2.42	3.63	4.27	2.59
2.00	1.76	3.31	2.47	1.76	1.67

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
44.00	48.50	56.10	65.90	73.70	82.00
86.30	85.50	78.60	67.90	55.60	47.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS
AND STATION LATITUDE = 32.85 DEGREES

****

ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	16.70	60621.004	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	16.494	59874.914	98.77
PERC./LEAKAGE THROUGH LAYER 3	0.071110	258.128	0.43
CHANGE IN WATER STORAGE	0.134	487.925	0.80
SOIL WATER AT START OF YEAR	126.739	460062.844	
SOIL WATER AT END OF YEAR	126.873	460550.781	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.035	0.00

****

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.49	110678.703	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	27.635	100313.383	90.63
PERC./LEAKAGE THROUGH LAYER 3	0.028855	104.742	0.09
CHANGE IN WATER STORAGE	2.827	10260.610	9.27
SOIL WATER AT START OF YEAR	126.873	460550.781	

SOIL WATER AT END OF YEAR	129.700	470811.375	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.029	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	23.64	85813.195	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	23.458	85151.266	99.23
PERC./LEAKAGE THROUGH LAYER 3	0.004783	17.364	0.02
CHANGE IN WATER STORAGE	0.178	644.567	0.75
SOIL WATER AT START OF YEAR	129.700	470811.375	
SOIL WATER AT END OF YEAR	129.878	471455.937	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.001	0.00

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.82	119136.609	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	27.239	98876.562	82.99
PERC./LEAKAGE THROUGH LAYER 3	0.032131	116.634	0.10
CHANGE IN WATER STORAGE	5.549	20143.354	16.91
SOIL WATER AT START OF YEAR	129.878	471455.937	
SOIL WATER AT END OF YEAR	135.427	491599.312	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.064	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	25.39	92165.703	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	25.829	93758.359	101.73
PERC./LEAKAGE THROUGH LAYER 3	0.297968	1081.622	1.17
CHANGE IN WATER STORAGE	-0.737	-2674.311	-2.90
SOIL WATER AT START OF YEAR	135.427	491599.312	
SOIL WATER AT END OF YEAR	134.690	488925.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE	0.0000	0.036	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.19	1.68	2.94	3.70	3.29	2.31
	1.14	2.79	3.01	1.23	1.10	1.43
STD. DEVIATIONS	0.88	1.01	2.33	3.31	1.42	1.27
	0.81	1.34	1.28	1.20	0.49	0.85
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	1.095	1.370	2.350	3.465	3.533	2.276
	1.803	2.498	2.721	1.401	0.855	0.764
STD. DEVIATIONS	0.156	0.243	0.703	1.583	1.531	1.019
	1.701	1.363	0.539	0.906	0.252	0.328
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.0030	0.0026	0.0044	0.0056	0.0028	0.0038
	0.0082	0.0119	0.0117	0.0113	0.0106	0.0112
STD. DEVIATIONS	0.0028	0.0028	0.0037	0.0053	0.0034	0.0057
	0.0147	0.0228	0.0229	0.0220	0.0204	0.0209

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     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH    5
 ------------------------------------------------------------------------------
-
                                 INCHES            CU. FEET       PERCENT
                             -------------------   -------------   ---------
  PRECIPITATION               25.81    (   6.303)      93683.0     100.00

  RUNOFF                       0.000   (  0.0000)         0.00       0.000

  EVAPOTRANSPIRATION          24.131   (  4.5712)      87594.90     93.501

  PERCOLATION/LEAKAGE THROUGH  0.08697 (  0.12032)      315.698      0.33699
    LAYER  3

  CHANGE IN WATER STORAGE      1.590   (  2.5851)       5772.43      6.162

******************************************************************************



 *****************************************************************************

               PEAK DAILY VALUES FOR YEARS    1 THROUGH    5
   ------------------------------------------------------------------------
                                                 (INCHES)     (CU. FT.)
                                                ----------   -------------
       PRECIPITATION                              3.80        13794.000

       RUNOFF                                     0.000           0.0000

       PERCOLATION/LEAKAGE THROUGH LAYER  3       0.002088        7.57880

       SNOW WATER                                 0.40         1453.1432

       MAXIMUM VEG. SOIL WATER (VOL/VOL)                  0.4413

       MINIMUM VEG. SOIL WATER (VOL/VOL)                  0.2574

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	3.5891	0.2991
2	121.3285	0.4044
3	9.7725	0.4072
SNOW WATER	0.000	

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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:    C:\Exide\EXFC.D4
TEMPERATURE DATA FILE:      C:\Exide\EXFC.D7
SOLAR RADIATION DATA FILE:  C:\Exide\EXFC.D13
EVAPOTRANSPIRATION DATA:    C:\Exide\EXFC.D11
SOIL AND DESIGN DATA FILE:  C:\Exide\EXFC.D10
OUTPUT DATA FILE:           C:\Exide\EXFC.OUT


TIME:  11:14     DATE:   4/22/2015


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     TITLE:  Exide Impingement Rate

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                       TYPE 1 - VERTICAL PERCOLATION LAYER
                           MATERIAL TEXTURE NUMBER  25
           THICKNESS                  =    12.00   INCHES
           POROSITY                   =     0.4370 VOL/VOL
           FIELD CAPACITY             =     0.3730 VOL/VOL
           WILTING POINT              =     0.2660 VOL/VOL
           INITIAL SOIL WATER CONTENT =     0.3151 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  =  0.359999990000E-05 CM/SEC
```

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NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  5.00
         FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                          LAYER  2
                          --------

                 TYPE 2 - LATERAL DRAINAGE LAYER
                   MATERIAL TEXTURE NUMBER   0
  THICKNESS                    =      0.20   INCHES
  POROSITY                     =      0.8500 VOL/VOL
  FIELD CAPACITY               =      0.0100 VOL/VOL
  WILTING POINT                =      0.0050 VOL/VOL
  INITIAL SOIL WATER CONTENT   =      0.3380 VOL/VOL
  EFFECTIVE SAT. HYD. COND.    =   6.30000019000     CM/SEC
  SLOPE                        =      1.00   PERCENT
  DRAINAGE LENGTH              =    180.0    FEET


                          LAYER  3
                          --------

                 TYPE 4 - FLEXIBLE MEMBRANE LINER
                   MATERIAL TEXTURE NUMBER  35
  THICKNESS                    =      0.04   INCHES
  POROSITY                     =      0.0000 VOL/VOL
  FIELD CAPACITY               =      0.0000 VOL/VOL
  WILTING POINT                =      0.0000 VOL/VOL
  INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
  EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
  FML PINHOLE DENSITY          =      0.00   HOLES/ACRE
  FML INSTALLATION DEFECTS     =      0.00   HOLES/ACRE
  FML PLACEMENT QUALITY        =  3 - GOOD


                          LAYER  4
                          --------

                   TYPE 3 - BARRIER SOIL LINER
                   MATERIAL TEXTURE NUMBER  15
  THICKNESS                    =     36.00   INCHES
  POROSITY                     =      0.4750 VOL/VOL
  FIELD CAPACITY               =      0.3780 VOL/VOL
  WILTING POINT                =      0.2650 VOL/VOL
  INITIAL SOIL WATER CONTENT   =      0.4750 VOL/VOL
  EFFECTIVE SAT. HYD. COND.    =  0.170000003000E-04 CM/SEC
```

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 14

```
THICKNESS                   =     12.00   INCHES
POROSITY                    =      0.4790 VOL/VOL
FIELD CAPACITY              =      0.3710 VOL/VOL
WILTING POINT               =      0.2510 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3710 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.249999994000E-04 CM/SEC
```

LAYER 6

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

```
THICKNESS                   =    300.00   INCHES
POROSITY                    =      0.6710 VOL/VOL
FIELD CAPACITY              =      0.2920 VOL/VOL
WILTING POINT               =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999997000E-06 CM/SEC
```

LAYER 7

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

```
THICKNESS                   =     24.00   INCHES
POROSITY                    =      0.4520 VOL/VOL
FIELD CAPACITY              =      0.4110 VOL/VOL
WILTING POINT               =      0.3110 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.4110 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999997000E-06 CM/SEC
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
SOIL DATA BASE USING SOIL TEXTURE #25 WITH BARE
GROUND CONDITIONS, A SURFACE SLOPE OF 1.% AND

A SLOPE LENGTH OF 180. FEET.

SCS RUNOFF CURVE NUMBER	=	96.80	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	12.2	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.849	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	5.414	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	3.193	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	122.863	INCHES
TOTAL INITIAL WATER	=	122.863	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
DALLAS TEXAS

STATION LATITUDE	=	32.85 DEGREES
MAXIMUM LEAF AREA INDEX	=	4.50
START OF GROWING SEASON (JULIAN DATE)	=	63
END OF GROWING SEASON (JULIAN DATE)	=	329
EVAPORATIVE ZONE DEPTH	=	12.2 INCHES
AVERAGE ANNUAL WIND SPEED	=	10.80 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	63.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	66.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.65	1.93	2.42	3.63	4.27	2.59
2.00	1.76	3.31	2.47	1.76	1.67

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

44.00	48.50	56.10	65.90	73.70	82.00
86.30	85.50	78.60	67.90	55.60	47.80

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR DALLAS TEXAS
AND STATION LATITUDE = 32.85 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.29	1.79	2.22	3.48	3.85	2.64
	2.76	1.67	3.70	2.52	1.61	1.76
STD. DEVIATIONS	0.88	1.03	1.32	2.14	1.79	1.71
	2.20	1.24	2.03	2.07	1.21	1.26
RUNOFF						
TOTALS	0.275	0.488	0.715	1.535	1.670	1.083
	1.291	0.513	1.703	1.119	0.493	0.509
STD. DEVIATIONS	0.352	0.446	0.737	1.400	1.216	0.938
	1.487	0.546	1.265	1.371	0.643	0.536
EVAPOTRANSPIRATION						
TOTALS	1.033	1.246	1.596	2.231	2.201	1.628
	1.518	1.134	1.848	1.372	0.815	1.047
STD. DEVIATIONS	0.449	0.454	0.703	0.980	0.701	0.911
	0.845	0.792	0.795	0.804	0.405	0.464
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	0.0814	0.0262	0.0328	0.0023	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0195	0.0729
STD. DEVIATIONS	0.1459	0.0977	0.0724	0.0118	0.0000	0.0000

	0.0000	0.0000	0.0000	0.0000	0.0826	0.1671

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 7

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0135	0.0048	0.0054	0.0004	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0033	0.0121
STD. DEVIATIONS	0.0241	0.0179	0.0120	0.0020	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0141	0.0276

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	29.29 (5.380)	106304.6	100.00
RUNOFF	11.394 (3.4064)	41361.24	38.908
EVAPOTRANSPIRATION	17.668 (2.4863)	64135.84	60.332
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.23513 (0.24098)	853.525	0.80290

```
  PERCOLATION/LEAKAGE THROUGH     0.00000 (  0.00000)        0.001     0.00000
    LAYER  4

  AVERAGE HEAD ON TOP             0.003 (    0.003)
    OF LAYER  3

  PERCOLATION/LEAKAGE THROUGH     0.00000 (  0.00000)        0.000     0.00000
    LAYER  7

  CHANGE IN WATER STORAGE        -0.013   (  0.4609)       -46.05    -0.043


*******************************************************************************


******************************************************************************

               PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
    ------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------   -------------
       PRECIPITATION                             4.98         18077.400

       RUNOFF                                    4.225        15335.1211

       DRAINAGE COLLECTED FROM LAYER  2          0.10770        390.93445

       PERCOLATION/LEAKAGE THROUGH LAYER  4      0.000000         0.00034

       AVERAGE HEAD ON TOP OF LAYER  3           0.552

       MAXIMUM HEAD ON TOP OF LAYER  3           0.981

       LOCATION OF MAXIMUM HEAD IN LAYER  2
             (DISTANCE FROM DRAIN)              20.0 FEET

       PERCOLATION/LEAKAGE THROUGH LAYER  7      0.000000         0.00000

       SNOW WATER                                1.00          3631.1433


       MAXIMUM VEG. SOIL WATER (VOL/VOL)                 0.4090

       MINIMUM VEG. SOIL WATER (VOL/VOL)                 0.2617


        ***  Maximum heads are computed using McEnroe's equations.  ***

             Reference:  Maximum Saturated Depth over Landfill Liner
                         by Bruce M. McEnroe, University of Kansas
                         ASCE Journal of Environmental Engineering
                         Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	3.4199	0.2850
2	0.0481	0.2403
3	0.0000	0.0000
4	17.1000	0.4750
5	4.4520	0.3710
6	87.5990	0.2920
7	9.8640	0.4110
SNOW WATER	0.000	

****
****

CALCULATIONS

Date:	10/20/2016	**Made by:**	VK
Project No.:	1302086	**Checked by:**	JBF
Subject:	Cell 13-15 LCS Trench Capacity Evaluation	**Reviewed by:**	
Project Short Title:	Exide/Frisco/TX		

OBJECTIVE

Evaluate the adequacy of the leachate collection trench for the maximum leachate impingement rate.

ASSUMPTIONS

The maximum leachate impingement rate from LCS Drainage Media Evaluation is:

q = 1.00E-06 cm/s

The granular drainage layer in the pipe trenches and sumps is assumed to have a minimum hydraulic conductivity of 1 cm/s based on typical values for gravel.

CALCULATIONS

The peak daily leachate generation rate, q = 3.3E-08 cf/sf/sec
= 123.48 cf/acre/day

Maximum inflow rate to the leachate collection trench:

$Q_{req} = A * q$

where:

A = maximum area draining into the leachate collection trench (conservatively assume entire cell area)
= 62,000 sf

Q_{req}= 2.03E-03 cf/sec

Capacity of the gravel within the leachate collection trench:

$Q_{drain} = k * i * a$

where:

k= 1 cm/s (conservative estimate)
i= hydraulic gradient = slope of trench = 1%
a = area of the gravel in LCS trench
= 1.9 sf

Q_{gravel} = 6.28E-04 cf/sec

Golder Associates

CALCULATIONS

Date:	10/20/2016	**Made by:**	VK
Project No.:	1302086	**Checked by:**	JBF
Subject:	Cell 13-15 LCS Trench Capacity Evaluation	**Reviewed by:**	
Project Short Title:	Exide/Frisco/TX		

Capacity of SDR 17 HDPE pipe within LCS trench, using Manning's equation:

$Q_{pipe} =$ $(1.49/n) * A * R^{2/3} * S^{1/2}$

where:

A= flow area

n= Manning's roughness coefficient = 0.009

R= hydraulic radius

S= channel slope

$Q_{pipe} =$ 0.11 cf/sec

$Q_{pipe + gravel} =$ 0.12 cf/sec

Factor of Safety (FS) provided by the chimney drain:

FS = $Q_{allowable} / Q_{req}$

= **56.8** **==> OK**

CONCLUSION

The proposed leachate collection trench design is adequate to convey the generated leachate to the leachate collection sump.

10/25/16

STATE OF TEXAS
JEFFREY B. FASSETT
85675
LICENSED PROFESSIONAL ENGINEER

Professional Engineering Firm
Registration Number F-2578

CALCULATIONS

Date:	10/20/2016	**Made by:**	VK
Project No.:	1302086	**Checked by:**	JBF
Subject:	Cell 13-15 Geotextile Filter Calculations	**Reviewed by:**	
Project Short Title:	Exide/Frisco/TX		

OBJECTIVE

Evaluate the adequacy of the nonwoven geotextile in the geocomposite drainage layer to retain soil in the protective cover soil while avoiding clogging.

GIVEN

The proposed leachate drainage layer is double-sided geocomposite, consisting of a 200-mil geonet, a 6-oz/sq. yard nonwoven geotextile heat-laminated to both sides. The specification for the nonwoven geotextile are provided

Product Specifications

Tested Property	Test Method	Frequency	Minimum Average Roll Value(1)	
Geocomposite			6 oz/yd²	8 oz/yd²
Transmissivity(2), gal/min/ft, (m^2/sec) Double-Sided Composite Single-Sided Composite	ASTM D 4716	1/540,000 ft²	 0.5 (1×10^{-4}) 4.8 (1×10^{-3})	 0.5 (1×10^{-4}) 4.8 (1×10^{-3})
Ply Adhesion, lb/in	ASTM D 7005	1/50,000 ft²	1.0	1.0
Geonet Core(1,3) – GSE HyperNet				
Geonet Core Thickness, mil	ASTM D 5199	1/50,000 ft²	200	200
Transmissivity(2), gal/min/ft (m^2/sec)	ASTM D 4716		9.6 (2×10^{-3})	9.6 (2×10^{-3})
Density, g/cm³	ASTM D 1505	1/50,000 ft²	0.94	0.94
Tensile Strength (MD), lb/in	ASTM D 7179	1/50,000 ft²	45	45
Carbon Black Content, %	ASTM D 4218	1/50,000 ft²	2.0	2.0
Geotextile(1,3)				
Mass per Unit Area, oz/yd²	ASTM D 5261	1/90,000 ft²	6	8
Grab Tensile Strength, lb	ASTM D 4632	1/90,000 ft²	160	220
Grab Elongation	ASTM D 4632	1/90,000 ft²	50%	50%
CBR Puncture Strength, lb	ASTM D 6241	1/540,000 ft²	435	575
Trapezoidal Tear Strength, lb	ASTM D 4533	1/90,000 ft²	65	90
AOS, US sieve(1), (mm)	ASTM D 4751	1/540,000 ft²	70 (0.212)	80 (0.180)
Permittivity, sec^{-1}	ASTM D 4491	1/540,000 ft²	1.5	1.3
Water Flow Rate, gpm/ft²	ASTM D 4491	1/540,000 ft²	110	95
UV Resistance, % retained	ASTM D 4355 (after 500 hours)	per formulation	70	70

The protective soil cover is a weathered shale with the following index properties:

Liquid Limit = 54 to 59

Plastic Limit = 15 to 17%

Plasticity Index = 39 to 42%

% Passing No. 200 = 85 to 87%

METHOD

(I) Soil Retention Requirements

Ensure that the geotextile openings are small enough to prevent excessive migration of soil particles.

(II) Geotextile Permeability Requirements.

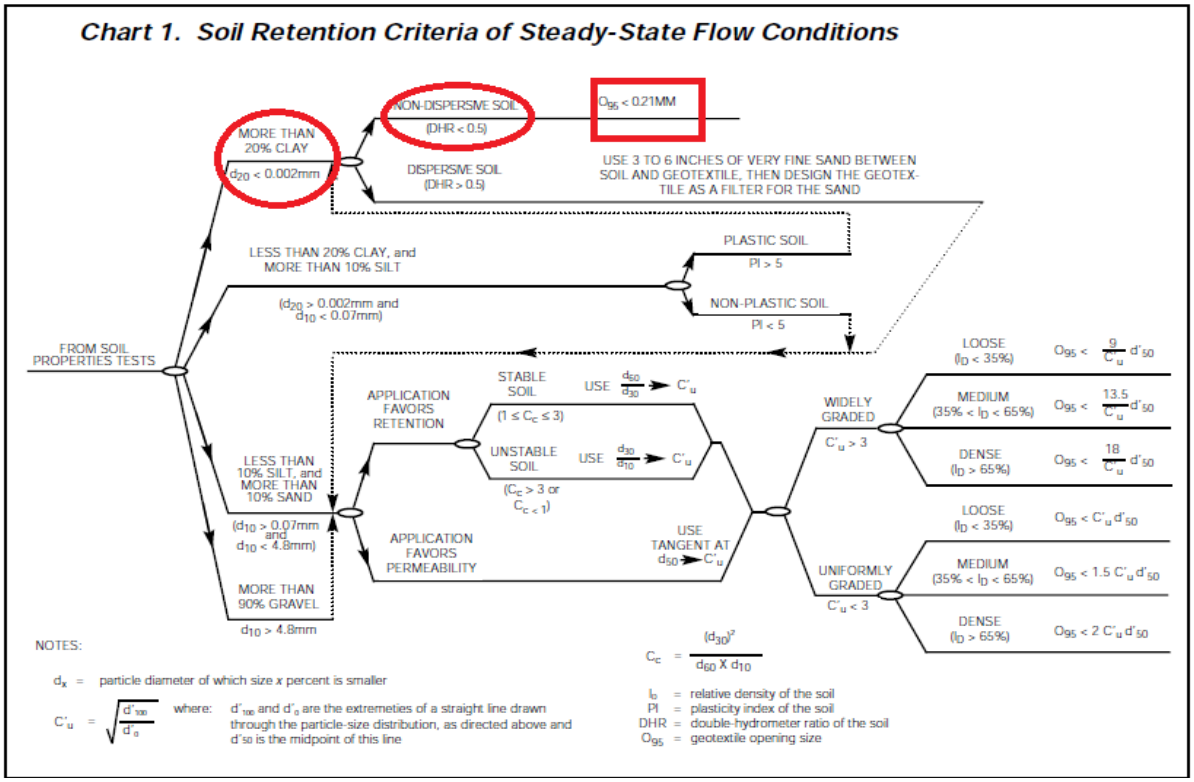
Ensure that the geotextile is permeable enough to allow liquid to readility pass through it.

Date:	10/20/2016	**Made by:**	VK
Project No.:	1302086	**Checked by:**	JBF
Subject:	Cell 13-15 Geotextile Filter Calculations	**Reviewed by:**	
Project Short Title:	Exide/Frisco/TX		

CALCULATIONS

(I) Soil Retention Requirements

From Ref 1,



(II) Geotextile Permeability Requirements

From Ref 2,

$k_{geotextile} > 10 \text{ to } 100\ k_{soil}$ (the larger value is used critical applications)

Based on the index properties of the Protective Soil Cover, the ksoil < 10^{-6} cm/s. The $k_{geotextile} > 10^{-4}$ cm/s, making it > 100 times more permeable than the soil.

CALCULATIONS

Date:	10/20/2016	**Made by:**	VK
Project No.:	1302086	**Checked by:**	JBF
Subject:	Cell 13-15 Geotextile Filter Calculations	**Reviewed by:**	
Project Short Title:	Exide/Frisco/TX		

CONCLUSION

The proposed nonwoven geotextile within the geocomposite drainage layer meets the filter criteria.

10/25/16

STATE OF TEXAS
JEFFREY B. FASSETT
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LICENSED
PROFESSIONAL ENGINEER

Professional Engineering Firm
Registration Number F-2578

6.0 REFERENCES

1) "Geotextile Filter Design, Application, and Product Selection Guide", TenCate.

2) The GSE Drainage Design Manual, GSE Lining Technology Inc. June 2007.

SPECIFICATIONS

10/28/14

STATE OF TEXAS
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LICENSED
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1. GENERAL

1.1 SCOPE OF WORK

A. The **CONTRACTOR** shall furnish all labor, materials, tools, equipment, and incidentals to perform all work and services for installation of leachate collection geocomposite drainage layer, high density polyethylene (HDPE) pipes for leachate collection piping, leachate collection sumps, leachate collection force mains, and electrical conduit extensions and related appurtenances as shown on the Construction Drawings and as specified in accordance with the provisions of the Contract Documents.

B. The **CONTRACTOR** shall furnish all supplementary or miscellaneous items not specifically shown or specified and all appurtenances and devices incidental to or necessary for a sound, secure, and complete installation although such Work is not specifically shown or specified.

C. Provide information on manufacturer, supplier, and installer, if used, as required and as necessary to verify materials used in the manufacture of HDPE pipe, geosynthetic drainage material, fittings, and appurtenances.

D. Work and services include, but are not limited to, preparing leachate collection trench and leachate collection sump to proper configuration and grade; installing the geocomposite drainage layer, installing HDPE piping, installing the geotextile filter, placement of drainage aggregate, installation of leachate force main, installation of the submersible pump and control panel, and extension of electrical conduits as shown on the Construction Drawings and as specified herein.

1.2 DELIVERY, STORAGE AND HANDLING

A. Pipe, fittings, appurtenances, and accessories shall be delivered, stored and handled in a manner that will ensure installation in a sound undamaged condition.

B. Pipe, fittings, appurtenances, and accessories, which have been damaged, shall be removed from the site. Damaged pipe repaired in accordance with the manufacturer's recommendations may be used only with written permission from the **ENGINEER**.

1.3 SUBMITTALS

A. Geotextile filter manufacturer’s certifications.

B. HDPE pipe manufacturer's certifications.

C. Drainage aggregate gradation supplier's certification and sample for verification.

2. PRODUCTS

1.1 GEOCOMPOSITE DRAINAGE LAYER

A. The geocomposite drainage material shall be supplied by **OWNER**.

1.2 GEOTEXTILE FILTER LAYER

A. The nonwoven geotextile filter shall be an 8-oz/sy, nonwoven, needle-punched made from staple fiber. The geotextile filter shall meet the following material properties.

Property	**Test Method**	**Frequency**	**Min. Ave. Roll Value**
Mass per unit area, oz/yd^2	ASTM D5261	90,000 ft^2	8
Grab Tensile Strength, lb	ASTM D4632	90,000 ft^2	220
Grab Elongation, %	ASTM D4632	90,000 ft^2	50
Trapezoidal Tear, lb	ASTM D4533	90,000 ft^2	90
Apparent Opening Size, mm	ASTM D4751	540,000 ft^2	0.18
Permittivity, gpm/ft^2	ASTM D4491	540,000 ft^2	95

1.3 HIGH DENSITY POLYETHYLENE PIPING MATERIALS

A. HDPE pipe for this project shall conform to ASTM D248, Type III, Class C, Category 5, Grade P34 with a PPI rating of PE 3408. The minimum cell classification value shall be 345434C, standard dimension ratio (SDR) 17 for leachate collection lateral piping, SDR 11 for leachate collection sump piping, SDR 11 for force main piping, and SDR 17 for force main carrier piping, as determined by ASTM D3350 and F714.

B. Standard commercial HDPE fittings shall be utilized on this project. The fittings shall be manufactured to the same grade and requirements as the HDPE pipe.

C. All pipes shall be accompanied by manufacturer's certifications and mill stamps indicating the grade and compliance to these specifications.

D. Leachate collection pipe and leachate collection sump pipe shall be perforated as indicated on the construction plans. All shavings from perforations shall be removed from the piping.

1.4 CONTROL COMPONENTS

A. Ball valves (liquid, air) shall be Flanged DUO BLOC, True Union Ball Valves or OMNI Ball Valves as manufactured by ASAHI/American, or **ENGINEER/OWNER** approved equal, with PVC body, EPDM seats, and EPDM seals.

B. Ball check valves (force main) shall be Flanged True Union Ball Valves as manufactured by ASAHI/American, or **ENGINEER/OWNER** approved equal, with PVC body, EPDM seals and EPDM seats.

1.5 LEACHATE CONNECTORS

A. Installation of force main piping into sideslope riser pipe shall be by extrusion welding or EPDM pipe boot and ring using No. 1 Deck Type Flashing by Fastenal.

1.6 DRAINAGE AGGREGATE

A. Drainage aggregate from an off site borrow source shall be used to surround the leachate collection pipe and the leachate collection sump piping. This drainage aggregate shall be natural stone or gravel, subrounded to subangular, free of shale, clay, friable materials and debris, and not derived from limestone or dolomite origin. The drainage aggregate shall be free of organics, foreign objects, or other deleterious materials and will have a calcium carbonate content of less than 15 percent (ASTM D3042 using hydrochloric acid and a solution with a pH of 5). To prevent clogging of pipe perforations, the drainage aggregate will meet the following requirements:

Sieve	**% Passing**
1-1/2”	90-100
1/2”	10-50
3/8”	0-15

B. Less than 5 percent shall pass the number 200 Sieve.

C. Sieve analyses shall be performed, in accordance with ASTM D422, at a minimum frequency of 1 test per 3,000 yd^3.

1.7 EQUIPMENT

A. Equipment for joining the HDPE pipe includes butt fusion equipment as recommended by the pipe manufacturer. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400 degrees Fahrenheit (°F), alignment, and 75 pounds per square inch (psi) interfacial fusion pressure.

B. Equipment for placing the drainage aggregate includes low ground pressure (LGP) front-end loaders and LGP bulldozers. Equipment shall apply a maximum of 5 psi contact pressure.

C.

3. EXECUTION

1.1 GEOCOMPOSITE DRAINAGE LAYER INSTALLATION

A. The geocomposite drainage layer shall be placed by the **CONTRACTOR** above the liner system. Clean geomembrane surface prior to placing geocomposite.

B. On slopes, secure the geocomposite and then roll it down the slope in a manner to keep it in tension. If necessary, position the geocomposite after deployment to minimize wrinkles.

C. Do not drag the geocomposite across textured geomembrane.

D. The **CONTRACTOR** shall take precautions to prevent damage to the underlying layers during placement of the geocomposite.

E. Each component of the geocomposite shall be secured or seamed to the like component at overlaps.

F. Adjacent edges of the geonet component of the geocomposite shall be butted against each other and joined using plastic ties spaced every 5 feet along the roll length.

G. Adjoining geocomposite rolls (end to end) shall be shingled down the direction of the slope, with the geonet portion of the top overlapping the geonet portion of the bottom a minimum of 12 inches across the roll width.

H. Any rips, tears or damaged areas of the geocomposite shall be removed and patched. The patch shall be secured to the original geonet by tying every 6 inches with plastic ties.

1.2 GEOTEXTILE FILTER INSTALLATION

A. The geotextile filter shall be placed by the **CONTRACTOR** in the leachate collection trench and leachate sump. Geotextile will be used to fully encompass the HDPE pipe and drainage aggregate with a minimum 1-ft overlap.

B. A minimum 1-ft overlap will be required at all seam locations. All seams shall be sewn by the **CONTRACTOR** using a flat seam with a 2-thread chain stitch or equivalent seam.

C. The geotextile fabric shall be sealed to the HDPE leachate collection pipe using nylon clamps or other approved methods.

1.3 HIGH DENSITY POLYETHYLENE PIPE INSTALLATION

A. Placement of joints of HDPE pipe by the **CONTRACTOR** shall occur only after the geotextile filter and the protective cover layer has been placed on the bottom of the landfill cells adjacent to the leachate collection trench.

B. The HDPE pipes shall be joined into continuous lengths on the job site above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400° F, alignment, and 75 psi interfacial fusion pressure.

C. Butt fusion joining shall be 100 percent efficient offering a joint weld strength equal to or greater than the tensile strength of the pipe. Socket fusion shall not be used.

D. Pressure test all HDPE forcemain piping in accordance with manufacturer's requirements.

1.4 LEACHATE PUMP/CONTROLS/FORCE MAIN/ ELECTRICAL INSTALLATION

A. The dual containment HDPE leachate force main shall extend from the existing leachate storage tank to near the new head wall. Install valves, flow meter, pressure switch, and check valves as indicated.

B. Backfill and compact trench to minimum of 90 percent of Standard Proctor.

C. Electrical conduits shall be extended from the existing power source to the new leachate collection sump.

D. Provide 6-inch wide electrical marking tape above underground electrical conduit.

1.5 HIGH DENSITY POLYETHYLENE FORCEMAIN PRESSURE TESTING

A. The **CONTRACTOR** shall pressure test the completed HDPE forcemain piping installation using the recommended testing producers provided in Paragraph 3.06. Prior to initiating the pressure testing, the **CONTACTOR** shall submit to the **ENGINEER**, a schedule for the testing to be employed by the **CONTRACTOR** for approval by the **ENGINEER.**

B. The **CONTRACTOR** shall provide the **ENGINEER/OWNER** a minimum 1-week notice prior to pressure testing any HDPE piping under an approved testing plan.

C. At a minimum the **CONTRACTOR** shall test the force main and force main carrier pipe.

1.6 PRESSURE TESTING

A. **CONTRACTOR** shall furnish compressors, gauges, and all related equipment to perform segment and final pressure testing for the completed HDPE forcemain piping system. Pressure testing of the HDPE piping system shall include all HDPE components installed outside the landfill cell boundary under this contract. The HDPE piping system includes, but is not limited to, all the HDPE piping, flanges, valves, fittings and other appurtenances incidental to the construction under this contract.

B. Final Pressure Testing

1. The final test shall be made on the completed pipe installation. Segments may be tested as approved by the **OWNER.**

2. The test pressure shall be 75 psi.

    a. Pressure testing gauge shall have minimum increments of 0.1 psi.

    b. **CONTRACTOR** shall submit verification and results of gauge calibration prior to and after completion of the PROJECT.

3. The allowable pressure drop observed during the test shall not exceed one percent of the testing gauge pressure over a period of one hour. This pressure drop shall be corrected for temperature changes before determining pass or failure.
4. **OWNER** shall be notified before testing procedure and shall have the option of being present during the test.
5. Equipment for this testing procedure shall be furnished by **CONTRACTOR**. This shall consist of a polyethylene flange adaptor with a polyvinyl chloride blind flange equal in size to the blower inlet valve. Tapped and threaded into the blind flange will be a temperature gauge zero to 100 ° C, a pressure gauge zero to 15 psi, a "tire-valve" to facilitate an air compressor hose, and a ball valve to release pipe pressure at completion of test. Polyethylene reducers shall be utilized to adapt test flange to size of pipe being tested.

C. Test Failure

1. The following steps shall be performed when a pipe segment fails the one percent – one hour test.
   a. The pipe and all fusions shall be inspected for cracks, pinholes or perforations.
   b. All blocked risers and capped ends shall be inspected for leaks.
   c. Leaks shall be verified by applying a soapwater solution and observing soap bubble formation.
2. All pipe and fused joint leaks shall be repaired by cutting out the leaking area and refusing the pipe.
3. After all leaks are repaired, a retest shall be performed.

D. Test Reporting

1. All testing shall be reported in writing to the OWNER and shall include the following information:
   a. Date and time;
   b. Person performing test;
   c. Name of OWNERS representative;
   d. Pipe length, size(s) and location;
   e. Test pressure measurements at ten (10) minute intervals; and
   f. Ambient temperature at ten (10) minute intervals (measured in trench for final test).
2. The following information shall be reported in writing if a failure occur:
   a. Nature of all leaks found;
   b. Detail of repair; and
   c. Retest results.

END OF SECTION

1. GENERAL

1.1 SCOPE OF WORK

A. The **CONTRACTOR** shall furnish all labor, materials, tools, equipment, and incidentals to perform all work and services for installation of Leachate Pumping System including submersible pump, control panels and related appurtenances as shown on the Construction Drawings and as specified in accordance with the provisions of the Contract Documents.

B. The **CONTRACTOR** shall furnish all supplementary or miscellaneous items not specifically shown or specified and all appurtenances and devices incidental to or necessary for a sound, secure, and complete installation although such Work is not specifically shown or specified.

C. Provide information on manufacturer, supplier, and installer, if used, as required and as necessary to verify materials used in the manufacture of submersible pumps, control panels and related appurtenances.

D. Work and services include, but are not limited to, installation of the submersible pump and control panel, related appurtenances and extension of electrical conduits as shown on the Construction Drawings and as specified herein.

1.2 DELIVERY, STORAGE AND HANDLING

A. **OWNER** and **CONTRACTOR** shall discuss and agree on an appropriate laydown area.

B. SUPPLIER shall:

1. Clean thoroughly each completed unit to remove all foreign matter. After completing the cleaning, equipment shall be painted. Any damage to previously painted surfaces shall be satisfactorily repaired.
2. Drain and thoroughly dry all equipment and protect against freezing and corrosion during shipment and storage at the job site.
3. Tightly close all openings for shipment (the use of adhesive tapes for this work is unacceptable). Bracing and blocks shall be provided to prevent damage or fatigue to shafts, members, or any components and cold working of bearings during shipment. Oil passages shall be protected to prevent the entry of moisture and dirt.
4. Protect against corrosion all machined surfaces, exposed threads, bolts, etc., by applying a coat of clean, gumless, and easy-to-remove sealing compound.
5. Remove, properly box and identify before shipment mounted instruments and sensitive and/or breakable items to allow correct installation and label for shipment to the job site.
6. Include shipping and all packing and shipping costs involved for delivery.

C. CONTRACTOR shall:

1. Provide for temporary yard storage and protection prior to pump delivery. **CONTRACTOR** shall include protection from direct ground contact and protection of painted surfaces from handling.
2. Provide site transportation, receipt, inspection, unloading, temporary storage, and handling required for installation of all materials.
3. For all Owner-furnished equipment and material, **CONTRACTOR** shall provide for receipt inspection, management, loading, and site transportation; protection of paint and coatings; and handling for assembly and installation. Upon acceptance, **CONTRACTOR** is responsible for the condition of Owner-furnished items and shall correct any damage or unsatisfactory conditions (mechanical damage, documentation, etc.) at no cost to Owner.
4. Store, inventory, and stage all received equipment and material in an orderly fashion. Each piece of equipment and each lot of material shall be clearly labeled as to its

manufacture, model number, size, and intended use. **CONTRACTOR** shall be responsible for maintenance of component identification and match marks used in field assembly of equipment. **CONTRACTOR** shall provide timbers or racks to prevent direct contact of assemblies and/or boxes and crates with the ground.

5. Maintain an orderly file of all documentation received.

1.3 SUBMITTALS

A. Submersible pump manufacturer's certifications.

B. Control panel manufacturer's certifications.

1.4 REFERENCES

A. American Iron and Steel Institute(AIS)

B. American Standards Institute (ANSI)

C. American Society for Testing and Materials (ASTM)

D. Factory Mutual (FM)

E. Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps (HI)

F. National Electrical Manufacturer's Association (NEMA)

1. 250, Enclosures for Electrical Equipment (1000) Volts Maximum)

2. ICS 6, Enclosures for Industrial Controls

G. National Fire Protection Agency (NFPA)

H. Underwriters Laboratories, Inc. (UL)

I. It is the intention of these Specifications that the pump, control panel, and necessary appurtenances are provided by a sole manufacturer with in-house testing facilities.

2. PRODUCTS

2.1 MANUFACTURER OF LEACHATE PUMPING SYSTEM, INCLUDING CONTROL PANELS AND COMPONENTS

A. Leachate pumping system, including sensors and control panels will be designed and supplied by EPG Companies or equal.

1. This includes UL Approval. Major components shall be made of 316 stainless steel construction and motor lead shall include waterproof and chemically resistant jacket.

2. Factory testing of system with operating sensors and control panel.

2.2 MATERIALS

A. Furnish unit components meeting the following material specifications.

1. Pump

a. Major components made of 304 stainless Steel

b. Built-in check value with nonmetallic seat

c. Bearings and seals proven for service in similar applications. Teflon or rubber is not acceptable.

d. Stainless steel shaft rotating on bearings that are fluid lubricated

e. The diffuser chambers for each impeller shall be 316 stainless steel and fitted with impeller seal rings.

f. The motor shall be a submersible, stainless steel, hermetically sealed, and capable of sustaining up to 100 starts per day.

g. The motor shall be connected to the pump by a motor adaptor and coupling of 316 stainless steel.

h. The motor lead shall be non-spliced with waterproof and chemically resistant jacket over 600-Volt insulation.

2.3 EQUIPMENT

A. Performance Requirements

1. Pumping Requirements: 21 gallons per minute at 29 ft. Total Dynamic Head (TDH).

2.4 ACCESSORIES

A. Sump Drainer

1. Pump shall include provisions for deployment and retrieval through an inclined riser pipe.

1. A removable transmitter mount shall be installed at the center bottom of the pump or housing for liquid level control.

2. Provide stainless steel suspension cable of sufficient strength with stainless steel connections and minimum 15 feet longer than the riser pipe length.

B. Discharge Fittings

1. Furnish stainless steel discharge adapter including NPT fittings.

2.5 CONTROL PANEL

A. The control panel shall be manufactured by the pump manufacturer. Furnish and provide one UL listed 508A/698A controller to operate one pump motor and auxiliary equipment in manual or automatic mode in accordance with the following:

1. The control panel must include provisions for additional devices and allow for automatic shutdowns.

2. The control panel enclosure shall be NEMA type 4X. The enclosure shall be equipped with a window in the outer door, an inner door, a stainless steel drip shield, and a tamper resistant latch. The NEMA 4X enclosure shall be 316L stainless steel. The control system will operate from a 240 Volt, 60 Hertz, single-phase power supply. Type 2 coordinated protection shall be provided for pump control components, and will be sized to operate pump motors of the specified horsepower.

3. The control panel shall be a tamper resistant enclosure that includes the following features:

a. The main power and motor protection shall be fused per National Electrical Code (NEC) Article 409 to limit Arc Flash potential. The main power switch shall prevent opening of the control panel while power is on.

b. The “Hand-Off-Auto” selector switch allows manual or automatic operation. The selector switch shall be heavy duty, oil tight, NEMA 4 rated and shall be mounted on the inner door. The hand position shall be momentary with a spring return.

c. The motor starter shall be sized to the pump motor horsepower, and shall be equipped with built in, single phasing protection and an ambient compensated, quick-trip, Class 10, adjustable thermal overload. The motor starter shall have two spare auxiliary contacts.

d. The control transformer with fused primary and secondary shall isolate the control circuit from the power circuit and provide easier and safer field wiring of accessories. It shall convert incoming voltage to 120 Volts.

e. The run light shall indicate energization of the motor circuit. It shall be heavy duty, oil tight, and NEMA 4 rated. The light shall be mounted on the inner door and will be green in color. The light shall also have a push-to-test light feature.

f. The motor overload light (single-phase only) shall indicate motor not running due to overload condition. It shall be heavy duty, oil tight, and NEMA 4 rated. The light shall be mounted on the inner door and will be red in color. The light shall also have a push-to-test light feature.

g. Optional alarm lights shall indicate high sump level or pump remote disable. They shall be heavy duty, oil tight, and NEMA 4 rated. The lights shall be mounted on the inner door and will be red in color. These lights shall also have a push-to-test light feature.

h. An optional amber top-mounted light shall be provided and activated by any alarm condition.

i. An optional non-resettable elapsed time meter shall be mounted on the inner door and will record total pump run time in hours.

4. Control Panel must display a SCCR (short circuit current rating) per UL specifications.

5. The level control meter shall be mounted on the inner door. The meter shall have a digital readout and the capability to monitor and maintain liquid levels as well as output a high level alarm. It shall also provide a high-high level alarm fail safe feature that shuts off the pump motor. The high-high alarm may indicate level sensor failure or a problem with the pump. Level control shall be accurate to within 0.1 inch.

6. The level simulator shall be mounted on the inner door. The level simulator shall be a built-in test circuit designed to simulate 4-20 mA loads to assist in level setup, calibration, and troubleshooting.

7. An optional flow meter shall register liquid flow rate and record total flow. It shall include a bi-directional, digital, two line, eight digit, 1/3 inch high display. The meter shall be front panel programmable for ease of calibration to line size and change in units, and include a non-volatile memory to retain programmed settings and totalized flow when power is disconnected.

8. The level circuits shall be protected by intrinsically safe barriers.

9. A lightning arrestor shall be internally mounted and shall be grounded, metal-to-metal, to water strata. When properly grounded, the lightning arrestor shall protect electrical equipment against lightning induced surges.

10. A labeled and numbered terminal strip shall provide easy connection of external components.

11. Inclusion of an industrial corrosion inhibitor emitter shall protect internal components of the control panel from corrosion for up to one year and shall be replaceable.

2.6 SYSTEM LOGIC AND FUNCTION

A. The controller is designed to start and stop a pump using the level control meter with a submersible pressure transmitter. The pump starts at the pump start level set point and continues to run until the liquid level decreases to the pump stop level set point as programmed in the level control meter. If the liquid level in the leachate tank rises to the high level alarm set point, a high level will be annunciated. If the liquid level in the leachate tank rises to the high-high level fail-safe set point, the pump motor will shut off. The pressure transmitter level sensor shall have a range of 0 to 75 feet with a 4-20 mA (HART) output signal. An elapsed time meter monitors total pump run time in hours. A pump remote enable (i.e. tank full) dry input contact with pass-along is also provided.

B. The leachate holding tank will be equipped with a high-level switch that automatically turns the submersible sump pumps off if the tank becomes full at liquid level 653.8 ft. High-level alarm and auto-dialer callout consisting of a level sensor will be installed to signal personnel when the tank reaches liquid level 652.3 ft (i.e. 1.5ft. below the maximum liquid level). The callout list will consist of at least two Exide Technologies employees who will contact a technician to inspect the Site. If a call-out alarm in initiated, a technician will check the tank and initiate any necessary corrective actions within 48 hours.

2.01 EXECUTION

A. INSTALLATION

1. Pump and control systems shall be installed by a trained installer.
2. Installation shall be properly grounded to meet the specific NEC code(s).

B. SOURCE QUALITY CONTROL

1. Test pump for 30 minutes in a tank operated by control panel and document the results.
2. Test motor and cable insulation for moisture content or insulation defects and document the results.

C. WARRANTY

1. Manufacturer to submit warranty with any required “as built shop drawings” and Operation and Maintenance Manuals.

*** END OF SECTION ***

ATTACHMENT C

SUMMARY OF WASTE CHARACTERIZATION SAMPLING OF PLACED SOIL IN EXIDE TECHNOLOGIES CLASS 2 LANDFILL CAMU, PREPARED BY GOLDER ASSOCIATES INC. AND DATED SEPTEMBER 6, 2017. THIS REPORT WAS APPROVED BY TCEQ ON SEPTEMBER 20, 2017

September 6, 2017 1302086

Mr. Richard A. Hyde, P.E.
Executive Director
Texas Commission on Environmental Quality
MC-127
P.O. Box 13087
Austin, TX 78753

Attention: Mr. R. Stuart Goldsmith, P.G., TCEQ

RE: SUMMARY OF WASTE CHARACTERIZATION SAMPLING OF PLACED SOIL IN EXIDE TECHNOLOGIES CLASS 2 LANDFILL CAMU
EXIDE FRISCO RECYCLING CENTER, 7471 5TH STREET, FRISCO, COLLIN COUNTY, TEXAS 75034
CUSTOMER NO. CN600129787; REGULATED ENTITY NO. RN106583511

Dear Mr. Hyde:

Golder Associates Inc. (Golder) was retained by Exide Technologies (Exide) to perform waste characterization sampling of soil placed in Exide Technologies Class 2 Landfill CAMU as shown on Figure 1. Golder's work was performed in accordance with the following:

- Work Plan for Waste Characterization of Placed Soil in Exide Technologies Class 2 Landfill CAMU, Exide Technologies Frisco Recycling Center, 7471 South Fifth Street, Frisco, Collin County, Texas 75034, Customer No. CN600129787; Regulated Entity No. RN106583511, Golder, May 23, 2017, with additional information provided to TCEQ via email on June 29, 2017.
- Texas Commission on Environmental Quality (TCEQ) Approval of Work Plan for Waste Characterization of Placed Soil in Exide Technologies Class 2 Landfill CAMU, provided electronically by TCEQ on August 2, 2017.
- Air Monitoring Plan for the Class 2 Landfill CAMU Final Operation and Closure Activities at Class 2 Landfill CAMU, Exide Technologies, Inc., Frisco, Texas. Originally prepared by Remediation Services, Inc. and ENVIRON International Corp., Reviewed and updated by Golder Associates, Inc., January 13, 2013, updated January 25, 2016.

1.0 IN-PLACE WASTE CHARACTERIZATION SAMPLING

As described in the Work Plan for Waste Characterization of Placed Soil in Exide Technologies Class 2 Landfill CAMU (Golder, 2017), prior to field mobilization, designated sampling locations were established to evaluate all extents of the process knowledge placed soils within the CAMU. As requested by TCEQ, a total of 11 locations were selected and sampled within the extents.

1.1 Health and Safety

Prior to mobilization, Golder prepared a Site-specific Health, Safety and Environment Plan (HASEP) for the J-Parcel RAP implementation work. The HASEP was based on the existing HASEP for the Exide Site and included additional components appropriate for the planned work on the North CAMU Soil Sampling.

Golder field staff performed personal air monitoring throughout the duration of the project, as appropriate. The personal air monitoring program included daily use of a DustTrak™. A Golder health and safety professional reviewed the air monitoring and personal air sampling results and determined that no additional control measures were needed.

1.2 Collection of GPS Data

Upon mobilization to the field, Golder marked the sample locations using survey stakes. GPS coordinates were collected at each sample location and are included in Table 2.

1.3 Soil Sampling Procedure

Characterization of the Process Knowledge Placed Soils was accomplished using direct-push (i.e. Geoprobe) drilling and sampling methods. Eleven direct-push borings were advanced in the area of the Process Knowledge Placed Soils. Sample depths ranged from 2 to 14 feet below ground surface (ft bgs), based on the elevation of the soil surface and the elevation of the top of the protective cover at each sampling location. In the area of the Process Knowledge Placed Soils, there was approximately two feet of previously characterized soil placed on top of the protective cover prior to Process Knowledge Placed Soils placement, so the borings extended from the surface of the soil pile to approximately two feet above the top of the protective cover. Soils above the protective cover but below the Process Knowledge Places Soils include previously characterized soils from the M-Tract and the SE Areas of the UBP.

The direct-push drilling methods resulted in soil samples collected from 4 to 5-feet long drill runs in 5-feet long acetate liners. One composite sample was collected from each approximate two-foot interval. Non-dedicated direct-push tooling was decontaminated between borings. This sampling method resulted in 1 to 7 samples collected at each boring location based on elevation of Process Knowledge Placed Soils at the location. A total of 42 soil samples and 1 duplicate sample were collected as part of this investigation.

1.4 Sample Handling and Laboratory Analysis

Soil samples were composited in plastic bags and then a representative portion was placed in laboratory-provided sample jars. Following sample collection, sample jars were placed in ice chests and handled under chain-of-custody procedures. The remaining soil was stored in a secure location at the Exide Former Operating Plant property (in a labeled plastic bag in 5-gallon buckets) until analytical data was received. Samples were delivered overnight to ALS Environmental of Houston, Texas via FedEx. The samples were analyzed for the RCRA 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) in TCLP extract using EPA Method 1311 (TCLP) and 6010B/6020A and 7470 (metals concentrations).

2.0 QUALITY ASSURANCE AND QUALITY CONTROL

Field procedures, waste characterization sampling and collection of quality assurance and quality control (QA/QC) samples, were conducted in general accordance with industry standard practices. To confirm the accuracy and reproducibility of the laboratory analytical results, the analytical laboratory implemented a program that includes laboratory replicate samples, method blanks and control standards. The laboratory QA/QC data generated during the sample analysis is included in the laboratory analytical reports provided to Golder and included in Attachment B.

An evaluation of the quality assurance and quality control data (Level 2 data validation) was performed and is included with the analytical data (Attachment B). A total of 42 waste characterization samples and 1 duplicate samples were included in the sample delivery groups. LCS recoveries, method blanks, hold times, and dilutions were reviewed during the validation process (where applicable). The USEPA National Functional Guidelines for validating inorganic data were used as guidance when evaluating results and raw data. No results required rejection of data. The lab applied a “J” qualifier (estimated value) if the detection was between the minimum detection limit and the reporting limit. No other items required qualification of the waste characterization sample results with the exception of the following:

- DUP-1: The arsenic detection was flagged “J” (estimated value) because the relative percent difference (RPD) was greater than 50% when compared to the original sample.
- PT 4 (10-12.3): The arsenic detection was flagged “J” (estimated value) because the relative percent difference (RPD) was greater than 50% when compared to the duplicate sample.

3.0 ANALYTICAL RESULTS

The analytical results of the waste characterization samples are presented in Table 1. The waste characterization samples were evaluated to determine the waste classification of the excavated material for disposal. The results of the TCLP metals were compared to Class 2 Non-Hazardous Waste Classification Criteria as described in the RAP (PBW, 2015). As shown in Table 1, no metals were detected above the Class 2 Criteria.

4.0 CLOSURE

Please let us know if you have questions or if additional information or clarification is needed.

Sincerely,

GOLDER ASSOCIATES INC.

Emily White

Anne Faeth-Boyd

Emily White
Staff Geological Engineer

Anne M. Faeth-Boyd, P.G.
Associate and Professional Geoscientist

Frederick M. Booth, P.G. (Missouri)
Principal and Program Leader

Attachments: Table 1 – North CAMU Soil Sampling Results
Table 2 – North CAMU Soil Sampling Locations
Figure 1 – North CAMU Soil Sampling Locations
Attachment A – Geoprobe Sample Collection Forms
Attachment B – Data Validation Forms and Laboratory Analytical Data

EPW/AMF/FMB

TABLES

Table 1
North CAMU Soil Sampling Results
Exide Frisco Recycling Center, Frisco, Texas

		ANALYTE	**Arsenic**	**Barium**	**Cadmium**	**Chromium**	**Lead**	**Mercury**	**Selenium**	**Silver**
		NON-HAZARDOUS CLASS 2 SCREENING VALUES	**1.8**	**100**	**0.5**	**5**	**1.5**	**0.2**	**1**	**5**
		UNITS	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
		ANALYTICAL METHOD	**SW6020**	**SW6020**	**SW6020**	**SW6020**	**SW6020**	**SW7470**	**SW6020**	**SW6020**
		REPORT RESULT UNIT	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Lab ID	**Sample ID**	**Sample Date**								
HS17080635-16	PT 1 (0-2)	8/10/2017	**0.0213 J**	**0.950**	**0.00814 J**	<0.00400 U	**0.0926**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-17	PT 1 (2-4)	8/10/2017	**0.00434 J**	**1.14**	**0.00511 J**	<0.00400 U	**0.0481 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-18	PT 1 (4-6)	8/10/2017	**0.0128 J**	**1.01**	<0.00200 U	<0.00400 U	**0.0129 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-19	PT 1 (6-8)	8/10/2017	**0.0111 J**	**1.07**	**0.00591 J**	<0.00400 U	**0.0437 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-20	PT 1 (8-10)	8/10/2017	**0.00652 J**	**0.941**	**0.00394 J**	<0.00400 U	**0.0325 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-21	PT 1 (10-12)	8/10/2017	**0.0201 J**	**1.23**	**0.00643 J**	<0.00400 U	**0.0548**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-22	PT 1 (12-13.5)	8/10/2017	**0.0295 J**	**1.29**	**0.00628 J**	<0.00400 U	**0.0726**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-30	PT 2 (0-2)	8/10/2017	**0.0131 J**	**1.09**	**0.00266 J**	<0.00400 U	**0.00925 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-31	PT 2 (2-4)	8/10/2017	<0.00400 U	**0.924**	<0.00200 U	<0.00400 U	**0.00735 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-32	PT 2 (4-6)	8/10/2017	**0.00508 J**	**1.09**	**0.00415 J**	<0.00400 U	**0.0434 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-33	PT 3 (0-2)	8/10/2017	**0.00901 J**	**1.21**	**0.00230 J**	<0.00400 U	**0.00813 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-34	PT 3 (2-4)	8/10/2017	**0.0550**	**1.24**	**0.00409 J**	<0.00400 U	**0.0619**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-35	PT 3 (4-6)	8/10/2017	<0.00400 U	**1.24**	**0.00419 J**	<0.00400 U	<0.00600 U	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-36	PT 3 (6-7.8)	8/10/2017	**0.00533 J**	**1.18**	**0.00358 J**	<0.00400 U	**0.0145 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-10	PT 4 (0-2)	8/10/2017	**0.00712 J**	**0.998**	**0.00363 J**	<0.00400 U	**0.0183 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-11	PT 4 (2-4)	8/10/2017	**0.00766 J**	**1.18**	**0.00293 J**	<0.00400 U	**0.0152 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-12	PT 4 (4-6)	8/10/2017	<0.00400 U	**0.998**	**0.00318 J**	<0.00400 U	**0.0123 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-13	PT 4 (6-8)	8/10/2017	**0.00415 J**	**0.941**	<0.00200 U	<0.00400 U	**0.00979 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-14	PT 4 (8-10)	8/10/2017	**0.0314 J**	**1.10**	<0.00200 U	<0.00400 U	**0.0297 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-15	PT 4 (10-12.3)	8/10/2017	**0.0354 J**	**1.02**	**0.00255 J**	<0.00400 U	**0.0174 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-43	PT 4 (10-12.3) DUP-1	8/10/2017	**0.0160 J**	**0.980**	**0.00298 J**	<0.00400 U	**0.0145 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-37	PT 5 (0-2)	8/10/2017	**0.00454 J**	**1.26**	**0.00591 J**	<0.00400 U	**0.0284 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-38	PT 5 (2-4)	8/10/2017	<0.00400 U	**1.01**	**0.00358 J**	<0.00400 U	**0.0163 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-39	PT 5 (4-6.4)	8/10/2017	<0.00400 U	**1.09**	**0.00521 J**	<0.00400 U	**0.0169 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-05	PT 6 (0-2)	8/10/2017	<0.00400 U	**1.06**	**0.00415 J**	<0.00400 U	**0.0230 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-06	PT 6 (2-4)	8/10/2017	<0.00400 U	**1.03**	**0.00445 J**	<0.00400 U	**0.0168 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-07	PT 6 (4-6)	8/10/2017	**0.00636 J**	**0.939**	**0.00431 J**	<0.00400 U	**0.0332 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-08	PT 6 (6-8)	8/10/2017	**0.00703 J**	**1.09**	**0.00567 J**	<0.00400 U	**0.0355 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-09	PT 6 (8-9.8)	8/10/2017	**0.00954 J**	**0.926**	**0.00481 J**	<0.00400 U	**0.0334 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-40	PT 7 (0-2)	8/10/2017	<0.00400 U	**0.872**	**0.00235 J**	<0.00400 U	<0.00600 U	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-41	PT 7 (2-4)	8/10/2017	**0.0136 J**	**1.01**	**0.00245 J**	<0.00400 U	**0.0164 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-42	PT 7 (4-6.3)	8/10/2017	**0.0102 J**	**1.07**	**0.00276 J**	<0.00400 U	**0.0174 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-01	PT 8 (0-2)	8/10/2017	<0.00400 U	**0.951**	<0.00200 U	<0.00400 U	<0.00600 U	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-02	PT 8 (2-4)	8/10/2017	**0.0294 J**	**1.20**	**0.00327 J**	<0.00400 U	**0.0360 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-03	PT 8 (4-6)	8/10/2017	**0.0249 J**	**1.09**	**0.00302 J**	<0.00400 U	**0.0221 J**	<0.0000300 U	<0.0110 U	<0.00200 U
HS17080635-04	PT 8 (6-8.7)	8/10/2017	**0.00948 J**	**1.04**	**0.00235 J**	<0.00400 U	**0.0173 J**	<0.0000300 U	<0.0110 U	<0.00200 U

Table 1
North CAMU Soil Sampling Results
Exide Frisco Recycling Center, Frisco, Texas

		ANALYTE	Arsenic		Barium		Cadmium		Chromium		Lead		Mercury		Selenium		Silver	
		NON-HAZARDOUS CLASS 2 SCREENING VALUES	1.8		100		0.5		5		1.5		0.2		1		5	
		UNITS	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
		ANALYTICAL METHOD	SW6020		SW6020		SW6020		SW6020		SW6020		SW7470		SW6020		SW6020	
		REPORT RESULT UNIT	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Lab ID	**Sample ID**	**Sample Date**																
HS17080635-29	PT 9 (0-2)	8/10/2017	<0.00400	U	**1.16**		**0.00333**	**J**	<0.00400	U	**0.0163**	**J**	<0.0000300	U	<0.0110	U	<0.00200	U
HS17080635-27	PT 10 (0-2)	8/10/2017	**0.00404**	**J**	**1.11**		**0.00400**	**J**	<0.00400	U	**0.0256**	**J**	<0.0000300	U	<0.0110	U	<0.00200	U
HS17080635-28	PT 10 (2-4.4)	8/10/2017	**0.0151**	**J**	**1.30**		<0.00200	U	<0.00400	U	**0.0409**	**J**	<0.0000300	U	<0.0110	U	<0.00200	U
HS17080635-23	PT 11 (0-2)	8/10/2017	**0.00561**	**J**	**1.22**		**0.00545**	**J**	<0.00400	U	**0.0455**	**J**	<0.0000300	U	<0.0110	U	<0.00200	U
HS17080635-24	PT 11 (2-4)	8/10/2017	**0.00844**	**J**	**1.19**		**0.00676**	**J**	<0.00400	U	**0.0592**		<0.0000300	U	<0.0110	U	<0.00200	U
HS17080635-25	PT 11 (4-6)	8/10/2017	**0.0248**	**J**	**1.32**		**0.00734**	**J**	<0.00400	U	**0.0679**		<0.0000300	U	<0.0110	U	<0.00200	U
HS17080635-26	PT 11 (6-7.7)	8/10/2017	**0.0165**	**J**	**1.33**		**0.00578**	**J**	<0.00400	U	**0.0396**	**J**	<0.0000300	U	<0.0110	U	<0.00200	U

NOTES

Detected analytes are bolded.

J - Analyte detected below quantitation limit.

U - Analyzed but not detected above the MDL/SDL.

mg/L - Milligrams per liter.

TCLP - Toxicity Characteristic Leaching Procedure.

Data subject to change based on data validation.

Prepared by: EPW 08/21/2017

Checked by: BCW 08/22/2017

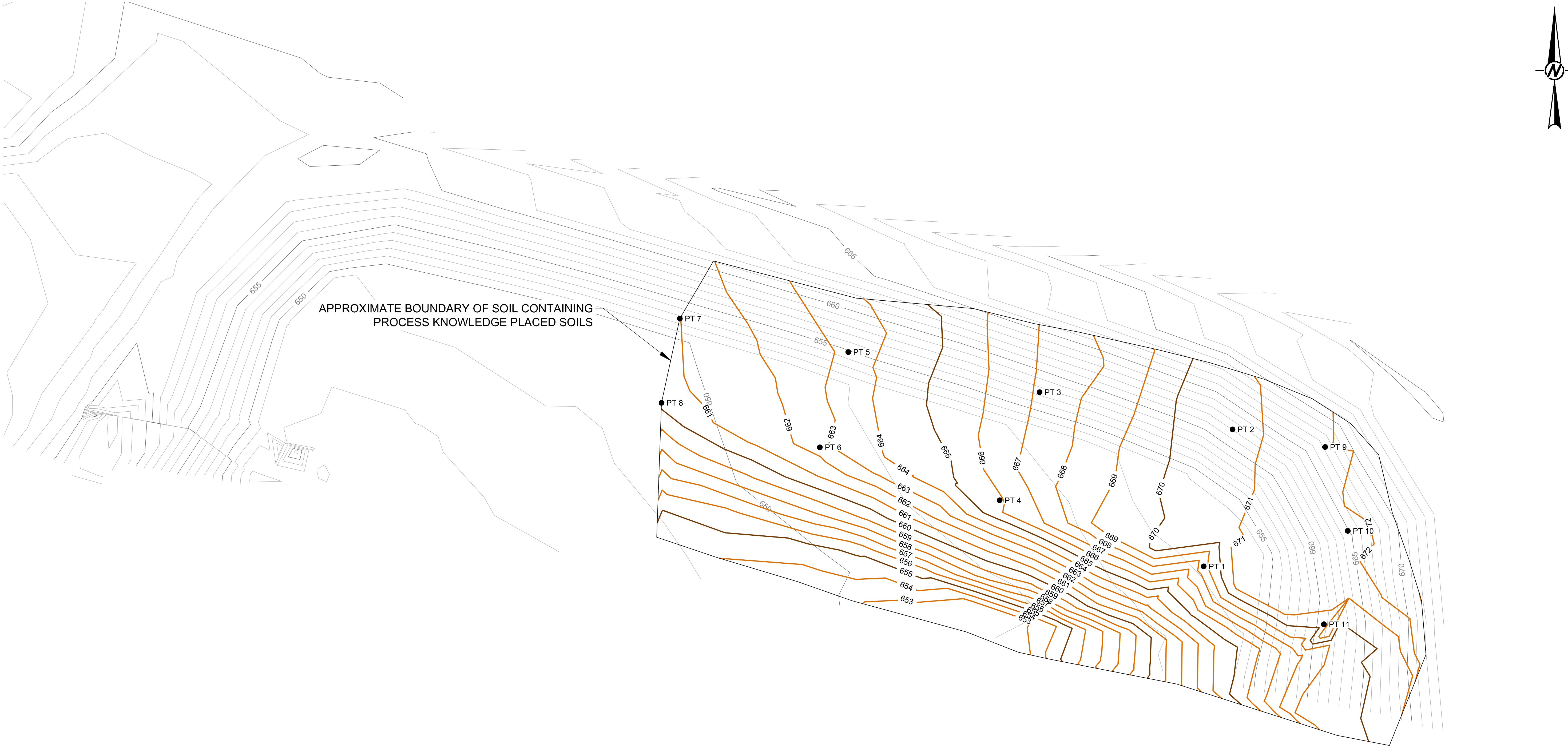
Reviewed by: AMF 08/23/2017

Table 2
North CAMU Soil Sampling Locations
Exide Frisco Recycling Center, Frisco, Texas

Sample ID	Total Depth of Borehole	Number of Samples Collected	x_coord	y_coord
PT 1	13.5	7	2480684.10	7103587.00
PT 2	6.0	3	2480695.30	7103641.00
PT 3	7.8	4	2480620.00	7103655.00
PT 4	12.3	6	2480604.40	7103613.00
PT 5	6.4	3	2480545.30	7103671.00
PT 6	9.8	5	2480534.20	7103634.00
PT 7	6.3	3	2480479.60	7103684.00
PT 8	8.7	4	2480472.40	7103651.00
PT 9	2.0	1	2480731.50	7103634.00
PT 10	4.4	2	2480740.30	7103601.00
PT 11	7.7	4	2480731.00	7103565.00

Prepared by: MGC 08/21/2017
Checked by: EPW/JSI 08/22/2017
Reviewed by: AMF 08/23/2017

FIGURES



CLIENT

EXIDE TECHNOLOGIES

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-08-29
DESIGNED	MGC
PREPARED	MGC
REVIEWED	JBF
APPROVED	AFB

PROJECT

EXIDE TECHNOLOGIES
CLASS 2 LANDFILL CAMU - CELLS 13-15
FRISCO, COLLIN COUNTY, TEXAS

TITLE

NORTH CAMU SOIL SAMPLING LOCATIONS

PROJECT NO.	PHASE	REV.	FIGURE
130-2086	1025	0	1

ATTACHMENTS

ATTACHMENT A

GEOPROBE SAMPLE COLLECTION FORMS

FIELD BORING LOG

BOREHOLE PT 1

Golder Associates

INVESTIGATION AREA Class 2 landfill (North CAMU)	**DRILLER** R. Williams	**DATE** START 08/10/17 FINISH 08/10/17
TOTAL DEPTH 13.5	**RIG** Geoprobe 7822DT	**TIME** START 1035 FINISH 1048
BOREHOLE DIAM. 2.25"	**NO. SAMPLES** 7	**BACKFILL TYPE** Bentonite Chips
	LOCATION S area of boundary of process knowledge, placed soils	

DEPTH (Feet)	SAMPLE No.	PID (ppm)	RECOVERY	OTHER	DESCRIPTION AND COMMENTS
0–2	PT 1 (0-2) 1045		46/48		(0 – 13.5') Dark brown clay w/ some silt; some gravel
2–4	PT 1 (2-4) 1048				
4–6	PT 1 (4-6) 1054		35.5/48		
6–8	PT 1 (6-8) 1056				
8–10	PT 1 (8-10) 1100		48/48		
10–12	PT 1 (10-12) 1105				
12–14	PT 1 (12-13.5) 1108		28/18		End of borehole at 13.5' bgs

PROJECT Exide - North CAMU soil sampling

LOCATION Frisco, TX

LOGGED BY F. White

PROJECT NO. 130-2086

FIELD BORING LOG

BOREHOLE PT2

Golder Associates

INVESTIGATION AREA Class 2 Landfill (North CAMU)	**DRILLER** R. Williams	**DATE** START 08/10/17 FINISH 08/10/17
TOTAL DEPTH 6.0	**RIG** Geoprobe 7822DT	**TIME** START 1346 FINISH 1350
BOREHOLE DIAM. 2.25"	**NO. SAMPLES** 3	**BACKFILL TYPE** Bentonite chips
	LOCATION N area of process knowledge placed soils	

DEPTH (Feet)	SAMPLE No.	PID (ppm)	RECOVERY	OTHER	DESCRIPTION AND COMMENTS
0–2	PT2 (0-2) 1352		32.5/48		(0-6') Dark brown clay w/ some silt; trace gravel.
2–4	PT2 (2-4) 1354				
4–6	PT2 (4-6) 1400		19.5/24		
6					End of hole 6' bgs
8					
10					
12					
14					

PROJECT Exide- North CAMU Soil Sampling **LOGGED BY** E. White

LOCATION Frisco, TX **PROJECT NO.** 130-2086

FIELD BORING LOG

BOREHOLE PT 3

Golder Associates

INVESTIGATION AREA Class 2 landfill (North CAMU)	DRILLER R. Williams		START / FINISH
	RIG Geoprobe 7822 DT	DATE	08/10/17 / 08/10/17
	NO. SAMPLES 4	TIME	1354 / 1400
TOTAL DEPTH 7.8	LOCATION N boundary area of process knowledge placed soils	BACKFILL TYPE	Bentonite Chips
BOREHOLE DIAM. 2.25"			

DEPTH (Feet)	SAMPLE No.	PID (ppm)	RECOVERY	OTHER	DESCRIPTION AND COMMENTS
	PT 1 (0-2) 1408		48/48		(0-0.75) Med brown silty clay, gravel (0.75-4) Dark brown clay, some silt (4-7.8) Med brown silty clay, trace gravel
2	PT 1 (2-4) 1410				
4	PT 1 (4-6) 1415		32/45.6		
6	PT 1 (6-7.8) 1420				
8					End of hole 7.8' BGS
10					
12					
14					

PROJECT Exide - North CAMU Soil Sampling
LOCATION Frisco, TX
LOGGED BY E. White
PROJECT NO. 130-2086

FIELD BORING LOG

BOREHOLE PT 4

Golder Associates

INVESTIGATION AREA Class 2 Landfill (North CAMU)	**DRILLER** R. Williams	**DATE** START 08/10/17 FINISH 08/10/17
TOTAL DEPTH 12.3	**RIG** Geoprobe 7822 DT	**TIME** START 0938 FINISH 1050
BOREHOLE DIAM. 2.25"	**NO. SAMPLES** 6	**BACKFILL TYPE** Bentonite Chips
	LOCATION S boundary area of process knowledge placed soils	

DEPTH (Feet)	SAMPLE No.	PID (ppm)	RECOVERY	OTHER	DESCRIPTION AND COMMENTS
2	PT 4 (0-2) 0958				(0-7.8) Med brown silty clay w/ gravel
4	PT 4 (2-4) 1000		20/48		(7.8-12.3) Dark brown clay w/ trace silt
6	PT 4 (4-6) 1002				
8	PT 4 (6-8) 1008		34/48		
10	PT 4 (8-10) 1010				
12	PT 4 (10-12.3) 1020 + DUP-1		53.5/51.6		End of borehole at 12.3'
14					

PROJECT Exide - North CAMU Soil Sampling **LOGGED BY** E. White

LOCATION Frisco, TX **PROJECT NO.** 130-2086

FIELD BORING LOG

BOREHOLE PT 5

Golder Associates

INVESTIGATION AREA Class 2 landfill (North CAMU)	**DRILLER** R. Williams	
TOTAL DEPTH 6.4'	**RIG** Geoprobe 7822 DT	
BOREHOLE DIAM. 2.25"	**NO. SAMPLES** 3	
	LOCATION N area of process knowledge placed soils	

	START	FINISH
DATE	08/10/17	08/10/17
TIME	1403	1435
BACKFILL TYPE	Bentonite Chips	

DEPTH (Feet)	SAMPLE No.	PID (ppm)	RECOVERY	OTHER	DESCRIPTION AND COMMENTS
	PT5 (0-2) 1435		24/48		(0-6.4) Med-Dark brown silty clay, gravel
2	PT5 (2-4) 1438				4.2 - large piece of limestone
4	PT5 (4-6.4) 1442		36/28.8		
6					End of hole at 6.4' bgs
8					
10					
12					
14					

PROJECT Exide - North CAMU Soil Sampling

LOCATION Frisco, TX

LOGGED BY E. White

PROJECT NO. 130-2086

FIELD BORING LOG

BOREHOLE PT 6

Golder Associates

INVESTIGATION AREA Class 2 Landfill (North CAMU)	DRILLER R. Williams		START / FINISH
	RIG Geoprobe 7822 DT	DATE	08/10/17 / 08/10/17
	NO. SAMPLES 5	TIME	0845 / 0855
TOTAL DEPTH 9.8	LOCATION S area of process knowledge placed soils	BACKFILL TYPE	Bentonite Chips
BOREHOLE DIAM. 2.25"			

DEPTH (Feet)	SAMPLE No.	PID (ppm)	RECOVERY	OTHER	DESCRIPTION AND COMMENTS
2	PT 6 (0-2) 0910		38/48		(0-4.5) Med. Brown silty clay w/ gravel (4.5-9.8) Med-Dark brown silty clay w/ trace gravel
4	PT 6 (2-4) 0912				
6	PT 6 (4-6) 0914		37/48		
8	PT 6 (6-8) 0916				
10	PT 6 (8-9.8)		22/21.6		End of borehole at 9.8' bgs
12					
14					

PROJECT Exide-North CAMU Soil Sampling

LOCATION Frisco, TX

LOGGED BY E. White

PROJECT NO. 130-2086

FIELD BORING LOG

BOREHOLE PT 7

Golder Associates

INVESTIGATION AREA Class 2 Landfill (North CAMU)	DRILLER R. Williams	START DATE 08/10/17
	RIG Geoprobe 7822DT	FINISH DATE 08/10/17
	NO. SAMPLES 3	START TIME 1442
TOTAL DEPTH 6.3'	LOCATION NW area of process knowledge placed soils	FINISH TIME 1445
BOREHOLE DIAM. 2.25"		BACKFILL TYPE Bentonite chips

DEPTH (Feet)	SAMPLE No.	PID (ppm)	RECOVERY	OTHER	DESCRIPTION AND COMMENTS
0–2	PT 7 (0-2) 1448		41/48		(0-6.3) Med brown - Dark brown silty clay, trace gravel
2–4	PT 7 (2-4) 1452				
4–6.3	PT 7 (4-6.3) 1455		26/27.6		End of hole at 6.3' bgs
8					
10					
12					
14					

PROJECT Exide - North CAMU soil sampling

LOCATION Frisco, TX

LOGGED BY E. White

PROJECT NO. 130-2086

FIELD BORING LOG

BOREHOLE PT 8

Golder Associates

INVESTIGATION AREA Class 2 Landfill (North CAMU)	**DRILLER** R. Williams		**START**	**FINISH**
	RIG Geoprobe 7822 DT	**DATE**	08/10/17	08/10/17
	NO. SAMPLES 4	**TIME**	0826	0840
TOTAL DEPTH 8.7	**LOCATION** SW corner of process knowledge placed soils	**BACKFILL TYPE**		
BOREHOLE DIAM.				

DEPTH (Feet)	SAMPLE No.	PID (ppm)	RECOVERY	OTHER	DESCRIPTION AND COMMENTS
0–2	PT 8 (0-2) 0845				(0-3) Med Brown silty clay w/ gravels (3'-8.7) Dark brown clay w/ silt; trace gravel
2–4	PT 8 (2-4) 0846		46/60		
4–6	PT 8 (4-6) 0855				
6–8.7	PT 8 (6-8.7) 0858		34.5/44.4		End of Hole 8.7' Lgs
10					
12					
14					

PROJECT Exide- North CAMU Soil Sampling

LOCATION Frisco, TX

LOGGED BY E. White

PROJECT NO. 130-2086

FIELD BORING LOG

BOREHOLE PT 9

Golder Associates

INVESTIGATION AREA Class 2 landfill (North CAMU)	**DRILLER** R. Williams	**DATE** START 08/10/17 FINISH 08/10/17
	RIG Geoprobe 7822DT	**TIME** START 1150 FINISH 1151
TOTAL DEPTH 2.0	**NO. SAMPLES** 1	**BACKFILL TYPE** Bentonite chips
BOREHOLE DIAM. 2.25"	**LOCATION** NE extent of process knowledge placed soils	

DEPTH (Feet)	SAMPLE No.	PID (ppm)	RECOVERY	OTHER	DESCRIPTION AND COMMENTS
	PT9 (0-2) 1215		21/24		
2					End of at 2.0' bgs
4					
6					
8					
10					
12					
14					

PROJECT Exide-North CAMU Soil Sampling
LOCATION Frisco, TX
LOGGED BY E. White
PROJECT NO. 130-2086

FIELD BORING LOG

BOREHOLE PT 10

Golder Associates

INVESTIGATION AREA Class 2 landfill (North CAMU)	DRILLER R. Williams	DATE START 08/10/17 FINISH 08/10/17
	RIG Geoprobe 7822DT	TIME START 1143
	NO. SAMPLES 2	
TOTAL DEPTH 4.4	LOCATION E extent of process knowledge placed soils	BACKFILL TYPE Bentonite chips
BOREHOLE DIAM. 2.25"		

DEPTH (Feet)	SAMPLE No.	PID (ppm)	RECOVERY	OTHER	DESCRIPTION AND COMMENTS
	PT 10 (0-2) 1204				(0-1.8) Med brown silty clay, gravel
2	PT 10 (2-4.4) 1208		42 / 52.8		(1.8-4.4) Dark brown clay w/ some silt; trace gravel
4					End of hole at 4.4' bgs
6					
8					
10					
12					
14					

PROJECT Exide - North CAMU Soil sampling

LOCATION Frisco, TX

LOGGED BY E. White

PROJECT NO. 130-20816

FIELD BORING LOG

BOREHOLE PT 11

Golder Associates

INVESTIGATION AREA Class 2 landfill (North CAMU)	**DRILLER** R. Williams	**DATE** START 08/10/17 FINISH 08/10/17
	RIG Geoprobe 7822DT	**TIME** START 1130 FINISH 1135
TOTAL DEPTH 7.7	**NO. SAMPLES** 4	**BACKFILL TYPE** Bentonite chips
BOREHOLE DIAM. 2.25"	**LOCATION** SE extent of process knowledge placed soils	

DEPTH (Feet)	SAMPLE No.	PID (ppm)	RECOVERY	OTHER	DESCRIPTION AND COMMENTS
0–2	PT 11 (0-2) 1138		47/48		(0-7.7) Dark brown clay w/ trace silt; trace gravel
2–4	PT 11 (2-4) 1140				
4–6	PT 11 (4-6) 1152		43/44.4		
6–8	PT 11 (6-7.7) 1154				End of hole at 7.7' bgs
8–10					
10–12					
12–14					

PROJECT Exide - North CAMU soil Sampling

LOCATION Frisco, TX

LOGGED BY E. White

PROJECT NO. 130-2086

ATTACHMENT B

DATA VALIDATION FORMS AND LABORATORY ANALYTICAL DATA

10450 Stancliff Rd. Suite 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887

August 18, 2017

Brett Forthaus
Golder Associates
820 South Main St.
Suite 100
St Charles, MO 63301

Work Order: **HS17080635**

Laboratory Results for: **Exide North CAMU**

Dear Brett,

ALS Environmental received 43 sample(s) on Aug 11, 2017 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: Jumoke.Lawal

Dane J. Wacasey

Client:	Golder Associates	**TRRP Laboratory Data Package Cover Page**
Project:	Exide North CAMU	
WorkOrder:	**HS17080635**	

This data package consists of all or some of the following as applicable:

This signature page, the laboratory review checklist, and the following reportable data:

R1 Field chain-of-custody documentation;

R2 Sample identification cross-reference;

R3 Test reports (analytical data sheets) for each environmental sample that includes:
a) Items consistent with NELAC Chapter 5,
b) dilution factors,
c) preparation methods,
d) cleanup methods, and
e) if required for the project, tentatively identified compounds (TICs).

R4 Surrogate recovery data including:
a) Calculated recovery (%R), and
b) The laboratory's surrogate QC limits.

R5 Test reports/summary forms for blank samples;

R6 Test reports/summary forms for laboratory control samples (LCSs) including:
a) LCS spiking amounts,
b) Calculated %R for each analyte, and
c)The laboratory's LCS QC limits.

R7 Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
a) Samples associated with the MS/MSD clearly identified,
b) MS/MSD spiking amounts,
c) Concentration of each MS/MSD analyte measured in the parent and spiked samples,
d) Calculated %Rs and relative percent differences (RPDs), and
e) The laboratory's MS/MSD QC limits.

R8 Laboratory analytical duplicate (if applicable) recovery and precision:
a) the amount of analyte measured in the duplicate,
b) the calculated RPD, and
c) the laboratory's QC limits for analytical duplicates.

R9 List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.

R10 Other problems or anomalies.
The Exception Report for each "No" or "Not Reviewed (NR)" item in Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory does not hold NELAC accreditation under the Texas Laboratory Accreditation Program.

Client:	Golder Associates	**TRRP Laboratory Data Package Cover Page**
Project:	Exide North CAMU	
WorkOrder:	**HS17080635**	

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the attached exception reports. By my signature below, I affirm to the best of my knowledge, all problems/anomalies, observed by the laboratory have been identified by the laboratory in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Check, if applicable: [NA] This laboratory meets an exception under 30 TAC §25.6 and was last inspected by [ ] TCEQ or [ ] ______________ on (enter date of last inspection). Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Dane J. Wacasey

Laboratory Review Checklist: Reportable Data

Laboratory Name: ALS Laboratory Group	LRC Date: 08/18/2017
Project Name: Exide North CAMU	Laboratory Job Number: HS17080635
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 119273,119305,119314,119315,119323,119341

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1	OI	**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
		Were all departures from standard conditions described in an exception report?	X				
R2	OI	**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
R3	OI	**Test reports**					
		Were all samples prepared and analyzed within holding times?	X				
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
		Were calculations checked by a peer or supervisor?	X				
		Were all analyte identifications checked by a peer or supervisor?	X				
		Were sample detection limits reported for all analytes not detected?	X				
		Were all results for soil and sediment samples reported on a dry weight basis?			X		
		Were % moisture (or solids) reported for all soil and sediment samples?			X		
		Were bulk soils/solids samples for volatile analysis extracted with methanol per SW-846 Method 5035?			X		
		If required for the project, TICs reported?			X		
R4	O	**Surrogate recovery data**					
		Were surrogates added prior to extraction?			X		
		Were surrogate percent recoveries in all samples within the laboratory QC limits?			X		
R5	OI	**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	X				
		Were blanks analyzed at the appropriate frequency?	X				
		Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
		Were blank concentrations < MQL?	X				
R6	OI	**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	X				
		Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
		Were LCSs analyzed at the required frequency?	X				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
		Does the detectability data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	X				
		Was the LCSD RPD within QC limits?	X				
R7	OI	**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	X				
		Were MS/MSD analyzed at the appropriate frequency?	X				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?	X				
		Were MS/MSD RPDs within laboratory QC limits?	X				
R8	OI	**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?			X		
		Were analytical duplicates analyzed at the appropriate frequency?			X		
		Were RPDs or relative standard deviations within the laboratory QC limits?			X		
R9	OI	**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	X				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
		Are unadjusted MQLs and DCSs included in the laboratory data package?	X				
R10	OI	**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
		Were all necessary corrective actions performed for the reported data?	X				
		Was applicable and available technology used to lower the SDL and minimize the matrix interference affects on the sample results?	X				
		Is the laboratory NELAC-accredited under the Texas Laboratory Program for the analytes, matrices and methods associated with this laboratory data package?	X				

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Review Checklist: Supporting Data							
Laboratory Name: ALS Laboratory Group			LRC Date: 08/18/2017				
Project Name: Exide North CAMU			Laboratory Job Number: HS17080635				
Reviewer Name: Dane Wacasey			Prep Batch Number(s): 119273,119305,119314,119315,119323,119341				
#[1]	**A[2]**	**Description**	**Yes**	**No**	**NA[3]**	**NR[4]**	**ER#[5]**
S1	OI	**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	X				
		Were percent RSDs or correlation coefficient criteria met?	X				
		Was the number of standards recommended in the method used for all analytes?	X				
		Were all points generated between the lowest and highest standard used to calculate the curve?	X				
		Are ICAL data available for all instruments used?	X				
		Has the initial calibration curve been verified using an appropriate second source standard?	X				
S2	OI	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB)**					
		Was the CCV analyzed at the method-required frequency?	X				
		Were percent differences for each analyte within the method-required QC limits?	X				
		Was the ICAL curve verified for each analyte?	X				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	X				
S3	O	**Mass spectral tuning:**					
		Was the appropriate compound for the method used for tuning?	X				
		Were ion abundance data within the method-required QC limits?	X				
S4	O	**Internal standards (IS):**					
		Were IS area counts and retention times within the method-required QC limits?	X				
S5	OI	**Raw data** (NELAC section 1 appendix A glossary, and section 5.12 or ISO/IEC 17025 section					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
		Were data associated with manual integrations flagged on the raw data?	X				
S6	O	**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			X		
S7	O	**Tentatively identified compounds (TICs):**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
S8	I	**Interference Check Sample (ICS) results:**					
		Were percent recoveries within method QC limits?	X				
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?		X			1
S10	OI	**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	X				
		Is the MDL either adjusted or supported by the analysis of DCSs?	X				
S11	OI	**Proficiency test reports:**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
S12	OI	**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
S13	OI	**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	X				
S14	OI	**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5C or ISO/IEC 4?	X				
		Is documentation of the analyst's competency up-to-date and on file?	X				
S15	OI	**Verification/validation documentation for methods** (NELAC Chap 5 or ISO/IEC 17025 Section 5)					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
S16	OI	**Laboratory standard operating procedures (SOPs):**					
		Are laboratory SOPs current and on file for each method performed?	X				

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
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NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Review Checklist: Exception Data	
Laboratory Name: ALS Laboratory Group	LRC Date: 08/18/2017
Project Name: Exide North CAMU	Laboratory Job Number: HS17080635
Reviewer Name: Dane Wacasey	Prep Batch Number(s): 119273,119305,119314,119315,119323,119341

ER#[5]	**Description**
1	Batch 119314, Metals Method SW1311/6020, sample PT 1 (10-12) the percent difference between the results of the sample and the serial dilution were greater than 10%. Barium.

Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period.
O = Organic Analyses; I = Inorganic Analyses (and general chemistry, when applicable);
NA = Not Applicable;
NR = Not Reviewed;
R# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Client: Golder Associates
Project: Exide North CAMU
Work Order: HS17080635

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS17080635-01	PT 8 (0-2)	Soil		10-Aug-2017 08:45	11-Aug-2017 08:25	☐
HS17080635-02	PT 8 (2-4)	Soil		10-Aug-2017 08:46	11-Aug-2017 08:25	☐
HS17080635-03	PT 8 (4-6)	Soil		10-Aug-2017 08:55	11-Aug-2017 08:25	☐
HS17080635-04	PT 8 (6-8.7)	Soil		10-Aug-2017 08:58	11-Aug-2017 08:25	☐
HS17080635-05	PT 6 (0-2)	Soil		10-Aug-2017 09:10	11-Aug-2017 08:25	☐
HS17080635-06	PT 6 (2-4)	Soil		10-Aug-2017 09:12	11-Aug-2017 08:25	☐
HS17080635-07	PT 6 (4-6)	Soil		10-Aug-2017 09:14	11-Aug-2017 08:25	☐
HS17080635-08	PT 6 (6-8)	Soil		10-Aug-2017 09:16	11-Aug-2017 08:25	☐
HS17080635-09	PT 6 (8-9.8)	Soil		10-Aug-2017 09:22	11-Aug-2017 08:25	☐
HS17080635-10	PT 4 (0-2)	Soil		10-Aug-2017 09:58	11-Aug-2017 08:25	☐
HS17080635-11	PT 4 (2-4)	Soil		10-Aug-2017 10:00	11-Aug-2017 08:25	☐
HS17080635-12	PT 4 (4-6)	Soil		10-Aug-2017 10:02	11-Aug-2017 08:25	☐
HS17080635-13	PT 4 (6-8)	Soil		10-Aug-2017 10:08	11-Aug-2017 08:25	☐
HS17080635-14	PT 4 (8-10)	Soil		10-Aug-2017 10:10	11-Aug-2017 08:25	☐
HS17080635-15	PT 4 (10-12.3)	Soil		10-Aug-2017 10:20	11-Aug-2017 08:25	☐
HS17080635-16	PT 1 (0-2)	Soil		10-Aug-2017 10:45	11-Aug-2017 08:25	☐
HS17080635-17	PT 1 (2-4)	Soil		10-Aug-2017 10:48	11-Aug-2017 08:25	☐
HS17080635-18	PT 1 (4-6)	Soil		10-Aug-2017 10:54	11-Aug-2017 08:25	☐
HS17080635-19	PT 1 (6-8)	Soil		10-Aug-2017 10:56	11-Aug-2017 08:25	☐
HS17080635-20	PT 1 (8-10)	Soil		10-Aug-2017 11:00	11-Aug-2017 08:25	☐
HS17080635-21	PT 1 (10-12)	Soil		10-Aug-2017 11:05	11-Aug-2017 08:25	☐
HS17080635-22	PT 1 (12-13.5)	Soil		10-Aug-2017 11:08	11-Aug-2017 08:25	☐
HS17080635-23	PT 11 (0-2)	Soil		10-Aug-2017 11:38	11-Aug-2017 08:25	☐
HS17080635-24	PT 11 (2-4)	Soil		10-Aug-2017 11:40	11-Aug-2017 08:25	☐
HS17080635-25	PT 11 (4-6)	Soil		10-Aug-2017 11:52	11-Aug-2017 08:25	☐
HS17080635-26	PT 11 (6-7.7)	Soil		10-Aug-2017 11:54	11-Aug-2017 08:25	☐
HS17080635-27	PT 10 (0-2)	Soil		10-Aug-2017 12:04	11-Aug-2017 08:25	☐

Client: Golder Associates
Project: Exide North CAMU
Work Order: HS17080635

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS17080635-28	PT 10 (2-4.4)	Soil		10-Aug-2017 12:08	11-Aug-2017 08:25	☐
HS17080635-29	PT 9 (0-2)	Soil		10-Aug-2017 12:15	11-Aug-2017 08:25	☐
HS17080635-30	PT 2 (0-2)	Soil		10-Aug-2017 13:52	11-Aug-2017 08:25	☐
HS17080635-31	PT 2 (2-4)	Soil		10-Aug-2017 13:54	11-Aug-2017 08:25	☐
HS17080635-32	PT 2 (4-6)	Soil		10-Aug-2017 14:00	11-Aug-2017 08:25	☐
HS17080635-33	PT 3 (0-2)	Soil		10-Aug-2017 14:08	11-Aug-2017 08:25	☐
HS17080635-34	PT 3 (2-4)	Soil		10-Aug-2017 14:10	11-Aug-2017 08:25	☐
HS17080635-35	PT 3 (4-6)	Soil		10-Aug-2017 14:15	11-Aug-2017 08:25	☐
HS17080635-36	PT 3 (6-7.8)	Soil		10-Aug-2017 14:20	11-Aug-2017 08:25	☐
HS17080635-37	PT 5 (0-2)	Soil		10-Aug-2017 14:35	11-Aug-2017 08:25	☐
HS17080635-38	PT 5 (2-4)	Soil		10-Aug-2017 14:38	11-Aug-2017 08:25	☐
HS17080635-39	PT 5 (4-6.4)	Soil		10-Aug-2017 14:42	11-Aug-2017 08:25	☐
HS17080635-40	PT 7 (0-2)	Soil		10-Aug-2017 14:48	11-Aug-2017 08:25	☐
HS17080635-41	PT 7 (2-4)	Soil		10-Aug-2017 14:52	11-Aug-2017 08:25	☐
HS17080635-42	PT 7 (4-6.3)	Soil		10-Aug-2017 14:55	11-Aug-2017 08:25	☐
HS17080635-43	DUP-1	Soil		10-Aug-2017 00:00	11-Aug-2017 08:25	☐

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 8 (0-2)		Lab ID:HS17080635-01
Collection Date:	10-Aug-2017 08:45		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	U		0.00400	0.0500	mg/L	1	16-Aug-2017 22:52
Barium	**0.951**		**0.0190**	**0.200**	**mg/L**	1	16-Aug-2017 22:52
Cadmium	U		0.00200	0.0500	mg/L	1	16-Aug-2017 22:52
Chromium	U		0.00400	0.0500	mg/L	1	16-Aug-2017 22:52
Lead	U		0.00600	0.0500	mg/L	1	16-Aug-2017 22:52
Selenium	U		0.0110	0.0500	mg/L	1	16-Aug-2017 22:52
Silver	U		0.00200	0.0500	mg/L	1	16-Aug-2017 22:52
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 16:50

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates	ANALYTICAL REPORT
Project:	Exide North CAMU	WorkOrder:HS17080635
Sample ID:	PT 8 (2-4)	Lab ID:HS17080635-02
Collection Date:	10-Aug-2017 08:46	Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A			**Method:SW1311/6020**	Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.0294**	J	**0.00400**	**0.0500**	**mg/L**	1	16-Aug-2017 22:57
Barium	**1.20**		**0.0190**	**0.200**	**mg/L**	1	16-Aug-2017 22:57
Cadmium	**0.00327**	J	**0.00200**	**0.0500**	**mg/L**	1	16-Aug-2017 22:57
Chromium	U		0.00400	0.0500	mg/L	1	16-Aug-2017 22:57
Lead	**0.0360**	J	**0.00600**	**0.0500**	**mg/L**	1	16-Aug-2017 22:57
Selenium	U		0.0110	0.0500	mg/L	1	16-Aug-2017 22:57
Silver	U		0.00200	0.0500	mg/L	1	16-Aug-2017 22:57
TCLP MERCURY BY SW7470A			**Method:SW7470**	Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 16:55

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 8 (4-6)		Lab ID:HS17080635-03
Collection Date:	10-Aug-2017 08:55		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.0249**	J	**0.00400**	**0.0500**	**mg/L**	1	16-Aug-2017 23:02
Barium	**1.09**		**0.0190**	**0.200**	**mg/L**	1	16-Aug-2017 23:02
Cadmium	**0.00302**	J	**0.00200**	**0.0500**	**mg/L**	1	16-Aug-2017 23:02
Chromium	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:02
Lead	**0.0221**	J	**0.00600**	**0.0500**	**mg/L**	1	16-Aug-2017 23:02
Selenium	U		0.0110	0.0500	mg/L	1	16-Aug-2017 23:02
Silver	U		0.00200	0.0500	mg/L	1	16-Aug-2017 23:02
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 16:56

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 8 (6-8.7)		Lab ID:HS17080635-04
Collection Date:	10-Aug-2017 08:58		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.00948**	J	**0.00400**	**0.0500**	**mg/L**	1	16-Aug-2017 23:06
Barium	**1.04**		**0.0190**	**0.200**	**mg/L**	1	16-Aug-2017 23:06
Cadmium	**0.00235**	J	**0.00200**	**0.0500**	**mg/L**	1	16-Aug-2017 23:06
Chromium	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:06
Lead	**0.0173**	J	**0.00600**	**0.0500**	**mg/L**	1	16-Aug-2017 23:06
Selenium	U		0.0110	0.0500	mg/L	1	16-Aug-2017 23:06
Silver	U		0.00200	0.0500	mg/L	1	16-Aug-2017 23:06
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 16:58

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU	WorkOrder:	HS17080635
Sample ID:	PT 6 (0-2)	Lab ID:	HS17080635-05
Collection Date:	10-Aug-2017 09:10	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:11
Barium	**1.06**		**0.0190**	**0.200**	**mg/L**	1	16-Aug-2017 23:11
Cadmium	**0.00415**	J	**0.00200**	**0.0500**	**mg/L**	1	16-Aug-2017 23:11
Chromium	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:11
Lead	**0.0230**	J	**0.00600**	**0.0500**	**mg/L**	1	16-Aug-2017 23:11
Selenium	U		0.0110	0.0500	mg/L	1	16-Aug-2017 23:11
Silver	U		0.00200	0.0500	mg/L	1	16-Aug-2017 23:11
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:00

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Group USA, Corp Date: 18-Aug-17

Client:	Golder Associates	**ANALYTICAL REPORT**
Project:	Exide North CAMU	WorkOrder:HS17080635
Sample ID:	PT 6 (2-4)	Lab ID:HS17080635-06
Collection Date:	10-Aug-2017 09:12	Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:16
Barium	**1.03**		**0.0190**	**0.200**	**mg/L**	1	16-Aug-2017 23:16
Cadmium	**0.00445**	J	**0.00200**	**0.0500**	**mg/L**	1	16-Aug-2017 23:16
Chromium	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:16
Lead	**0.0168**	J	**0.00600**	**0.0500**	**mg/L**	1	16-Aug-2017 23:16
Selenium	U		0.0110	0.0500	mg/L	1	16-Aug-2017 23:16
Silver	U		0.00200	0.0500	mg/L	1	16-Aug-2017 23:16
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:05

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 6 (4-6)		Lab ID:HS17080635-07
Collection Date:	10-Aug-2017 09:14		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.00636**	J	**0.00400**	**0.0500**	**mg/L**	1	16-Aug-2017 23:30
Barium	**0.939**		**0.0190**	**0.200**	**mg/L**	1	16-Aug-2017 23:30
Cadmium	**0.00431**	J	**0.00200**	**0.0500**	**mg/L**	1	16-Aug-2017 23:30
Chromium	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:30
Lead	**0.0332**	J	**0.00600**	**0.0500**	**mg/L**	1	16-Aug-2017 23:30
Selenium	U		0.0110	0.0500	mg/L	1	16-Aug-2017 23:30
Silver	U		0.00200	0.0500	mg/L	1	16-Aug-2017 23:30
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:07

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 6 (6-8)		Lab ID:HS17080635-08
Collection Date:	10-Aug-2017 09:16		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.00703**	J	**0.00400**	**0.0500**	**mg/L**	1	16-Aug-2017 23:35
Barium	**1.09**		**0.0190**	**0.200**	**mg/L**	1	16-Aug-2017 23:35
Cadmium	**0.00567**	J	**0.00200**	**0.0500**	**mg/L**	1	16-Aug-2017 23:35
Chromium	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:35
Lead	**0.0355**	J	**0.00600**	**0.0500**	**mg/L**	1	16-Aug-2017 23:35
Selenium	U		0.0110	0.0500	mg/L	1	16-Aug-2017 23:35
Silver	U		0.00200	0.0500	mg/L	1	16-Aug-2017 23:35
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:08

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU	WorkOrder:	HS17080635
Sample ID:	PT 6 (8-9.8)	Lab ID:	HS17080635-09
Collection Date:	10-Aug-2017 09:22	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.00954**	J	**0.00400**	**0.0500**	**mg/L**	1	16-Aug-2017 23:39
Barium	**0.926**		**0.0190**	**0.200**	**mg/L**	1	16-Aug-2017 23:39
Cadmium	**0.00481**	J	**0.00200**	**0.0500**	**mg/L**	1	16-Aug-2017 23:39
Chromium	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:39
Lead	**0.0334**	J	**0.00600**	**0.0500**	**mg/L**	1	16-Aug-2017 23:39
Selenium	U		0.0110	0.0500	mg/L	1	16-Aug-2017 23:39
Silver	U		0.00200	0.0500	mg/L	1	16-Aug-2017 23:39
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:10

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 4 (0-2)		Lab ID:HS17080635-10
Collection Date:	10-Aug-2017 09:58		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.00712**	J	**0.00400**	**0.0500**	**mg/L**	1	16-Aug-2017 23:44
Barium	**0.998**		**0.0190**	**0.200**	**mg/L**	1	16-Aug-2017 23:44
Cadmium	**0.00363**	J	**0.00200**	**0.0500**	**mg/L**	1	16-Aug-2017 23:44
Chromium	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:44
Lead	**0.0183**	J	**0.00600**	**0.0500**	**mg/L**	1	16-Aug-2017 23:44
Selenium	U		0.0110	0.0500	mg/L	1	16-Aug-2017 23:44
Silver	U		0.00200	0.0500	mg/L	1	16-Aug-2017 23:44
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:12

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 4 (2-4)		Lab ID:HS17080635-11
Collection Date:	10-Aug-2017 10:00		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.00766**	J	**0.00400**	**0.0500**	**mg/L**	1	16-Aug-2017 23:49
Barium	**1.18**		**0.0190**	**0.200**	**mg/L**	1	16-Aug-2017 23:49
Cadmium	**0.00293**	J	**0.00200**	**0.0500**	**mg/L**	1	16-Aug-2017 23:49
Chromium	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:49
Lead	**0.0152**	J	**0.00600**	**0.0500**	**mg/L**	1	16-Aug-2017 23:49
Selenium	U		0.0110	0.0500	mg/L	1	16-Aug-2017 23:49
Silver	U		0.00200	0.0500	mg/L	1	16-Aug-2017 23:49
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:14

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 4 (4-6)		Lab ID:HS17080635-12
Collection Date:	10-Aug-2017 10:02		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:53
Barium	**0.998**		**0.0190**	**0.200**	**mg/L**	1	16-Aug-2017 23:53
Cadmium	**0.00318**	J	**0.00200**	**0.0500**	**mg/L**	1	16-Aug-2017 23:53
Chromium	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:53
Lead	**0.0123**	J	**0.00600**	**0.0500**	**mg/L**	1	16-Aug-2017 23:53
Selenium	U		0.0110	0.0500	mg/L	1	16-Aug-2017 23:53
Silver	U		0.00200	0.0500	mg/L	1	16-Aug-2017 23:53
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:15

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 4 (6-8)		Lab ID:HS17080635-13
Collection Date:	10-Aug-2017 10:08		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.00415**	J	**0.00400**	**0.0500**	**mg/L**	1	16-Aug-2017 23:58
Barium	**0.941**		**0.0190**	**0.200**	**mg/L**	1	16-Aug-2017 23:58
Cadmium	U		0.00200	0.0500	mg/L	1	16-Aug-2017 23:58
Chromium	U		0.00400	0.0500	mg/L	1	16-Aug-2017 23:58
Lead	**0.00979**	J	**0.00600**	**0.0500**	**mg/L**	1	16-Aug-2017 23:58
Selenium	U		0.0110	0.0500	mg/L	1	16-Aug-2017 23:58
Silver	U		0.00200	0.0500	mg/L	1	16-Aug-2017 23:58
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:17

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 4 (8-10)		Lab ID:HS17080635-14
Collection Date:	10-Aug-2017 10:10		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.0314**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 00:03
Barium	**1.10**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 00:03
Cadmium	U		0.00200	0.0500	mg/L	1	17-Aug-2017 00:03
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 00:03
Lead	**0.0297**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 00:03
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 00:03
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 00:03
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:19

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 4 (10-12.3)		Lab ID:HS17080635-15
Collection Date:	10-Aug-2017 10:20		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.0354**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 00:07
Barium	**1.02**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 00:07
Cadmium	**0.00255**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 00:07
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 00:07
Lead	**0.0174**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 00:07
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 00:07
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 00:07
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:20

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU	WorkOrder:	HS17080635
Sample ID:	PT 1 (0-2)	Lab ID:	HS17080635-16
Collection Date:	10-Aug-2017 10:45	Matrix:	Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.0213**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 00:31
Barium	**0.950**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 00:31
Cadmium	**0.00814**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 00:31
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 00:31
Lead	**0.0926**		**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 00:31
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 00:31
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 00:31
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:26

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 1 (2-4)		Lab ID:HS17080635-17
Collection Date:	10-Aug-2017 10:48		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.00434**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 00:36
Barium	**1.14**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 00:36
Cadmium	**0.00511**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 00:36
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 00:36
Lead	**0.0481**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 00:36
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 00:36
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 00:36
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:27

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 1 (4-6)		Lab ID:HS17080635-18
Collection Date:	10-Aug-2017 10:54		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.0128**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 00:40
Barium	**1.01**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 00:40
Cadmium	U		0.00200	0.0500	mg/L	1	17-Aug-2017 00:40
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 00:40
Lead	**0.0129**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 00:40
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 00:40
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 00:40
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:29

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 1 (6-8)		Lab ID:HS17080635-19
Collection Date:	10-Aug-2017 10:56		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 14-Aug-2017	Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.0111**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 00:45
Barium	**1.07**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 00:45
Cadmium	**0.00591**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 00:45
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 00:45
Lead	**0.0437**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 00:45
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 00:45
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 00:45
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 14-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:31

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 1 (8-10)		Lab ID:HS17080635-20
Collection Date:	10-Aug-2017 11:00		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**		Leache:SW1311 / 14-Aug-2017		Prep:SW3010A / 15-Aug-2017		Analyst: JCJ
Arsenic	**0.00652**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 00:50
Barium	**0.941**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 00:50
Cadmium	**0.00394**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 00:50
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 00:50
Lead	**0.0325**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 00:50
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 00:50
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 00:50
TCLP MERCURY BY SW7470A	**Method:SW7470**		Leache:SW1311 / 14-Aug-2017		Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 17:32

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Group USA, Corp Date: 18-Aug-17

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 1 (10-12)		Lab ID:HS17080635-21
Collection Date:	10-Aug-2017 11:05		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.0201**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 10:56
Barium	**1.23**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 10:56
Cadmium	**0.00643**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 10:56
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 10:56
Lead	**0.0548**		**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 10:56
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 10:56
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 10:56
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:24

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 1 (12-13.5)		Lab ID:HS17080635-22
Collection Date:	10-Aug-2017 11:08		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.0295**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 14:49
Barium	**1.29**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 14:49
Cadmium	**0.00628**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 14:49
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 14:49
Lead	**0.0726**		**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 14:49
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 14:49
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 14:49
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:29

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 11 (0-2)		Lab ID:HS17080635-23
Collection Date:	10-Aug-2017 11:38		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.00561**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 14:52
Barium	**1.22**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 14:52
Cadmium	**0.00545**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 14:52
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 14:52
Lead	**0.0455**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 14:52
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 14:52
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 14:52
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:31

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Group USA, Corp Date: 18-Aug-17

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 11 (2-4)		Lab ID:HS17080635-24
Collection Date:	10-Aug-2017 11:40		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.00844**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 14:55
Barium	**1.19**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 14:55
Cadmium	**0.00676**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 14:55
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 14:55
Lead	**0.0592**		**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 14:55
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 14:55
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 14:55
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:33

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 11 (4-6)		Lab ID:HS17080635-25
Collection Date:	10-Aug-2017 11:52		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.0248**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 14:58
Barium	**1.32**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 14:58
Cadmium	**0.00734**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 14:58
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 14:58
Lead	**0.0679**		**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 14:58
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 14:58
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 14:58
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:34

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Group USA, Corp Date: 18-Aug-17

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 11 (6-7.7)		Lab ID:HS17080635-26
Collection Date:	10-Aug-2017 11:54		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.0165**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 15:01
Barium	**1.33**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:01
Cadmium	**0.00578**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 15:01
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:01
Lead	**0.0396**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 15:01
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:01
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:01
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:36

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 10 (0-2)		Lab ID:HS17080635-27
Collection Date:	10-Aug-2017 12:04		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.00404**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 15:04
Barium	**1.11**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:04
Cadmium	**0.00400**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 15:04
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:04
Lead	**0.0256**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 15:04
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:04
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:04
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:38

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 10 (2-4.4)		Lab ID:HS17080635-28
Collection Date:	10-Aug-2017 12:08		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.0151**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 15:07
Barium	**1.30**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:07
Cadmium	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:07
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:07
Lead	**0.0409**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 15:07
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:07
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:07
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:39

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 9 (0-2)		Lab ID:HS17080635-29
Collection Date:	10-Aug-2017 12:15		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:10
Barium	**1.16**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:10
Cadmium	**0.00333**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 15:10
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:10
Lead	**0.0163**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 15:10
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:10
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:10
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:45

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 2 (0-2)		Lab ID:HS17080635-30
Collection Date:	10-Aug-2017 13:52		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.0131**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 15:19
Barium	**1.09**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:19
Cadmium	**0.00266**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 15:19
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:19
Lead	**0.00925**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 15:19
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:19
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:19
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:46

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 2 (2-4)		Lab ID:HS17080635-31
Collection Date:	10-Aug-2017 13:54		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:21
Barium	**0.924**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:21
Cadmium	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:21
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:21
Lead	**0.00735**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 15:21
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:21
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:21
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:48

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 2 (4-6)		Lab ID:HS17080635-32
Collection Date:	10-Aug-2017 14:00		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.00508**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 15:24
Barium	**1.09**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:24
Cadmium	**0.00415**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 15:24
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:24
Lead	**0.0434**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 15:24
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:24
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:24
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:50

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 3 (0-2)		Lab ID:HS17080635-33
Collection Date:	10-Aug-2017 14:08		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.00901**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 15:27
Barium	**1.21**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:27
Cadmium	**0.00230**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 15:27
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:27
Lead	**0.00813**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 15:27
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:27
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:27
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:51

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 3 (2-4)		Lab ID:HS17080635-34
Collection Date:	10-Aug-2017 14:10		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.0550**		**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 15:30
Barium	**1.24**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:30
Cadmium	**0.00409**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 15:30
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:30
Lead	**0.0619**		**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 15:30
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:30
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:30
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:53

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 3 (4-6)		Lab ID:HS17080635-35
Collection Date:	10-Aug-2017 14:15		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:33
Barium	**1.24**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:33
Cadmium	**0.00419**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 15:33
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:33
Lead	U		0.00600	0.0500	mg/L	1	17-Aug-2017 15:33
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:33
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:33
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:55

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates	ANALYTICAL REPORT
Project:	Exide North CAMU	WorkOrder:HS17080635
Sample ID:	PT 3 (6-7.8)	Lab ID:HS17080635-36
Collection Date:	10-Aug-2017 14:20	Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.00533**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 15:36
Barium	**1.18**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:36
Cadmium	**0.00358**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 15:36
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:36
Lead	**0.0145**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 15:36
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:36
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:36
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:57

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 5 (0-2)		Lab ID:HS17080635-37
Collection Date:	10-Aug-2017 14:35		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	**0.00454**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 15:39
Barium	**1.26**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:39
Cadmium	**0.00591**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 15:39
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:39
Lead	**0.0284**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 15:39
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:39
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:39
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 18:58

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates	**ANALYTICAL REPORT**
Project:	Exide North CAMU	WorkOrder:HS17080635
Sample ID:	PT 5 (2-4)	Lab ID:HS17080635-38
Collection Date:	10-Aug-2017 14:38	Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:42
Barium	**1.01**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:42
Cadmium	**0.00358**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 15:42
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:42
Lead	**0.0163**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 15:42
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:42
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:42
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 19:00

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		ANALYTICAL REPORT
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 5 (4-6.4)		Lab ID:HS17080635-39
Collection Date:	10-Aug-2017 14:42		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A			**Method:SW1311/6020**	Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JDE
Arsenic	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:45
Barium	**1.09**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 15:45
Cadmium	**0.00521**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 15:45
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 15:45
Lead	**0.0169**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 15:45
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 15:45
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 15:45
TCLP MERCURY BY SW7470A			**Method:SW7470**	Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 19:05

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 7 (0-2)		Lab ID:HS17080635-40
Collection Date:	10-Aug-2017 14:48		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JCJ
Arsenic	U		0.00400	0.0500	mg/L	1	17-Aug-2017 17:17
Barium	**0.872**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 17:17
Cadmium	**0.00235**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 17:17
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 17:17
Lead	U		0.00600	0.0500	mg/L	1	17-Aug-2017 17:17
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 17:17
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 17:17
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 16-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	16-Aug-2017 19:07

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 7 (2-4)		Lab ID:HS17080635-41
Collection Date:	10-Aug-2017 14:52		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A		**Method:SW1311/6020**		Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JCJ
Arsenic	**0.0136**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 17:22
Barium	**1.01**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 17:22
Cadmium	**0.00245**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 17:22
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 17:22
Lead	**0.0164**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 17:22
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 17:22
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 17:22
TCLP MERCURY BY SW7470A		**Method:SW7470**		Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 17-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	17-Aug-2017 16:57

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	PT 7 (4-6.3)		Lab ID:HS17080635-42
Collection Date:	10-Aug-2017 14:55		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JCJ
Arsenic	**0.0102**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 17:26
Barium	**1.07**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 17:26
Cadmium	**0.00276**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 17:26
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 17:26
Lead	**0.0174**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 17:26
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 17:26
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 17:26
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 17-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	17-Aug-2017 16:59

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates		**ANALYTICAL REPORT**
Project:	Exide North CAMU		WorkOrder:HS17080635
Sample ID:	DUP-1		Lab ID:HS17080635-43
Collection Date:	10-Aug-2017 00:00		Matrix:Soil

ANALYSES	RESULT	QUAL	SDL	MQL	UNITS	DILUTION FACTOR	DATE ANALYZED
TCLP METALS BY SW6020A	**Method:SW1311/6020**			Leache:SW1311 / 15-Aug-2017	Prep:SW3010A / 16-Aug-2017		Analyst: JCJ
Arsenic	**0.0160**	J	**0.00400**	**0.0500**	**mg/L**	1	17-Aug-2017 17:31
Barium	**0.980**		**0.0190**	**0.200**	**mg/L**	1	17-Aug-2017 17:31
Cadmium	**0.00298**	J	**0.00200**	**0.0500**	**mg/L**	1	17-Aug-2017 17:31
Chromium	U		0.00400	0.0500	mg/L	1	17-Aug-2017 17:31
Lead	**0.0145**	J	**0.00600**	**0.0500**	**mg/L**	1	17-Aug-2017 17:31
Selenium	U		0.0110	0.0500	mg/L	1	17-Aug-2017 17:31
Silver	U		0.00200	0.0500	mg/L	1	17-Aug-2017 17:31
TCLP MERCURY BY SW7470A	**Method:SW7470**			Leache:SW1311 / 15-Aug-2017	Prep:SW7470 / 17-Aug-2017		Analyst: JC
Mercury	U		0.0000300	0.000200	mg/L	1	17-Aug-2017 17:00

Note: See Qualifiers Page for a list of qualifiers and their explanation.

WEIGHT LOG

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

Batch ID: 119273 **Method:** TCLP METALS BY SW6020A **Prep:** 3010A_TCLP

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS17080635-01	1	1	10 (mL)	10
HS17080635-02	1	1	10 (mL)	10
HS17080635-03	1	1	10 (mL)	10
HS17080635-04	1	1	10 (mL)	10
HS17080635-05	1	1	10 (mL)	10
HS17080635-06	1	1	10 (mL)	10
HS17080635-07	1	1	10 (mL)	10
HS17080635-08	1	1	10 (mL)	10
HS17080635-09	1	1	10 (mL)	10
HS17080635-10	1	1	10 (mL)	10
HS17080635-11	1	1	10 (mL)	10
HS17080635-12	1	1	10 (mL)	10
HS17080635-13	1	1	10 (mL)	10
HS17080635-14	1	1	10 (mL)	10
HS17080635-15	1	1	10 (mL)	10
HS17080635-16	1	1	10 (mL)	10
HS17080635-17	1	1	10 (mL)	10
HS17080635-18	1	1	10 (mL)	10
HS17080635-19	1	1	10 (mL)	10
HS17080635-20	1	1	10 (mL)	10

Batch ID: 119305 **Method:** TCLP MERCURY BY SW7470A **Prep:** 1311_HGPR

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS17080635-01	1	10	10 (mL)	1
HS17080635-02	1	10	10 (mL)	1
HS17080635-03	1	10	10 (mL)	1
HS17080635-04	1	10	10 (mL)	1
HS17080635-05	1	10	10 (mL)	1
HS17080635-06	1	10	10 (mL)	1
HS17080635-07	1	10	10 (mL)	1
HS17080635-08	1	10	10 (mL)	1
HS17080635-09	1	10	10 (mL)	1
HS17080635-10	1	10	10 (mL)	1
HS17080635-11	1	10	10 (mL)	1
HS17080635-12	1	10	10 (mL)	1
HS17080635-13	1	10	10 (mL)	1
HS17080635-14	1	10	10 (mL)	1
HS17080635-15	1	10	10 (mL)	1
HS17080635-16	1	10	10 (mL)	1
HS17080635-17	1	10	10 (mL)	1
HS17080635-18	1	10	10 (mL)	1
HS17080635-19	1	10	10 (mL)	1
HS17080635-20	1	10	10 (mL)	1

WEIGHT LOG

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

Batch ID: 119314 **Method:** TCLP METALS BY SW6020A **Prep:** 3010A_TCLP

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS17080635-21	1	1	10 (mL)	10
HS17080635-22	1	1	10 (mL)	10
HS17080635-23	1	1	10 (mL)	10
HS17080635-24	1	1	10 (mL)	10
HS17080635-25	1	1	10 (mL)	10
HS17080635-26	1	1	10 (mL)	10
HS17080635-27	1	1	10 (mL)	10
HS17080635-28	1	1	10 (mL)	10
HS17080635-29	1	1	10 (mL)	10
HS17080635-30	1	1	10 (mL)	10
HS17080635-31	1	1	10 (mL)	10
HS17080635-32	1	1	10 (mL)	10
HS17080635-33	1	1	10 (mL)	10
HS17080635-34	1	1	10 (mL)	10
HS17080635-35	1	1	10 (mL)	10
HS17080635-36	1	1	10 (mL)	10
HS17080635-37	1	1	10 (mL)	10
HS17080635-38	1	1	10 (mL)	10
HS17080635-39	1	1	10 (mL)	10

Batch ID: 119315 **Method:** TCLP METALS BY SW6020A **Prep:** 3010A_TCLP

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS17080635-40	1	1	10 (mL)	10
HS17080635-41	1	1	10 (mL)	10
HS17080635-42	1	1	10 (mL)	10
HS17080635-43	1	1	10 (mL)	10

Batch ID: 119323 **Method:** TCLP MERCURY BY SW7470A **Prep:** 1311_HGPR

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS17080635-21	1	10	10 (mL)	1
HS17080635-22	1	10	10 (mL)	1
HS17080635-23	1	10	10 (mL)	1
HS17080635-24	1	10	10 (mL)	1
HS17080635-25	1	10	10 (mL)	1
HS17080635-26	1	10	10 (mL)	1
HS17080635-27	1	10	10 (mL)	1
HS17080635-28	1	10	10 (mL)	1
HS17080635-29	1	10	10 (mL)	1
HS17080635-30	1	10	10 (mL)	1
HS17080635-31	1	10	10 (mL)	1
HS17080635-32	1	10	10 (mL)	1
HS17080635-33	1	10	10 (mL)	1
HS17080635-34	1	10	10 (mL)	1
HS17080635-35	1	10	10 (mL)	1
HS17080635-36	1	10	10 (mL)	1
HS17080635-37	1	10	10 (mL)	1
HS17080635-38	1	10	10 (mL)	1
HS17080635-39	1	10	10 (mL)	1
HS17080635-40	1	10	10 (mL)	1

WEIGHT LOG

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

Batch ID: 119341 **Method:** TCLP MERCURY BY SW7470A **Prep:** 1311_HGPR

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS17080635-41	1	10	10 (mL)	1
HS17080635-42	1	10	10 (mL)	1
HS17080635-43	1	10	10 (mL)	1

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID 119273	**Test Name :** TCLP METALS BY SW6020A			**Matrix:** Soil		
HS17080635-01	PT 8 (0-2)	10 Aug 2017 08:45	14 Aug 2017 16:00	15 Aug 2017 14:43	16 Aug 2017 22:52	1
HS17080635-02	PT 8 (2-4)	10 Aug 2017 08:46	14 Aug 2017 16:00	15 Aug 2017 14:43	16 Aug 2017 22:57	1
HS17080635-03	PT 8 (4-6)	10 Aug 2017 08:55	14 Aug 2017 16:00	15 Aug 2017 14:43	16 Aug 2017 23:02	1
HS17080635-04	PT 8 (6-8.7)	10 Aug 2017 08:58	14 Aug 2017 16:00	15 Aug 2017 14:43	16 Aug 2017 23:06	1
HS17080635-05	PT 6 (0-2)	10 Aug 2017 09:10	14 Aug 2017 16:00	15 Aug 2017 14:43	16 Aug 2017 23:11	1
HS17080635-06	PT 6 (2-4)	10 Aug 2017 09:12	14 Aug 2017 16:00	15 Aug 2017 14:43	16 Aug 2017 23:16	1
HS17080635-07	PT 6 (4-6)	10 Aug 2017 09:14	14 Aug 2017 16:00	15 Aug 2017 14:43	16 Aug 2017 23:30	1
HS17080635-08	PT 6 (6-8)	10 Aug 2017 09:16	14 Aug 2017 16:00	15 Aug 2017 14:43	16 Aug 2017 23:35	1
HS17080635-09	PT 6 (8-9.8)	10 Aug 2017 09:22	14 Aug 2017 16:00	15 Aug 2017 14:43	16 Aug 2017 23:39	1
HS17080635-10	PT 4 (0-2)	10 Aug 2017 09:58	14 Aug 2017 16:00	15 Aug 2017 14:43	16 Aug 2017 23:44	1
HS17080635-11	PT 4 (2-4)	10 Aug 2017 10:00	14 Aug 2017 16:00	15 Aug 2017 14:43	16 Aug 2017 23:49	1
HS17080635-12	PT 4 (4-6)	10 Aug 2017 10:02	14 Aug 2017 16:00	15 Aug 2017 14:43	16 Aug 2017 23:53	1
HS17080635-13	PT 4 (6-8)	10 Aug 2017 10:08	14 Aug 2017 16:00	15 Aug 2017 14:43	16 Aug 2017 23:58	1
HS17080635-14	PT 4 (8-10)	10 Aug 2017 10:10	14 Aug 2017 16:00	15 Aug 2017 14:43	17 Aug 2017 00:03	1
HS17080635-15	PT 4 (10-12.3)	10 Aug 2017 10:20	14 Aug 2017 16:00	15 Aug 2017 14:43	17 Aug 2017 00:07	1
HS17080635-16	PT 1 (0-2)	10 Aug 2017 10:45	14 Aug 2017 16:00	15 Aug 2017 14:43	17 Aug 2017 00:31	1
HS17080635-17	PT 1 (2-4)	10 Aug 2017 10:48	14 Aug 2017 16:00	15 Aug 2017 14:43	17 Aug 2017 00:36	1
HS17080635-18	PT 1 (4-6)	10 Aug 2017 10:54	14 Aug 2017 16:00	15 Aug 2017 14:43	17 Aug 2017 00:40	1
HS17080635-19	PT 1 (6-8)	10 Aug 2017 10:56	14 Aug 2017 16:00	15 Aug 2017 14:43	17 Aug 2017 00:45	1
HS17080635-20	PT 1 (8-10)	10 Aug 2017 11:00	14 Aug 2017 16:00	15 Aug 2017 14:43	17 Aug 2017 00:50	1

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID 119305	**Test Name :** TCLP MERCURY BY SW7470A			**Matrix:** Soil		
HS17080635-01	PT 8 (0-2)	10 Aug 2017 08:45	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 16:50	1
HS17080635-02	PT 8 (2-4)	10 Aug 2017 08:46	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 16:55	1
HS17080635-03	PT 8 (4-6)	10 Aug 2017 08:55	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 16:56	1
HS17080635-04	PT 8 (6-8.7)	10 Aug 2017 08:58	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 16:58	1
HS17080635-05	PT 6 (0-2)	10 Aug 2017 09:10	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:00	1
HS17080635-06	PT 6 (2-4)	10 Aug 2017 09:12	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:05	1
HS17080635-07	PT 6 (4-6)	10 Aug 2017 09:14	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:07	1
HS17080635-08	PT 6 (6-8)	10 Aug 2017 09:16	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:08	1
HS17080635-09	PT 6 (8-9.8)	10 Aug 2017 09:22	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:10	1
HS17080635-10	PT 4 (0-2)	10 Aug 2017 09:58	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:12	1
HS17080635-11	PT 4 (2-4)	10 Aug 2017 10:00	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:14	1
HS17080635-12	PT 4 (4-6)	10 Aug 2017 10:02	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:15	1
HS17080635-13	PT 4 (6-8)	10 Aug 2017 10:08	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:17	1
HS17080635-14	PT 4 (8-10)	10 Aug 2017 10:10	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:19	1
HS17080635-15	PT 4 (10-12.3)	10 Aug 2017 10:20	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:20	1
HS17080635-16	PT 1 (0-2)	10 Aug 2017 10:45	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:26	1
HS17080635-17	PT 1 (2-4)	10 Aug 2017 10:48	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:27	1
HS17080635-18	PT 1 (4-6)	10 Aug 2017 10:54	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:29	1
HS17080635-19	PT 1 (6-8)	10 Aug 2017 10:56	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:31	1
HS17080635-20	PT 1 (8-10)	10 Aug 2017 11:00	14 Aug 2017 16:00	16 Aug 2017 13:18	16 Aug 2017 17:32	1
Batch ID 119314	**Test Name :** TCLP METALS BY SW6020A			**Matrix:** Soil		
HS17080635-21	PT 1 (10-12)	10 Aug 2017 11:05	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 10:56	1
HS17080635-22	PT 1 (12-13.5)	10 Aug 2017 11:08	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 14:49	1
HS17080635-23	PT 11 (0-2)	10 Aug 2017 11:38	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 14:52	1
HS17080635-24	PT 11 (2-4)	10 Aug 2017 11:40	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 14:55	1
HS17080635-25	PT 11 (4-6)	10 Aug 2017 11:52	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 14:58	1
HS17080635-26	PT 11 (6-7.7)	10 Aug 2017 11:54	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:01	1
HS17080635-27	PT 10 (0-2)	10 Aug 2017 12:04	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:04	1
HS17080635-28	PT 10 (2-4.4)	10 Aug 2017 12:08	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:07	1
HS17080635-29	PT 9 (0-2)	10 Aug 2017 12:15	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:10	1
HS17080635-30	PT 2 (0-2)	10 Aug 2017 13:52	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:19	1
HS17080635-31	PT 2 (2-4)	10 Aug 2017 13:54	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:21	1
HS17080635-32	PT 2 (4-6)	10 Aug 2017 14:00	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:24	1
HS17080635-33	PT 3 (0-2)	10 Aug 2017 14:08	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:27	1
HS17080635-34	PT 3 (2-4)	10 Aug 2017 14:10	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:30	1
HS17080635-35	PT 3 (4-6)	10 Aug 2017 14:15	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:33	1
HS17080635-36	PT 3 (6-7.8)	10 Aug 2017 14:20	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:36	1
HS17080635-37	PT 5 (0-2)	10 Aug 2017 14:35	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:39	1
HS17080635-38	PT 5 (2-4)	10 Aug 2017 14:38	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:42	1
HS17080635-39	PT 5 (4-6.4)	10 Aug 2017 14:42	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 15:45	1

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID 119315	**Test Name :** TCLP METALS BY SW6020A			**Matrix:** Soil		
HS17080635-40	PT 7 (0-2)	10 Aug 2017 14:48	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 17:17	1
HS17080635-41	PT 7 (2-4)	10 Aug 2017 14:52	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 17:22	1
HS17080635-42	PT 7 (4-6.3)	10 Aug 2017 14:55	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 17:26	1
HS17080635-43	DUP-1	10 Aug 2017 00:00	15 Aug 2017 16:00	16 Aug 2017 14:00	17 Aug 2017 17:31	1
Batch ID 119323	**Test Name :** TCLP MERCURY BY SW7470A			**Matrix:** Soil		
HS17080635-21	PT 1 (10-12)	10 Aug 2017 11:05	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:24	1
HS17080635-22	PT 1 (12-13.5)	10 Aug 2017 11:08	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:29	1
HS17080635-23	PT 11 (0-2)	10 Aug 2017 11:38	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:31	1
HS17080635-24	PT 11 (2-4)	10 Aug 2017 11:40	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:33	1
HS17080635-25	PT 11 (4-6)	10 Aug 2017 11:52	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:34	1
HS17080635-26	PT 11 (6-7.7)	10 Aug 2017 11:54	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:36	1
HS17080635-27	PT 10 (0-2)	10 Aug 2017 12:04	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:38	1
HS17080635-28	PT 10 (2-4.4)	10 Aug 2017 12:08	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:39	1
HS17080635-29	PT 9 (0-2)	10 Aug 2017 12:15	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:45	1
HS17080635-30	PT 2 (0-2)	10 Aug 2017 13:52	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:46	1
HS17080635-31	PT 2 (2-4)	10 Aug 2017 13:54	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:48	1
HS17080635-32	PT 2 (4-6)	10 Aug 2017 14:00	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:50	1
HS17080635-33	PT 3 (0-2)	10 Aug 2017 14:08	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:51	1
HS17080635-34	PT 3 (2-4)	10 Aug 2017 14:10	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:53	1
HS17080635-35	PT 3 (4-6)	10 Aug 2017 14:15	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:55	1
HS17080635-36	PT 3 (6-7.8)	10 Aug 2017 14:20	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:57	1
HS17080635-37	PT 5 (0-2)	10 Aug 2017 14:35	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 18:58	1
HS17080635-38	PT 5 (2-4)	10 Aug 2017 14:38	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 19:00	1
HS17080635-39	PT 5 (4-6.4)	10 Aug 2017 14:42	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 19:05	1
HS17080635-40	PT 7 (0-2)	10 Aug 2017 14:48	15 Aug 2017 16:00	16 Aug 2017 15:24	16 Aug 2017 19:07	1
Batch ID 119341	**Test Name :** TCLP MERCURY BY SW7470A			**Matrix:** Soil		
HS17080635-41	PT 7 (2-4)	10 Aug 2017 14:52	15 Aug 2017 16:00	17 Aug 2017 12:00	17 Aug 2017 16:57	1
HS17080635-42	PT 7 (4-6.3)	10 Aug 2017 14:55	15 Aug 2017 16:00	17 Aug 2017 12:00	17 Aug 2017 16:59	1
HS17080635-43	DUP-1	10 Aug 2017 00:00	15 Aug 2017 16:00	17 Aug 2017 12:00	17 Aug 2017 17:00	1

WorkOrder: HS17080635
InstrumentID: HG03
Test Code: 1311_HG
Test Number: SW7470
Test Name: TCLP Mercury by SW7470A

METHOD DETECTION / REPORTING LIMITS

Matrix: Leachate **Units:** mg/L

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	Mercury	7439-97-6	0.000100	0.000115	0.0000300	0.000200

WorkOrder: HS17080635
InstrumentID: ICPMS04
Test Code: 1311_METALS_HS
Test Number: SW1311/6020
Test Name: TCLP Metals by SW6020A

METHOD DETECTION / REPORTING LIMITS

Matrix: Leachate **Units:** mg/L

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	Arsenic	7440-38-2	0.00500	0.00530	0.000400	0.00500
A	Arsenic	7440-38-2	0.00100	0.00112	0.000400	0.00500
A	Barium	7440-39-3	0.00100	0.00129	0.00190	0.0200
A	Barium	7440-39-3	0.00500	0.00535	0.00190	0.0200
A	Cadmium	7440-43-9	0.00100	0.00115	0.000200	0.00500
A	Cadmium	7440-43-9	0.00500	0.00551	0.000200	0.00500
A	Chromium	7440-47-3	0.00500	0.00520	0.000400	0.00500
A	Chromium	7440-47-3	0.00100	0.00109	0.000400	0.00500
A	Lead	7439-92-1	0.00100	0.00155	0.000600	0.00500
A	Lead	7439-92-1	0.00500	0.00526	0.000600	0.00500
A	Selenium	7782-49-2	0.00500	0.00506	0.00110	0.00500
A	Selenium	7782-49-2	0.00100	0.00124	0.00110	0.00500
A	Silver	7440-22-4	0.00100	0.00112	0.000200	0.00500
A	Silver	7440-22-4	0.00500	0.00521	0.000200	0.00500

WorkOrder: HS17080635
InstrumentID: ICPMS05
Test Code: 1311_METALS_HS
Test Number: SW1311/6020
Test Name: TCLP Metals by SW6020A

METHOD DETECTION / REPORTING LIMITS

Matrix: Leachate **Units:** mg/L

Type	Analyte	CAS	DCS Spike	DCS	MDL	PQL
A	Arsenic	7440-38-2	0.00100	0.00111	0.000400	0.00500
A	Barium	7440-39-3	0.00100	0.00119	0.00190	0.0200
A	Cadmium	7440-43-9	0.00100	0.00117	0.000200	0.00500
A	Chromium	7440-47-3	0.00100	0.000978	0.000400	0.00500
A	Lead	7439-92-1	0.00100	0.00109	0.000600	0.00500
A	Selenium	7782-49-2	0.00100	0.000711	0.00110	0.00500
A	Silver	7440-22-4	0.00100	0.00116	0.000200	0.00500

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

QC BATCH REPORT

Batch ID: 119273 **Instrument:** ICPMS04 **Method:** SW1311/6020

MBLK Sample ID: **MBLKT2-119273** Units: **mg/L** Analysis Date: **16-Aug-2017 22:38**
Client ID: Run ID: **ICPMS04_300169** SeqNo: **4202103** PrepDate: **15-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	U	0.0500								
Barium	U	0.200								
Cadmium	U	0.0500								
Chromium	U	0.0500								
Lead	U	0.0500								
Selenium	U	0.0500								
Silver	U	0.0500								

MBLK Sample ID: **MBLK-119273** Units: **mg/L** Analysis Date: **16-Aug-2017 22:43**
Client ID: Run ID: **ICPMS04_300169** SeqNo: **4202104** PrepDate: **15-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	U	0.00500								
Barium	U	0.0200								
Cadmium	U	0.00500								
Chromium	U	0.00500								
Lead	U	0.00500								
Selenium	U	0.00500								
Silver	U	0.00500								

LCS Sample ID: **LCS-119273** Units: **mg/L** Analysis Date: **16-Aug-2017 22:48**
Client ID: Run ID: **ICPMS04_300169** SeqNo: **4202105** PrepDate: **15-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.04948	0.00500	0.05	0	99.0	80 - 120				
Barium	0.04858	0.0200	0.05	0	97.2	80 - 120				
Cadmium	0.04964	0.00500	0.05	0	99.3	80 - 120				
Chromium	0.04896	0.00500	0.05	0	97.9	80 - 120				
Lead	0.04757	0.00500	0.05	0	95.2	80 - 120				
Selenium	0.04871	0.00500	0.05	0	97.4	80 - 120				
Silver	0.04878	0.00500	0.05	0	97.6	80 - 120				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

QC BATCH REPORT

Batch ID: 119273 **Instrument:** ICPMS04 **Method:** SW1311/6020

MS Sample ID: **HS17080635-20MS** Units: **mg/L** Analysis Date: **17-Aug-2017 00:59**
Client ID: **PT 1 (8-10)** Run ID: **ICPMS04_300169** SeqNo: **4202133** PrepDate: **15-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.5128	0.0500	0.5	0.00652	101	80 - 120				
Barium	1.433	0.200	0.5	0.9413	98.4	80 - 120				
Cadmium	0.4857	0.0500	0.5	0.00394	96.4	80 - 120				
Chromium	0.4867	0.0500	0.5	-0.00135	97.6	80 - 120				
Lead	0.5068	0.0500	0.5	0.03252	94.9	80 - 120				
Selenium	0.5102	0.0500	0.5	0.00066	102	80 - 120				
Silver	0.4745	0.0500	0.5	-0.00006	94.9	80 - 120				

MSD Sample ID: **HS17080635-20MSD** Units: **mg/L** Analysis Date: **17-Aug-2017 01:04**
Client ID: **PT 1 (8-10)** Run ID: **ICPMS04_300169** SeqNo: **4202134** PrepDate: **15-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.5033	0.0500	0.5	0.00652	99.4	80 - 120	0.5128	1.86	20	
Barium	1.436	0.200	0.5	0.9413	99.0	80 - 120	1.433	0.203	20	
Cadmium	0.4888	0.0500	0.5	0.00394	97.0	80 - 120	0.4857	0.636	20	
Chromium	0.4779	0.0500	0.5	-0.00135	95.9	80 - 120	0.4867	1.82	20	
Lead	0.5035	0.0500	0.5	0.03252	94.2	80 - 120	0.5068	0.649	20	
Selenium	0.5207	0.0500	0.5	0.00066	104	80 - 120	0.5102	2.03	20	
Silver	0.4822	0.0500	0.5	-0.00006	96.5	80 - 120	0.4745	1.61	20	

PDS Sample ID: **HS17080635-20PDS** Units: **mg/L** Analysis Date: **17-Aug-2017 01:08**
Client ID: **PT 1 (8-10)** Run ID: **ICPMS04_300169** SeqNo: **4202135** PrepDate: **15-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	1.029	0.0500	1	0.00652	102	75 - 125				
Barium	1.927	0.200	1	0.9413	98.6	75 - 125				
Cadmium	0.9816	0.0500	1	0.00394	97.8	75 - 125				
Chromium	0.9868	0.0500	1	-0.00135	98.8	75 - 125				
Lead	1.001	0.0500	1	0.03252	96.9	75 - 125				
Selenium	1.068	0.0500	1	0.00066	107	75 - 125				
Silver	0.9889	0.0500	1	-0.00006	98.9	75 - 125				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

QC BATCH REPORT

Batch ID: **119273** **Instrument:** **ICPMS04** **Method:** **SW1311/6020**

SD Sample ID: **HS17080635-20SD** Units: **mg/L** Analysis Date: **17-Aug-2017 00:54**
Client ID: **PT 1 (8-10)** Run ID: **ICPMS04_300169** SeqNo: **4202132** PrepDate: **15-Aug-2017** DF: **5**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Arsenic	U	0.250					0.00652	0	10	
Barium	0.9728	1.00					0.9413	0	10	J
Cadmium	U	0.250					0.00394	0	10	
Chromium	U	0.250					-0.00135	0	10	
Lead	0.03325	0.250					0.03252	0	10	J
Selenium	U	0.250					0.00066	0	10	
Silver	U	0.250					-0.00006	0	10	

The following samples were analyzed in this batch:

HS17080635-01	HS17080635-02	HS17080635-03	HS17080635-04
HS17080635-05	HS17080635-06	HS17080635-07	HS17080635-08
HS17080635-09	HS17080635-10	HS17080635-11	HS17080635-12
HS17080635-13	HS17080635-14	HS17080635-15	HS17080635-16
HS17080635-17	HS17080635-18	HS17080635-19	HS17080635-20

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

QC BATCH REPORT

Batch ID: 119305 **Instrument:** HG03 **Method:** SW7470

MBLK Sample ID: **MBLK-119305** Units: **mg/L** Analysis Date: **16-Aug-2017 16:46**
Client ID: Run ID: **HG03_300160** SeqNo: **4201620** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	U	0.000200								

MBLK Sample ID: **GBLKT2-119305** Units: **mg/L** Analysis Date: **16-Aug-2017 16:44**
Client ID: Run ID: **HG03_300160** SeqNo: **4201619** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	U	0.000200								

LCS Sample ID: **LCS-119305** Units: **mg/L** Analysis Date: **16-Aug-2017 16:48**
Client ID: Run ID: **HG03_300160** SeqNo: **4201621** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.00474	0.000200	0.005	0	94.8	80 - 120				

MS Sample ID: **HS17080635-01MS** Units: **mg/L** Analysis Date: **16-Aug-2017 16:51**
Client ID: **PT 8 (0-2)** Run ID: **HG03_300160** SeqNo: **4201623** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.00481	0.000200	0.005	-0.000017	96.5	75 - 125				

MSD Sample ID: **HS17080635-01MSD** Units: **mg/L** Analysis Date: **16-Aug-2017 16:53**
Client ID: **PT 8 (0-2)** Run ID: **HG03_300160** SeqNo: **4201624** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.00491	0.000200	0.005	-0.000017	98.5	75 - 125	0.00481	2.06	20	

The following samples were analyzed in this batch:

HS17080635-01	HS17080635-02	HS17080635-03	HS17080635-04
HS17080635-05	HS17080635-06	HS17080635-07	HS17080635-08
HS17080635-09	HS17080635-10	HS17080635-11	HS17080635-12
HS17080635-13	HS17080635-14	HS17080635-15	HS17080635-16
HS17080635-17	HS17080635-18	HS17080635-19	HS17080635-20

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

QC BATCH REPORT

Batch ID: 119314 **Instrument:** ICPMS05 **Method:** SW1311/6020

MBLK Sample ID: **MBLKT2-119314** Units: **mg/L** Analysis Date: **17-Aug-2017 10:38**
Client ID: Run ID: **ICPMS05_300209** SeqNo: **4202320** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	U	0.0500								
Barium	U	0.200								
Cadmium	U	0.0500								
Chromium	U	0.0500								
Lead	U	0.0500								
Selenium	U	0.0500								
Silver	U	0.0500								

MBLK Sample ID: **MBLK-119314** Units: **mg/L** Analysis Date: **17-Aug-2017 10:41**
Client ID: Run ID: **ICPMS05_300209** SeqNo: **4202321** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	U	0.00500								
Barium	U	0.0200								
Cadmium	U	0.00500								
Chromium	U	0.00500								
Lead	U	0.00500								
Selenium	U	0.00500								
Silver	U	0.00500								

LCS Sample ID: **LCS-119314** Units: **mg/L** Analysis Date: **17-Aug-2017 10:44**
Client ID: Run ID: **ICPMS05_300209** SeqNo: **4202322** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.05215	0.00500	0.05	0	104	80 - 120				
Barium	0.05479	0.0200	0.05	0	110	80 - 120				
Cadmium	0.05588	0.00500	0.05	0	112	80 - 120				
Chromium	0.05224	0.00500	0.05	0	104	80 - 120				
Lead	0.05258	0.00500	0.05	0	105	80 - 120				
Selenium	0.05277	0.00500	0.05	0	106	80 - 120				
Silver	0.05373	0.00500	0.05	0	107	80 - 120				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

QC BATCH REPORT

Batch ID: 119314 **Instrument:** ICPMS05 **Method:** SW1311/6020

MS Sample ID: **HS17080635-21MS** Units: **mg/L** Analysis Date: **17-Aug-2017 11:02**
Client ID: **PT 1 (10-12)** Run ID: **ICPMS05_300209** SeqNo: **4202328** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.5567	0.0500	0.5	0.02013	107	80 - 120				
Barium	1.815	0.200	0.5	1.225	118	80 - 120				
Cadmium	0.559	0.0500	0.5	0.00643	111	80 - 120				
Chromium	0.5354	0.0500	0.5	-0.00072	107	80 - 120				
Lead	0.5778	0.0500	0.5	0.05479	105	80 - 120				
Selenium	0.5216	0.0500	0.5	-0.00263	105	80 - 120				
Silver	0.5274	0.0500	0.5	0.0001	105	80 - 120				

MSD Sample ID: **HS17080635-21MSD** Units: **mg/L** Analysis Date: **17-Aug-2017 11:05**
Client ID: **PT 1 (10-12)** Run ID: **ICPMS05_300209** SeqNo: **4202329** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.5506	0.0500	0.5	0.02013	106	80 - 120	0.5567	1.1	20	
Barium	1.772	0.200	0.5	1.225	109	80 - 120	1.815	2.4	20	
Cadmium	0.5637	0.0500	0.5	0.00643	111	80 - 120	0.559	0.827	20	
Chromium	0.5279	0.0500	0.5	-0.00072	106	80 - 120	0.5354	1.4	20	
Lead	0.5746	0.0500	0.5	0.05479	104	80 - 120	0.5778	0.548	20	
Selenium	0.538	0.0500	0.5	-0.00263	108	80 - 120	0.5216	3.1	20	
Silver	0.5304	0.0500	0.5	0.0001	106	80 - 120	0.5274	0.556	20	

PDS Sample ID: **HS17080635-21PDS** Units: **mg/L** Analysis Date: **17-Aug-2017 11:08**
Client ID: **PT 1 (10-12)** Run ID: **ICPMS05_300209** SeqNo: **4202330** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	1.125	0.0500	1	0.02013	110	75 - 125				
Barium	2.393	0.200	1	1.225	117	75 - 125				
Cadmium	1.139	0.0500	1	0.00643	113	75 - 125				
Chromium	1.107	0.0500	1	-0.00072	111	75 - 125				
Lead	1.137	0.0500	1	0.05479	108	75 - 125				
Selenium	1.1	0.0500	1	-0.00263	110	75 - 125				
Silver	1.078	0.0500	1	0.0001	108	75 - 125				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

QC BATCH REPORT

Batch ID: **119314** **Instrument:** **ICPMS05** **Method:** **SW1311/6020**

SD Sample ID: **HS17080635-21SD** Units: **mg/L** Analysis Date: **17-Aug-2017 10:59**
Client ID: **PT 1 (10-12)** Run ID: **ICPMS05_300209** SeqNo: **4202327** PrepDate: **16-Aug-2017** DF: **5**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Arsenic	U	0.250					0.02013	0	10	
Barium	1.064	1.00					1.225	13.1	10	R
Cadmium	U	0.250					0.00643	0	10	
Chromium	U	0.250					-0.00072	0	10	
Lead	0.04888	0.250					0.05479	0	10	J
Selenium	U	0.250					-0.00263	0	10	
Silver	U	0.250					0.0001	0	10	

The following samples were analyzed in this batch:

HS17080635-21	HS17080635-22	HS17080635-23	HS17080635-24
HS17080635-25	HS17080635-26	HS17080635-27	HS17080635-28
HS17080635-29	HS17080635-30	HS17080635-31	HS17080635-32
HS17080635-33	HS17080635-34	HS17080635-35	HS17080635-36
HS17080635-37	HS17080635-38	HS17080635-39	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

QC BATCH REPORT

Batch ID: 119315 **Instrument: ICPMS04** **Method: SW1311/6020**

MBLK Sample ID: **MBLKT1-119315** Units: **mg/L** Analysis Date: **17-Aug-2017 17:03**
Client ID: Run ID: **ICPMS04_300221** SeqNo: **4202836** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	U	0.0500								
Barium	U	0.200								
Cadmium	U	0.0500								
Chromium	U	0.0500								
Lead	U	0.0500								
Selenium	U	0.0500								
Silver	U	0.0500								

MBLK Sample ID: **MBLK-119315** Units: **mg/L** Analysis Date: **17-Aug-2017 17:08**
Client ID: Run ID: **ICPMS04_300221** SeqNo: **4202837** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	U	0.00500								
Barium	U	0.0200								
Cadmium	U	0.00500								
Chromium	U	0.00500								
Lead	U	0.00500								
Selenium	U	0.00500								
Silver	U	0.00500								

LCS Sample ID: **LCS-119315** Units: **mg/L** Analysis Date: **17-Aug-2017 17:13**
Client ID: Run ID: **ICPMS04_300221** SeqNo: **4202838** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.04844	0.00500	0.05	0	96.9	80 - 120				
Barium	0.04774	0.0200	0.05	0	95.5	80 - 120				
Cadmium	0.04843	0.00500	0.05	0	96.9	80 - 120				
Chromium	0.04846	0.00500	0.05	0	96.9	80 - 120				
Lead	0.04551	0.00500	0.05	0	91.0	80 - 120				
Selenium	0.04934	0.00500	0.05	0	98.7	80 - 120				
Silver	0.04575	0.00500	0.05	0	91.5	80 - 120				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

QC BATCH REPORT

Batch ID: 119315 **Instrument:** ICPMS04 **Method:** SW1311/6020

MS Sample ID: **HS17080682-01MS** Units: **mg/L** Analysis Date: **17-Aug-2017 18:05**
Client ID: Run ID: **ICPMS04_300221** SeqNo: **4202883** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.5082	0.0500	0.5	0.00075	101	80 - 120				
Barium	1.402	0.200	0.5	0.9203	96.3	80 - 120				
Cadmium	0.4958	0.0500	0.5	0.00121	98.9	80 - 120				
Chromium	0.5009	0.0500	0.5	-0.00025	100	80 - 120				
Lead	0.4734	0.0500	0.5	0.00231	94.2	80 - 120				
Selenium	0.5182	0.0500	0.5	0.00156	103	80 - 120				
Silver	0.4568	0.0500	0.5	0.00005	91.4	80 - 120				

MSD Sample ID: **HS17080682-01MSD** Units: **mg/L** Analysis Date: **17-Aug-2017 18:10**
Client ID: Run ID: **ICPMS04_300221** SeqNo: **4202884** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.5199	0.0500	0.5	0.00075	104	80 - 120	0.5082	2.27	20	
Barium	1.437	0.200	0.5	0.9203	103	80 - 120	1.402	2.48	20	
Cadmium	0.5089	0.0500	0.5	0.00121	102	80 - 120	0.4958	2.6	20	
Chromium	0.5126	0.0500	0.5	-0.00025	103	80 - 120	0.5009	2.3	20	
Lead	0.4861	0.0500	0.5	0.00231	96.8	80 - 120	0.4734	2.65	20	
Selenium	0.5408	0.0500	0.5	0.00156	108	80 - 120	0.5182	4.25	20	
Silver	0.4646	0.0500	0.5	0.00005	92.9	80 - 120	0.4568	1.69	20	

PDS Sample ID: **HS17080682-01PDS** Units: **mg/L** Analysis Date: **17-Aug-2017 18:14**
Client ID: Run ID: **ICPMS04_300221** SeqNo: **4202885** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	1.016	0.0500	1	0.00075	102	75 - 125				
Barium	1.846	0.200	1	0.9203	92.5	75 - 125				
Cadmium	0.9726	0.0500	1	0.00121	97.1	75 - 125				
Chromium	0.9992	0.0500	1	-0.00025	99.9	75 - 125				
Lead	0.9527	0.0500	1	0.00231	95.0	75 - 125				
Selenium	1.082	0.0500	1	0.00156	108	75 - 125				
Silver	0.9094	0.0500	1	0.00005	90.9	75 - 125				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

QC BATCH REPORT

Batch ID: **119315** **Instrument:** **ICPMS04** **Method:** **SW1311/6020**

SD Sample ID: **HS17080682-01SD** Units: **mg/L** Analysis Date: **17-Aug-2017 18:01**
Client ID: Run ID: **ICPMS04_300221** SeqNo: **4202882** PrepDate: **16-Aug-2017** DF: **5**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Arsenic	U	0.250					0.00075	0	10	
Barium	0.8626	1.00					0.9203	0	10	J
Cadmium	U	0.250					0.00121	0	10	
Chromium	U	0.250					-0.00025	0	10	
Lead	U	0.250					0.00231	0	10	
Selenium	U	0.250					0.00156	0	10	
Silver	U	0.250					0.00005	0	10	

The following samples were analyzed in this batch: HS17080635-40 HS17080635-41 HS17080635-42 HS17080635-43

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

QC BATCH REPORT

Batch ID: 119323 **Instrument:** HG03 **Method:** SW7470

MBLK Sample ID: **MBLK-119323** Units: **mg/L** Analysis Date: **16-Aug-2017 18:17**
Client ID: Run ID: **HG03_300160** SeqNo: **4201649** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	U	0.000200								

MBLK Sample ID: **GBLKT2-119323** Units: **mg/L** Analysis Date: **16-Aug-2017 18:15**
Client ID: Run ID: **HG03_300160** SeqNo: **4201648** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	U	0.000200								

LCS Sample ID: **LCS-119323** Units: **mg/L** Analysis Date: **16-Aug-2017 18:19**
Client ID: Run ID: **HG03_300160** SeqNo: **4201650** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.00488	0.000200	0.005	0	97.6	80 - 120				

MS Sample ID: **HS17080635-21MS** Units: **mg/L** Analysis Date: **16-Aug-2017 18:26**
Client ID: **PT 1 (10-12)** Run ID: **HG03_300160** SeqNo: **4201654** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.00482	0.000200	0.005	0	96.4	75 - 125				

MSD Sample ID: **HS17080635-21MSD** Units: **mg/L** Analysis Date: **16-Aug-2017 18:27**
Client ID: **PT 1 (10-12)** Run ID: **HG03_300160** SeqNo: **4201655** PrepDate: **16-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.00473	0.000200	0.005	0	94.6	75 - 125	0.00482	1.88	20	

The following samples were analyzed in this batch:

HS17080635-21	HS17080635-22	HS17080635-23	HS17080635-24
HS17080635-25	HS17080635-26	HS17080635-27	HS17080635-28
HS17080635-29	HS17080635-30	HS17080635-31	HS17080635-32
HS17080635-33	HS17080635-34	HS17080635-35	HS17080635-36
HS17080635-37	HS17080635-38	HS17080635-39	HS17080635-40

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Group USA, Corp

Date: 18-Aug-17

Client: Golder Associates
Project: Exide North CAMU
WorkOrder: HS17080635

QC BATCH REPORT

Batch ID: 119341 **Instrument:** HG03 **Method:** SW7470

MBLK Sample ID: **MBLK-119341** Units: **mg/L** Analysis Date: **17-Aug-2017 16:52**
Client ID: Run ID: **HG03_300247** SeqNo: **4202900** PrepDate: **17-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	U	0.000200								

MBLK Sample ID: **GBLKT2-119341** Units: **mg/L** Analysis Date: **17-Aug-2017 16:50**
Client ID: Run ID: **HG03_300247** SeqNo: **4202899** PrepDate: **17-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	U	0.000200								

MBLK Sample ID: **GBLKT1-119341** Units: **mg/L** Analysis Date: **17-Aug-2017 16:48**
Client ID: Run ID: **HG03_300247** SeqNo: **4202898** PrepDate: **17-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	U	0.000200								

LCS Sample ID: **LCS-119341** Units: **mg/L** Analysis Date: **17-Aug-2017 16:54**
Client ID: Run ID: **HG03_300247** SeqNo: **4202901** PrepDate: **17-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.00498	0.000200	0.005	0	99.6	80 - 120				

MS Sample ID: **HS17080860-01MS** Units: **mg/L** Analysis Date: **17-Aug-2017 17:13**
Client ID: Run ID: **HG03_300247** SeqNo: **4202911** PrepDate: **17-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.00516	0.000200	0.005	-0.000014	103	75 - 125				

MSD Sample ID: **HS17080860-01MSD** Units: **mg/L** Analysis Date: **17-Aug-2017 17:14**
Client ID: Run ID: **HG03_300247** SeqNo: **4202912** PrepDate: **17-Aug-2017** DF: **1**

Analyte	Result	MQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.00489	0.000200	0.005	-0.000014	98.1	75 - 125	0.00516	5.37	20	

The following samples were analyzed in this batch: HS17080635-41 HS17080635-42 HS17080635-43

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client:	Golder Associates	**QUALIFIERS, ACRONYMS, UNITS**
Project:	Exide North CAMU	
WorkOrder:	**HS17080635**	

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL

Acronym	Description
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
Date	
mg/L	Milligrams per Liter

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	17-027-0	27-Mar-2018
California	2919 2016-2018	31-Jul-2018
Illinois	004112	09-May-2018
Kentucky	123043	30-Apr-2018
Louisiana	03087 2017-2017	30-Jun-2018
North Carolina	624-2017	31-Dec-2017
North Dakota	R193 2017-2017	30-Apr-2018
Oklahoma	2016-122	31-Aug-2017
Texas	T104704231-17-19	30-Apr-2018

Sample Receipt Checklist

Client Name:	Golder St Louis	Date/Time Received:	**11-Aug-2017 08:25**
Work Order:	HS17080635	Received by:	**RPG**

Checklist completed by: *Nilesh D. Ranchod* (eSignature) 11-Aug-2017 (Date)

Reviewed by: *Dane J. Wacasey* (eSignature) 18-Aug-2017 (Date)

Matrices: **Soil**

Carrier name: **FedEx Priority Overnight**

Question	Yes	No	Other
Shipping container/cooler in good condition?	☑	☐	Not Present ☐
Custody seals intact on shipping container/cooler?	☑	☐	Not Present ☐
Custody seals intact on sample bottles?	☐	☐	Not Present ☑
Chain of custody present?	☑	☐	
Chain of custody signed when relinquished and received?	☑	☐	
Chain of custody agrees with sample labels?	☐	☑	
Samples in proper container/bottle?	☑	☐	
Sample containers intact?	☑	☐	
TX1005 solids received in hermetically sealed vials?	☐	☐	N/A ☑
Sufficient sample volume for indicated test?	☑	☐	
All samples received within holding time?	☑	☐	
Container/Temp Blank temperature in compliance?	☑	☐	
Temperature(s)/Thermometer(s):	2.6C/3.1C, 1.4C/1.9C UC/C		IR # 20
Cooler(s)/Kit(s):	25574,24028		
Date/Time sample(s) sent to storage:	08/11/2017 3:00PM		
Water - VOA vials have zero headspace?	☐	☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	☐	☐	N/A ☑
pH adjusted?	☐	☐	N/A ☑
pH adjusted by:			

Login Notes: Sample PT-4 (10-12.3) and DUP -1 Caps incorrect. Logged in per sample labels.
PT 5 (0-2) sample label times do not match; COC: 1435 Label: 1438

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

HS17080635
Golder Associates
Exide North CAMU

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Chain of Custody Form

Page 1 of 5

COC ID: 166499

ALS Project Manager:

Customer Information		Project Information	
Purchase Order	1302086-03	Project Name	Exide North CAMU
Work Order		Project Number	1302086-03
Company Name	Golder Associates	Bill To Company	Golder Associates
Send Report To	Anne Faeth-Boyd /Emily White →	Invoice Attn	Anne Faeth-Boyd
Address	820 South Main St. Suite 100	Address	820 South Main St. Suite 100
City/State/Zip	St Charles, MO 63301	City/State/Zip	St Charles, MO 63301
Phone	(636) 724-9191	Phone	(636) 724-9191
Fax	(636) 724-9323	Fax	(636) 724-9323
e-Mail Address	ewhite@golder.com	e-Mail Address	afaeth@golder.com

A	1311_TCLP RCRA Metals (1311/3010/6020/7470 -RCRA 8)
B	
C	
D	
E	
F	
G	
H	
I	
J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	PT 8 (0-2)	08/10/17	0845	Soil	8	2	X										
2	PT 8 (2-4)		0846				X										
3	PT 8 (4-6)		0855				X										
4	PT 8 (6-8.7)		0858				X										
5	PT 6 (0-2)		0910				X										
6	PT 6 (2-4)		0912				X										
7	PT 6 (4-6)		0914				X										
8	PT 6 (6-8)		0916				X										
9	PT 6 (8-9.8)		0922				X										
10	PT 4 (0-2)		0958				X										

Sampler(s) Please Print & Sign: Emily White Emily White

Shipment Method: FedEx

Required Turnaround Time: (Check Box) TAT 5 days Other:

Results Due Date:

Relinquished by:	Date:	Time:	Received by:
Emily White	08/10/17	1710	
Relinquished by:	Date:	Time:	Received by (Laboratory): R Giga 8/11/17 0825
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):

Notes: [Exide Frisco]

Cooler ID	Cooler Temp. uc
25574	2.6c
24028	1.4c
IR #20	
cf +0.5	

QC Package: (Check One Box Below)
QC Level TRRP LRC
Other:

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

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Chain of Custody Fo[r]

HS17080635
Golder Associates
Exide North CAMU

Page 2 of 5

COC ID: 16649[6]

ALS Project Manager:

Customer Information		Project Information			
Purchase Order	1302086-03	Project Name	Exide North CAMU	A	1311_TCLP RCRA Metals (1311/3010/6020/7470 -RCRA 8)
Work Order		Project Number	1302086-03	B	
Company Name	Golder Associates	Bill To Company	Golder Associates	C	
Send Report To	~~Anne Faeth-Boyd~~ Emily White →	Invoice Attn	Anne Faeth-Boyd	D	
Address	820 South Main St.	Address	820 South Main St.	E	
	Suite 100		Suite 100	F	
City/State/Zip	St Charles, MO 63301	City/State/Zip	St Charles, MO 63301	G	
Phone	(636) 724-9191	Phone	(636) 724-9191	H	
Fax	(636) 724-9323	Fax	(636) 724-9323	I	
e-Mail Address	ewhite@golder.com	e-Mail Address	afaeth@golder.com	J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Ho[ld]
1	PT 4 (2-4)	08/10/17	1000	soil	8	2	X										
2	PT 4 (4-6)		1002				X										
3	PT 4 (6-8)		1008				X										
4	PT 4 (8-10)		1010				X										
5	PT 4 (10-12.3)		1020				X										
6	PT 1 (0-2)		1045				X										
7	PT 1 (2-4)		1048				X										
8	PT 1 (4-6)		1054				X										
9	PT 1 (6-8)		1056				X										
10	PT 1 (8-10)		1100				X										

Sampler(s) Please Print & Sign: Emily White Emily White
Shipment Method: FedEx
Required Turnaround Time: (Check Box) TAT 5 days Other:
Results Due Date:

Relinquished by: Emily White	Date: 08/10/17	Time: 1710	Received by:		
Relinquished by:	Date:	Time:	Received by (Laboratory): R Cuga 8/11/17 8:25am		
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):		

Notes: [Exide Frisco]

Cooler ID	Cooler Temp.
	UC
25574	2.6
24028	1.4
IR 20	
CF+0.5	

QC Package: (Check One Box Below)
QC Level: TRRP LRC
Other:

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.

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Chain of Custody Form

Page 3 of 5

COC ID: 166497

ALS Project Manager:

HS17080635
Golder Associates
Exide North CAMU

Customer Information		Project Information	
Purchase Order	1302086-03	Project Name	Exide North CAMU
Work Order		Project Number	1302086-03
Company Name	Golder Associates	Bill To Company	Golder Associates
Send Report To	Anne Faeth-Boyd /Emily White →	Invoice Attn	Anne Faeth-Boyd
Address	820 South Main St. Suite 100	Address	820 South Main St. Suite 100
City/State/Zip	St Charles, MO 63301	City/State/Zip	St Charles, MO 63301
Phone	(636) 724-9191	Phone	(636) 724-9191
Fax	(636) 724-9323	Fax	(636) 724-9323
e-Mail Address	ewhite@golder.com	e-Mail Address	afaeth@golder.com

A	1311_TCLP RCRA Metals (1311/3010/6020/7470 -RCRA 8)
B	
C	
D	
E	
F	
G	
H	
I	
J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J
1	PT1 (10-12)	08/10/17	1105	soil	8	2	X									
2	PT1 (12-13.5)		1108				X									
3	PT11 (0-2)		1138				X									
4	PT11 (2-4)		1140				X									
5	PT11 (4-6)		1152				X									
6	PT11 (6-7.7)		1154				X									
7	PT10 (0-2)		1204				X									
8	PT10 (2-4.4)		1208				X									
9	PT9 (0-2)		1215				X									
10	PT2 (0-2)		1352				X									

Sampler(s) Please Print & Sign: Emily White Emily White

Shipment Method: FedEx

Required Turnaround Time: (Check Box) TAT 5 days Other:

Results Due Date:

Relinquished by: Emily White	Date: 08/10/17	Time: 1710	Received by:
Relinquished by:	Date:	Time:	Received by (Laboratory): R Grigg 8/11/17 08:25
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):

Notes: [Exide Frisco]

Cooler ID	Cooler Temp.
	we
25574	2.6
24028	1.4
1220	
cf+0.5	

QC Package: (Check One Box Below)
QC Level TRRP LRC
Other:

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse...

Chain of Custody For

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Fort Collins, CO +1 970 490 1511
Everett, WA +1 425 356 2600
Holland, MI +1 616 399 6070

Page 4 of 5

COC ID: 166495

ALS Project Manager:

HS17080635

Golder Associates

Exide North CAMU

Customer Information		Project Information	
Purchase Order	1302086-03	Project Name	Exide North CAMU
Work Order		Project Number	1302086-03
Company Name	Golder Associates	Bill To Company	Golder Associates
Send Report To	Anne Faeth-Boyd / Emily White →	Invoice Attn	Anne Faeth-Boyd
Address	820 South Main St. Suite 100	Address	820 South Main St. Suite 100
City/State/Zip	St Charles, MO 63301	City/State/Zip	St Charles, MO 63301
Phone	(636) 724-9191	Phone	(636) 724-9191
Fax	(636) 724-9323	Fax	(636) 724-9323
e-Mail Address	ewhite@golder.com	e-Mail Address	afaeth@golder.com

A	1311_TCLP RCRA Metals (1311/3010/6020/7470 -RCRA 8)
B	
C	
D	
E	
F	
G	
H	
I	
J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	PT 2 (2-4)	08/10/17	1354	soil	8	2	X										
2	PT 2 (4-6)		1400				X										
3	PT 3 (0-2)		1408				X										
4	PT 3 (2-4)		1410				X										
5	PT 3 (4-6)		1415				X										
6	PT 3 (6-7.8)		1420				X										
7	PT 5 (0-2)		1435				X										
8	PT 5 (2-4)		1438				X										
9	PT 5 (4-6.4)		1442				X										
10	PT 7 (0-2)		1448				X										

Sampler(s) Please Print & Sign: Emily White Emily White

Shipment Method: FedEx

Required Turnaround Time: (Check Box) TAT 5 days Other:

Results Due Date:

Relinquished by: Emily White	Date: 08/10/17	Time: 1710	Received by:	Notes: [Exide Frisco]
Relinquished by:	Date:	Time:	Received by (Laboratory): R Cage 8/11/17 08:25	
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):	

Cooler ID	Cooler Temp.
25574	2.6
24028	1.4
IR20	
C470.5	

QC Package: (Check One Box Below)
QC Level TRRP LRC
Other:

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

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Holland, MI +1 616 399 6070

Chain of Custody Form

Page 5 of 5

COC ID: 166494

HS17080635
Golder Associates
Exide North CAMU

ALS Project Manager:

Customer Information		Project Information			
Purchase Order	1302086-03	Project Name	Exide North CAMU	A	1311_TCLP RCRA Metals (1311/3010/6020/7470 -RCRA 8)
Work Order		Project Number	1302086-03	B	
Company Name	Golder Associates	Bill To Company	Golder Associates	C	
Send Report To	~~Anne Faeth-Boyd~~ Emily White →	Invoice Attn	Anne Faeth-Boyd	D	
Address	820 South Main St.	Address	820 South Main St.	E	
	Suite 100		Suite 100	F	
City/State/Zip	St Charles, MO 63301	City/State/Zip	St Charles, MO 63301	G	
Phone	(636) 724-9191	Phone	(636) 724-9191	H	
Fax	(636) 724-9323	Fax	(636) 724-9323	I	
e-Mail Address	ewhite@golder.com	e-Mail Address	afaeth@golder.com	J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	PT 7 (2-4)	08/10/17	1452	Soil	8	2	X										
2	PT 7 (4-6.3)	|	1455	|	|	|	X										
3	DUP-1	|	—	|	|	|	X										
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Sampler(s) Please Print & Sign: Emily White Emily White

Shipment Method: FedEx

Required Turnaround Time: (Check Box) TAT 5 days Other:

Results Due Date:

Relinquished by: Emily White	Date: 08/10/17	Time: 1710	Received by:
Relinquished by:	Date:	Time:	Received by (Laboratory): R Gage 8/11/17 08:25
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):

Notes: [Exide Frisco]

Cooler ID	Cooler Temp. °C
25574	2.6
24028	1.4
IR 20	

CF +0.5

QC Package: (Check One Box Below)
QC Level TRRP LRC
Other:

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

ALS
10450 Stancliff Rd., Suite 210
Houston, Texas 77099
Tel. +1 281 530 5656
Fax. +1 281 530 5887

25574

CUSTODY SEAL

Date: 08/10/17 Time: 08/10/17 1710
Name: Emily Wis
Company: Golder

Seal Broken By: SM
Date: 08/11/17

25574 AUG 11 2017

RMA: EXIDE - North CAMU

FedEx Express E

J171616102001uv

FedEx

FRI - 11 AUG 10:30A

TRK# 0221 7376 9747 8427

PRIORITY OVERNIGHT

AB SGRA 25574

77099
TX-US IAH

ALS
10450 Stancliff Rd., Suite 210
Houston, Texas 77099
Tel. +1 281 530 5656
Fax. +1 281 530 5887

24028

CUSTODY SEAL

Date: 08/10/17 Time: 1710
Name: Emily Wis
Company: Golder

Seal Broken By:
Date:

24028 AUG 11 2017

RMA: North CAMU

FedEx Express E

J161216101001uv

FedEx

FRI - 11 AUG 10:30A

TRK# 0221 7376 9747 4454

PRIORITY OVERNIGHT

AB SGRA 24028

77099
TX-US IAH

QA LEVEL II – INORGANIC DATA EVALUATION CHECKLIST

Company Name: Golder Associates
Project Manager: Anne Faeth-Boyd
Project Name: Exide Frisco - North CAMU Soil Sampling
Project Number: 130-2086
Reviewer: Samantha DiCenso
Validation Date: August 21, 2017
Laboratory: ALS Environmental
SDG#: HS17080635
Analytical Method (type and no.): TCLP Metals by SW1311/6020A, TCLP Mercury by SW7470A

Matrix: ☐ Air ☑ Soil/Sed. ☐ Water ☐ Waste ☐ Other(specify):

Sample Names: See attached lab report.

NOTE: Please provide calculations in comment areas or on the back (if on the back, please indicate in comment (areas).

Field Information	YES	NO	NA	COMMENTS
a) Sampling dates noted?	☑	☐	☐	08/10/2017
b) Sampling team indicated?	☑	☐	☐	
c) Sampling location noted?	☑	☐	☐	
d) Sampling depth indicated (soils)?	☑	☐	☐	
e) Sample type indicated (grab/composite)?	☐	☐	☑	
f) Field QC noted?	☑	☐	☐	
g) Field parameters collected (note types)?	☐	☐	☑	
h) Field Calibration within control limits?	☐	☐	☑	
i) Notations of unacceptable field conditions/performances from field logs or field notes?	☐	☑	☐	
j) Does the laboratory narrative note deficiencies?	☑	☐	☐	

Note deficiencies: The RPD between sample and serial dilution (SD) was greater than 10% for Barium in batch 119314.

Chain of Custody (COC)	YES	NO	NA	COMMENTS
a) Was the COC properly completed?	☑	☐	☐	
b) Was the COC signed by both field and laboratory personnel?	☑	☐	☐	
c) Were the samples received in good condition?	☑	☐	☐	

General (reference QAPP or Method)	YES	NO	NA	COMMENTS
a) Were the hold times met for sample pretreatment?	☑	☐	☐	
b) Were the hold times met for sample analysis?	☑	☐	☐	
c) Were the correct preservatives used?	☑	☐	☐	
d) Was the correct method used?	☑	☐	☐	
e) Were the appropriate reporting limits achieved?	☑	☐	☐	
f) Were any sample dilutions noted?	☐	☑	☐	
g) Were any matrix problems noted?	☐	☑	☐	

QA LEVEL II – INORGANIC DATA EVALUATION CHECKLIST

Blanks	YES	NO	NA	COMMENTS
a) Were analytes detected in the method blank(s)?	☐	☑	☐	
b) Were analytes detected in the field blank(s)?	☐	☐	☑	
c) Were analytes detected in the equipment blank(s)?	☐	☐	☑	
d) Were analytes detected in the trip blank(s)?	☐	☐	☑	

Laboratory Control Sample (LCS)	YES	NO	NA	COMMENTS
a) Was a LCS analyzed once per SDG?	☑	☐	☐	
b) Were the proper compounds included in the LCS?	☑	☐	☐	
c) Was the LCS accuracy criteria met?	☑	☐	☐	

Duplicates	YES	NO	NA	COMMENTS
a) Were field duplicates collected (note original and duplicate sample names)?	☑	☐	☐	PT 4 (10-12.3) and DUP-1
b) Were field dup. precision criteria met (note RPD)?	☐	☑	☐	See notes
c) Were lab duplicates analyzed (note original and duplicate samples)?	☐	☐	☑	
d) Were lab dup. precision criteria met (note RPD)?	☐	☐	☑	

Blind Standards	YES	NO	NA	COMMENTS
a) Was a blind standard used (indicate name compounds included and concentrations)?	☐	☐	☑	
b) Was the %D within control limits?	☐	☐	☑	

Matrix Spike/Matrix Spike Duplicate (MS/MSD)	YES	NO	NA	COMMENTS
a) Was MS accuracy criteria met?	☑	☐	☐	
Recovery criteria could not be calculated since sample Contained high concentration of analyte?	☐	☐	☑	
b) Was MSD accuracy criteria met?	☑	☐	☐	
Recovery criteria could not be calculated since sample contained high concentration of analyte?	☐	☐	☑	
c) Were MS/MSD precision criteria met?	☑	☐	☐	

Comments/Notes:

Duplicates: RPD > 50% between PT 4 (10-12.3) and DUP-1 for Arsenic

QA LEVEL II – INORGANIC DATA EVALUATION CHECKLIST

Data Qualification:

Sample Name	Constituent(s)	Result	Qualifier	Reason
PT 4 (10-12.3)	Arsenic	0.0354	J	RPD >50% between sample and DUP
DUP-1	Arsenic	0.0160	J	"

Signature: Samantha Hilicc

Date: 08/21/17

Revised April 2015

Bryan W. Shaw, Ph.D., P.E., *Chairman*
Toby Baker, *Commissioner*
Jon Niermann, *Commissioner*
Richard A. Hyde, P.E., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

September 20, 2017

Mr. Bradley Weaver, Director
Remediation
Exide Technologies
P.O. Box 250
7471 5th Street
Frisco, Texas 75034

Re: *Summary of Waste Characterization Sampling of Placed Soil in Exide Technologies Class 2 Landfill CAMU,* dated September 6, 2017
Class 2 Landfill, Exide Frisco Recycling Facility, 7471 5th St., Frisco, TX 75034-5047
TCEQ SWR No. 30516, CN600129779, RN100218643
TCEQ Hazardous Waste Permit No. HW-50206
TCEQ Agreed Order Docket No. 2011-1712-IHW-E
EPA ID No. TXD006451090

Dear Mr. Weaver:

The Texas Commission on Environmental Quality (TCEQ) has reviewed the above referenced report, prepared by Golder Associates. After careful review, the TCEQ agrees that the analytical results from all samples were below Class 2 Criteria. The information provided in this report, and in the additional supporting information provided via email and supporting attachments dated June 29, 2017, adequately address the concerns of the TCEQ regarding the uncharacterized soils from the Undeveloped Buffer Property that were placed in the landfill.

Please reference SWR No. 30516 on the front of any future letters or reports. Future submittals should be mailed to the TCEQ, Remediation Division at Mail Code MC-127. You may contact me with any questions at (512) 239-2961.

Sincerely,

R. Stuart Goldsmith, Project Manager
VCP-CA Section
Remediation Division

RSG/mdh

cc: Mr. Sam Barrett, Waste Section Manager, TCEQ Region 4 Office, Dallas/Ft. Worth

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

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Golder Associates

Engineering Earth's Development, Preserving Earth's Integrity