HAZARDOUS WASTE PERMIT RENEWAL APPLICATION
VOLUME 2

Hazardous Waste Permit No. 50189

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Hazardous Waste Permit Renewal Application
Ascend Performance Materials Texas Inc., Alvin, Texas

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Part B Application Form, Section V

V. Engineering Reports

Provide all Part B responsive information in Appendix V. When preparing the physical format organize your submittal using the [Format of Hazardous Waste permit Application and Instructions.]()

For multiple units provide an include all Part B responsive information in a separate Appendix for each unit.

The engineering report represents the conceptual basis for the storage, processing, or disposal units at the hazardous waste management (HWM) facility. It should include calculations and other such engineering information as may be necessary to follow the logical development of the facility design. Plans and specifications are an integral part of the report. They should include construction procedures, materials specifications, dimensions, design capacities relative to the volume of wastes (as appropriate), and the information required by 40 CFR 270.14(b)(8), 270.14(b)(10). Since these reports may be incorporated into any issued permit, the report should not include trade names, manufacturers, or vendors of specific materials, equipment, or services unless such information is critical to the technical adequacy of the material. Technical specifications and required performance standards are sufficient to conduct a technical review. For landfills, surface impoundments, and waste piles, a Construction Quality Assurance Plan, which considers the guidance in EPA publication 530-SW-85-014, Minimum Technology Guidance on Double Liner Systems for Landfills and Surface Impoundments; Design, Construction, and Operation, and/or EPA/600/R-93/182, Quality Assurance And Quality Control For Waste Containment Facilities, should be submitted.

For facilities which will receive wastes from off-site sources, the engineering report must also contain information on the units which will manage these off-site wastes in accordance with 30 TAC 335.45(a).

Certain ancillary components or appurtenant devices must be addressed in the Part B application. These include but are not limited to sumps, pipelines, ditches, and canals. The technical information and the level of detail required will vary with the nature, scope, and location of the ancillary component. At a minimum they should be included in descriptions of piping and process flow. More information may be required. A single area containing a large number of ancillary components or a remote appurtenant device in an unusually sensitive location may warrant some specific permit requirements. All ancillary components must be included in calculating closure cost estimates.

In each of the unit-specific sections, describe precautions taken to prevent accidental commingling of incompatible wastes. If reactive or ignitable wastes are to be managed, or if incompatible wastes are deliberately commingled, provide information to ensure that precautions are taken to avoid danger due to:

- generation of extreme heat or pressure, fire, explosion, or violent reaction;
- production of uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health;
- production of uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosion;
- damaging the structural integrity of the device or facility containing the waste; or
- threatening human health or the environment by any other means.

Comprehensive consideration should be given to ensure that the facility is designed in accordance with good public health and hazardous waste management practices. The application will be evaluated primarily for the aspects of design covered by the regulations. Nothing in any approval is intended to relieve the facility owner or operator of any liabilities or responsibilities with respect to the design, construction, or operation of the project.

A. General Engineering Reports

1. General Information

   Complete Table V.A. - Facility Waste Management Handling Units listing all past, current or proposed units. *[Indicate units' status as* Active, Closed, Inactive *(built but not yet managing waste)*, Proposed *(not yet built)*, Never Built, Transferred, or Post-Closure. *Indicate appropriate units for Capacity information.]* **Note for renewals and modifications involving adding or dropping units from the permit:** List all TCEQ Permit Unit Numbers that have been assigned previously as in a current permit Attachment D -Authorized Facility Units table and do not reuse or reassign permit numbers for units that have been replaced, closed, removed from the permit, or transferred to other ownership. All Notice of Registration (NOR) Numbers must match the State of Texas Environmental Electronic Reporting System (STEERS) and may not be reused for replacement units.

   Provide an overall plan view of the entire facility. Identify each hazardous or industrial solid waste management unit (container storage area, tank, incinerator, etc.) to be permitted in relation to its location and the type of waste managed in that unit. Also provide a plan view at an appropriate scale to clearly show the location of all hazardous waste management units to be permitted on one or more 8 1/2" x 14" sheets. Indicate on this plan view how the design or operation provides for buffer zones or waste segregation as appropriate for incompatible, ignitable, or reactive wastes.

   Submit a topographic map or maps of the facility which clearly shows the information specified in 40 CFR 270.14(b)(19), 270.14(c)(3), and 270.14(d)(1)(i) (for large HWM facilities, the TCEQ will allow the use of other scales on a case-by-case basis). Please note that the term "facility" includes all contiguous land, structures, other appurtenances, and improvements on the land for storing, processing, or disposing of hazardous and industrial solid waste.

2. Features to Mitigate Unsuitable Site Characteristics

   For all new hazardous waste management storage and/or processing facilities or areal expansions of existing hazardous waste management storage and/or processing facilities, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(a)(1) and (a)(3) through (9).

3. Construction Schedules

   a. In order to meet the required design standards, extensive retrofitting of some facilities may be required. In the worst case, the applicant may elect to close certain operations rather than comply with the RCRA standards. Thus, the permit may specify a schedule of compliance requiring the accomplishment of given tasks within specific time frames. As required, indicate an appropriate schedule(s) of compliance in this application. The schedule should provide for facility compliance as soon as possible and in accordance with 40 CFR 270.33(a)(2) and 270.33(b).

b. For commercial hazardous waste management facilities, permit applications (new, renewal, or interim status applications), major amendments, and Class 3 modifications must include a construction schedule. A construction schedule must be submitted even if the application does not include an addition of units or a revision to permitted units. This schedule should comply with the requirements of 30 TAC 305.149.

4. Provide detailed plans and specifications which when, accompanied by the engineering report, will be sufficiently detailed and complete to allow the Executive Director to ascertain whether the facility will be constructed and operated in compliance with all pertinent permitting requirements. Engineering plans and specifications must be prepared under the supervision of and sealed by a licensed Professional Engineer, with current license, along with the Registered Engineering Firm's name and Registration Number as required by the Texas Engineering Practice Act. For some facilities, plans in the form of a standard piping and instrumentation diagram will be sufficient. Overall dimensions and materials of construction must be shown.

B. Container Storage Areas

1. Provide an engineering report which includes all of the information specified in 40 CFR 264.170-264.173, 264.175-264.177, and 270.15.
Complete Table V.B - Container Storage Areas and list the container storage areas covered by this application to be permitted. List the N.O.R. unit number, the rated capacity or size of each unit (including the maximum number of each type of container to be stored at each unit and total maximum capacity of all types wastes stored in the unit), the areal dimensions, containment volume, aisle space requirements, whether ignitable, reactive, or incompatible waste will be stored in each unit, and whether processing will occur within the unit.

2. Container storage areas must have a containment system that is capable of collecting and holding spills, leaks, and precipitation. In addition to the requirements of 40 CFR 270.15, the design report should include the following:

   a. Capacity of the containment relative to the number and volume of containers to be stored; in addition, for unenclosed areas, the amount of rainfall collected prior to removal. The TCEQ recommends using a 25-year, 24-hour rainfall event for this extra capacity; and

   b. Run-on into the containment system must be prevented, or a collection system with sufficient excess capacity must be provided. If run-on is collected within the containment system, delineate the area(s) from which run-on is collected. The 25-year, 24-hour rainfall event should be used to calculate the excess capacity.

3. Wastes Containing No Free Liquids
With the exception of 40 CFR 264.175(d), storage areas that hold only wastes that do not contain free liquids need not have a containment system, provided that compliance with 40 CFR 264.175(c) is demonstrated. This demonstration must be submitted as part of the application and must include:

   a. test procedures and results or other documentation or information to show that the wastes do not contain free liquids; and

   b. a description of how the storage area is designed or operated to drain and remove liquids or how containers are kept from contact with standing liquids.

4. Managing Ignitable or Reactive Wastes

   If a container storage area will manage ignitable or reactive waste, as indicated on Table V.B, provide in the engineering report drawings demonstrating compliance with the buffer zone requirement of 40 CFR 264.17 and 264.176.

5. Managing Incompatible Wastes

   If a container storage area will manage incompatible waste, as indicated on Table V.B, provide in the engineering report a description of the procedures used to ensure compliance with 40 CFR 264.17 and 264.177.

6. Managing Nonhazardous Wastes and/or Universal Wastes

   If a container storage area will manage nonhazardous wastes, and/or universal wastes in addition to hazardous waste, provide a description of all types of wastes managed in the engineering report and procedures used to ensure compliance with 40 CFR 264 Subpart I.

C. Tanks and Tank Systems

Provide an engineering report which includes all of the information specified in 40 CFR 264.190-264.194, 264.196, 264.198-264.199, and 270.16.

1. For inclusion into a permit, complete Table V.C - Tanks and Tank Systems and list the tanks covered by this application to be permitted. List the N.O.R. unit number, whether the unit is for storage and/or processing, the waste managed in each unit, the rated capacity of each unit, overall dimensions of each unit, containment volume, and whether ignitable, reactive, or incompatible waste will be stored in each unit.

2. For inclusion into a permit, complete Table V.C - Tanks and Tank Systems and list the tanks covered by this application to be permitted. List the N.O.R. unit number, whether the unit is for storage and/or processing, the waste managed in each unit, the rated capacity of each unit, overall dimensions of each unit, containment volume, and whether ignitable, reactive, or incompatible waste will be stored in each unit.

3. If a tank will manage incompatible waste, as indicated on Table V.C, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.199.

4. Submit written assessments that were reviewed and certified by an independent, qualified licensed Professional Engineer that attests to the structural integrity and suitability of handling the hazardous waste for each tank system, as required under 40 CFR 264.191-264.192 for existing tanks which do not have secondary containment meeting the standards of 40 CFR 264.193. The engineer signing the written assessment must make the certification specified in 40 CFR 270.11(d). The certification must be sealed by a licensed Professional Engineer, with current license, along with the Registered Engineering Firm's name and Registration Number as required by the Texas Engineering Practice Act.

5. If a tank has been de-rated or if the permitted capacity is otherwise different from the design capacity, specify any such change(s) in the engineering report.

Provide in the report any additional information for tanks and tank systems as specified in the above regulatory citations including: specifics of leak, spill, and unfit for use systems responses; assessments of tank systems; new tank systems or components; overfill control and prevention; special requirements for ignitable and/or reactive wastes; incompatible wastes; air emissions control; detection of leaks into secondary containment; ancillary equipment; and plans and specifications individually sealed by a licensed professional engineer with current Texas registration with the Registered Engineering Firm's name and Registration number.

D. Surface Impoundments

For Surface Impoundments Closed as a Landfill

1. Provide as-built plans and specifications for the final cover system, individually for each unit that is sealed, signed and dated by a licensed professional engineer with current Texas registration along with the Registered Engineering Firm's name and Registration Number would satisfy this requirement; Other as-built plans and specifications for the unit may be submitted upon request.

2. Complete Table V.D.1 - Surface Impoundments and list the surface impoundments, covered by this application, to be permitted. List the waste(s) managed in each unit and the rated capacity or size of each unit.

3. Complete Table V.D. 6. - Surface Impoundment Liner System for each surface impoundment to be permitted.

For Proposed or Active Surface Impoundments

Provide an engineering report which includes all of the information specified in 30 TAC 305.50(a)(6), 335.168, 335.169, and 40 CFR 264.19, 264.220, 264.221, 264.222, 264.223, 264.226(a) and (c), 264.227, 264.229-264.231, and 270.17.

For storage surface impoundments at a new hazardous waste management facility or which are part of an areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(d). For any surface impoundment to be closed as a landfill (where wastes will remain after closure of the impoundment) at a new hazardous waste management facility or which are part of an areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(e).

For all impoundments, include in the report the following information.

1. Complete Table V.D.1 - Surface Impoundments and list the surface impoundments, covered by this application, to be permitted. List the waste(s) managed in each unit and the rated capacity or size of each unit.

2. If a surface impoundment will manage ignitable or reactive waste, as indicated on Table V.D.1., describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.229.

3. If a surface impoundment will manage incompatible waste, as indicated on Table V.D.1., describe in the engineering report the procedures used to ensure

compliance with 40 CFR 264.17 and 264.230.

4. If a surface impoundment will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.D.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.231.

5. Describe the surface impoundment. Detailed plan view and cross-sectional drawings of the surface impoundment should be included with the engineering report.

6. Freeboard
   Specify the minimum freeboard to be maintained and the basis of the design to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and wave action; rainfall; run-on; malfunctions of level controllers, alarms, and other equipment; and human error. Show that adequate freeboard will be available to prevent overtopping from a 100-year, 24-hour storm. [40 CFR 264.221(g)]
   If the impoundment is inflow sensitive, it should be equipped with a high-level alarm based on a different level sensor than that used for automatic control.

7. Waste Flow
   Describe the means that will be used to immediately shut off the flow of waste to the impoundment to prevent overtopping or in the event of liner failure, and include appropriate detailed drawings.
   If the surface impoundment is a flow-through facility describe the flow of waste, including a hydraulic profile.

8. Dike Construction

   a. If dikes are used, download the dike design and materials of construction engineering certification from the attachments **list** the following certification as part of the engineering report:

   b. The structural integrity of the dike system must be certified by a qualified Professional Engineer before a permit is issued. If the impoundment is not being used, the dike licensed system must be certified before it can be put into use. The certification must be sealed by a licensed Professional Engineer, with current license, along with the Registered Engineering Firm's name and Registration Number as required by the Texas Engineering Practice Act.

   c. A report shall accompany the dike certification which summarizes the activities, calculations, and laboratory and field analyses performed in support of the dike certification. Describe the design basis used in construction of the dikes. Provide the following analyses as attachments to the engineering report (A Quality Assurance Project Plan <QAPP> should be included in the report to ensure that each analysis is performed appropriately):

      (1) Slope Stability Analysis
      (2) Hydrostatic and Hydrodynamic Analysis
      (3) Storm Loading
      (4) Rapid Drawdown

   d. Earthen dikes should have a protective cover to minimize wind and water erosion and to preserve the structural integrity of the dike. Describe the protective cover used and describe its installation and maintenance.

9. Containment System

We suggest that the applicant use available recognized guidance documents, such as EPA publication 530-SW-85-014, which provide design guidance for liner systems. The applicant is strongly encouraged to test each synthetic liner after installation by an electrical leak location test, such as the electric field method described in EPA Technical Guidance Document EPA/600/R-93/182, Quality Assurance and Quality Control for Waste Containment Facilities, or an equivalent method, such as those found in ASTM publications, and approved by the Executive Director. Construction above the liner may not proceed until any detected leaks are sealed.

a. Complete Table V.D. 6. - Surface Impoundment Liner System for each surface impoundment to be permitted.

b. In the engineering report, describe the design, installation and operation of liner and leak detection components. The description must demonstrate that the liner and leak detection system will prevent discharge to the land, and ground and surface water. Include the following analyses as attachments to the engineering report (A QAPP should be included in the report to ensure that each analysis is performed appropriately):

For artificial liners:

(1) Seaming method
(2) Surface preparation method
(3) Tensile Strength
(4) Impact Resistance
(5) Compatibility Demonstration
(6) Foundation Design (including Settlement Potential, Bearing Capacity and Stability, and Potential for Bottom Heave Blow-out)

For soil liners:

(1) Waste Migration Analysis (based on head, porosity, and permeability) for the most mobile and least attenuated waste constituents
(2) Atterberg Limits, % passing a #200 sieve, and Permeability
(3) Moisture Content
(4) Standard Proctor Density, Compaction Data

For leachate collection systems:

(1) Pipe Material and Strength
(2) Pipe Network Spacing and Grading
(3) Collection Sump(s) Material and Strength
(4) Drainage Media Specifications and Performance
(5) Analyses showing that pipe and pipe perforation size will prevent clogging and allow free liquid access to the pipe.
(6) Compatibility Demonstration
(7) Capacity of System
    (a) rate of leachate removal
    (b) capacity of sumps
    (c) thickness of mounding and maximum hydraulic head

c. Specify the liner system installation date and expected lifetime of liner system (years).

d. Specify whether the liner is chemically resistant to the waste and how this resistance was determined. Attach any tests or documentation to the engineering report.

e. Submit a quality assurance/quality control plan for all components to demonstrate that all components will be properly installed and will perform to design specifications.

f. Submit a Response Action Plan that proposes actions to be taken if the Action Leakage Rate for the surface impoundment exceeds. At a minimum the Response Action Plan must include the requirements of 40 CFR 264.223.

10. Surface impoundments that receive waste on or after May 8, 1985 (or for newly-regulated units, the effective date of the new RCRA regulation) into new units and/or lateral expansions or replacements of existing units must meet the minimum technological requirements of the Hazardous and Solid Waste Amendments of 1984, unless an appropriate waiver is granted by the Commission. The owner or operator of each new surface impoundment unit for which the construction commences after January 29, 1992, or each lateral expansion of an existing surface impoundment unit where construction commences after July 29, 1992, or replacement of an existing surface impoundment unit that commence reuse after July 29, 1992 must install two or more liners and leachate collection and removal system unless commission approves alternate design or operating practices. Plans and specifications for both new and existing surface impoundments must demonstrate conformity with 30 TAC 335.168 and 40 CFR 264.221

11. Run-on Diversion

Describe in detail how the surface impoundment system will manage stormwater run-on away from the surface impoundment. Stormwater run-on must be diverted away from a surface impoundment. Use at least a 100-year, 24-hour rainfall event in the design and analysis of diversion structures. Where dikes are used to divert run-on, they must be protected from erosion. Include all analyses used to calculate run-on volumes.

12. The Commission may approve an alternate design or operating practice for a surface impoundment if the owner or operator demonstrates that such design or operating practices, together with location characteristics [40 CFR 264.221(d)]:

a. Will prevent the migration of hazardous constituents into the groundwater or surface water at least as effectively as the liners and leachate collection and removal system required by 40 CFR 264.221; and

b. Will allow detection leaks of hazardous constituents through the top liner at least as effectively.

13. Exemption from Double-Liner Requirements for Monofills [264.221(e)]

Owners or operators of hazardous waste surface impoundment monofills will be exempted from the double-liner requirements if the Commission finds, based on a demonstration by the owner or operator, that alternative design and operating practices, together with location characteristics are at least as effective as a double liner in preventing migration of hazardous constituents to the groundwater or surface water. If an exemption is sought, submit detailed plans and engineering and hydrogeologic reports, as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the groundwater or surface water at any future time.

E. Waste Piles

This section applies to owners or operators of industrial solid waste facilities that store or process hazardous waste in piles. A hazardous waste pile that will be closed with wastes left in place must be managed as a landfill. Existing portions of waste piles are those areas that were listed on the original Part A and on which wastes have been lawfully placed.

For Waste Piles Closed as a Landfill

1. Provide as-built plans and specifications for the final cover system, individually for each unit that is sealed, signed and dated by a licensed professional engineer with current Texas registration along with the Registered Engineering Firm's name and Registration Number would satisfy this requirement; Other as-built plans and specifications for the unit may be submitted upon request.
2. Complete Table V.E.1 - Waste Piles and list the waste piles covered by this application. List the waste managed in each unit and the rated capacity or size of the unit.
3. Complete Table V.E. 3 - Waste Pile Liner System and specify the type of containment/ liner system.

   Provide an engineering report which includes all of the information specified in 30 TAC 335.170 and 40 CFR 264.19, 264.250, 264.251, 264.252-264.253, 264.254(a) and (c), 264.256, 264.257, 264.259, and 270.18.

   For waste piles at a new hazardous waste management facility or which are part of any areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(c).

   For all waste piles, include in the report the following information.

   1. For inclusion into a permit, complete Table V.E.1 - Waste Piles and list the waste piles covered by this application. List the waste managed in each unit and the rated capacity or size of the unit.
   2. If a waste pile will manage ignitable or reactive waste, as indicated on Table V.E.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.256.
   3. If a waste pile will manage incompatible waste, as indicated on Table V.E.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.257.
   4. If a waste pile will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.E.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.259.

5. Describe the waste pile, including any structure surrounding or enclosing the waste pile.

6. Containment System

We suggest that the applicant use available recognized guidance documents, such as EPA publication 530-SW-85-014, which provide design guidance for liner systems. The applicant is strongly encouraged to test each synthetic liner after installation by an electrical leak location test, such as the electric field method described in EPA Technical Guidance Document EPA/600/R-93/182, Quality Assurance and Quality Control for Waste Containment Facilities, or an equivalent method, such as those found in ASTM publications, and approved by the Executive Director. Construction above the liner may not proceed until any detected leaks are sealed.

a. For inclusion into a permit, complete Table V.E. 3 - Waste Pile Liner System and specify the type of containment/liner system.

b. In the engineering report, describe the design, installation, construction, and operation of the liner and leachate collection system. The description must demonstrate that containment systems will prevent discharge to the land, surface water, or groundwater. Include the following analyses as attachments to the engineering report, when applicable to the containment system being described (A QAPP should be included in the report to ensure that each analysis is performed appropriately):

For artificial liners:

(1) Seaming method
(2) Surface preparation method
(3) Tensile Strength
(4) Impact Resistance
(5) Compatibility Demonstration
(6) Foundation Design (including Settlement Potential, Bearing Capacity and Stability, and Potential for Bottom Heave Blow-out)

For soil liners:

(7) Waste Migration Analysis (based on head, porosity, and permeability) for the most mobile and least attenuated constituents.
(8) Atterberg Limits, % passing a #200 sieve, and Permeability
(9) Moisture Content
(10) Standard Proctor Density, Compaction Data

For leachate detection, collection, and removal system:

(11) Capacity of system
  (a) rate of leachate removal
  (b) capacity of sumps
  (c) thickness of mounding and maximum hydraulic head
(12) Pipe Material and Strength
(13) Pipe Network Spacing and Grading
(14) Collection Sump(s) Material and Strength
(15) Drainage Media Specifications and Performance

(16) Analysis showing that pipe and perforation size will prevent clogging and allow free liquid access to the pipe.
(17) Compatibility Demonstration

c. Containment/liner system installation date and expected lifetime of liner system (years).

d. Specify whether the containment/liner system is chemically resistant to the waste and how this resistance was determined. Attach any tests or documentation to the engineering report.

e. Submit a quality assurance/quality control plan for all components to demonstrate that all components will be properly installed and will perform to design specifications.

f. Submit a Response Action Plan that proposes actions to be taken if the Action Leakage Rate for the waste pile exceeds. At a minimum the Response Action Plan must include the requirements of 40 CFR 264.253.

7. Wind Dispersal [30 TAC 335.170(j)]

Waste piles containing hazardous waste which could be subject to dispersal by wind must be covered or otherwise managed so that wind dispersal is minimized. Describe practices to control wind dispersal (e.g., cover or frequent wetting) of the hazardous waste.

8. Run-on Diversion [30 TAC 335.170(g)]

Describe in detail the measures used to control and divert run-on from the unit. The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the pile during peak discharge from at least a 100-year, 24-hour storm.

Include all analyses used to calculate: flow rates; run-on volume and depth; and back-water calculations for the ditches on plant property.

Any tanks or basins associated with the run-on control systems must be emptied or otherwise managed expeditiously after a storm to maintain the design capacity of the system. [30 TAC 335.170(i)]

9. Run-off Control [30 TAC 335.170(h)]

Describe in detail the measures used to control run-off from the unit. Include all analyses used to calculate the run-off volumes.

The owner or operator must design, construct, operate, and maintain a run-off management system to collect and control at least the water volume resulting from a 100-year, 24-hour storm.

Collection and holding facilities (e.g., tanks or basins) associated with the run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain the design capacity of the system. [30 TAC 335.170(i)]

10. Give a description of design and operating procedures to properly manage and/or dispose of any residuals (e.g., leachate) that may be generated during waste management. Describe the management process and any equipment used.

11. Provide a description and list of all equipment and procedures used to place the

waste in or on the waste pile, and how the liner surface will be exposed for inspection, if necessary. A containment system must be protected from plant growth which could puncture any component of the system.

12. Exemption from Liner and Leachate Collection Requirements

The Commission may approve an alternate design or operating practice for a waste pile if the owner or operator demonstrates that such design or operating practices, together with location characteristics [40 CFR 264.251(d)]:

a. Will prevent the migration of hazardous constituents into the groundwater or surface water at least as effectively as the liners and leachate collection and removal system; and

b. Will allow detection leaks of hazardous constituents through the top liner at least as effectively.

13. Exemption from Groundwater Monitoring under 40 CFR 264.250(c)

A waste pile may be exempt from groundwater monitoring if the following standards are met:

a. The waste pile (including its underlying liners) must be located entirely above the seasonal high water table; and

b. The waste pile is inside or under a structure that provides protection from precipitation so that neither run-off nor leachate is generated, provided that:

(1) Liquids or materials containing free liquids are not placed in the pile;

(2) The waste pile is protected from surface water run-on by the structure or in some other manner;

(3) The waste pile is designed and operated to control dispersal of the waste by wind, where necessary, by means other than wetting; and

(4) The waste pile will not generate leachate through decomposition or other reactions; or

c. The waste pile must have a leachate collection and removal system above the top liner; and

d. Underlayment:

(1) either:

(a) The waste pile must be underlain by two liners, which are designed and constructed in a manner that prevents the migration of liquids into or out of the space between the liners and a leak detection system which must be designed, constructed, maintained, and operated between the liners to detect any migration of liquids into the space between the liners; and

(b) A demonstration must be made that there is a low potential for migration of liquid from the waste pile to the uppermost aquifer during the life of the waste pile (including the closure period). The owner or operator must base any predictions made on assumptions that maximize the rate of liquid migration;

(2) or:

(a) The waste pile must be underlain by a liner (base) that is designed, constructed, and installed in a manner that prevents the migration of liquids or waste beyond the liner; and

(b) The wastes in the waste pile must be removed periodically, and the liner must be inspected for deterioration, cracks, or other conditions that may result in leaks. The frequency of inspection will be specified in the inspection plan and must be based on the potential for the liner (base) to crack or otherwise deteriorate under the conditions of operation (e.g., waste type, rainfall, loading rates and subsurface stability).

The liner(s) used to satisfy V.D.13.d. must be of sufficient strength and thickness to prevent failure due to puncture, cracking, tearing, or other physical damage from equipment used to place waste in or on the pile or to clean and expose the liner surface for inspection.

F. Land Treatment Units

Provide an engineering report which includes all of the information specified in 30 TAC 305.50(a)(6), 335.171, 335.172, 40 CFR 264.270-264.272, 264.273, 264.276, 264.278, 264.279, 264.281-264.283, and 270.20 for each land treatment unit.

For land treatment units at a new hazardous waste management facility or which are part of an areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(b).

For all land treatment units, include in the report the following information.

1. Complete Tables V.F.1 - Land Treatment Units and V.F.2 - Land Treatment Unit Capacity and list the land treatment units covered by this application. List the waste(s) managed in each unit and the rated capacity or size of the unit. If different wastes are placed on separate portions of the land treatment area, each portion is considered a land treatment unit, and requires a separate summary form and engineering report.

   The treatment zone is defined as the soil area of the unsaturated zone of a land treatment unit within which hazardous constituents are degraded, transformed, or immobilized. In this section, specify the depth of the treatment zone. The maximum depth of the treatment zone for new land treatment units must be [40 CFR 264.271(c)]:

   a. No more than 1.5 meters (5 feet) from the surface; and

   b. More than 1 meter (3 feet) above the seasonal high water table.

2. If a land treatment unit will manage ignitable or reactive waste, as indicated on Table V.F.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.281.

3. If a land treatment unit will manage incompatible waste, as indicated on Table V.F.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.282.

4. If a land treatment unit will manage F020, F021, F022, F023, F026 and F027 waste, as indicated on Table V.F.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.283.

5. Describe the land treatment unit. The report shall include all the information requested in this section including drawings. At a minimum, a plan view and cross-section of the unit should be included with the engineering report.

6. Complete Table V.F.3. - Land Treatment Principal Hazardous Constituents and list the wastes for which the treatment demonstration will be made and the principal hazardous constituents in each waste. Specify in the report the data sources to be used to make the demonstration such as laboratory data, field data, operating data, literature, or other.

7. Run-on Diversion
   Describe in detail the measures used to control run-on and divert run-on from the unit. Include all the analyses used to calculate the run-on volumes.
   The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the land treatment unit during peak discharge from a 100-year, 24-hour storm. [30 TAC 335.171(3)]
   Collection holding facilities (e.g., tanks or basins) associated with the run-on control system must be emptied or otherwise managed expeditiously after storms to maintain the design capacity of the system. [30 TAC 335.171(5)].

8. Run-off Control
   Describe in detail the measures used to control the run-off from the unit, and minimize hazardous constituents in the run-off, include all the analyses used to calculate the run-off volumes.
   The owner or operator must design, construct, operate and maintain a run-off management system to collect and control at least the water volume resulting from a 100-year, 24-hour storm. [30 TAC 335.171(4)]
   Collection and holding facilities (e.g., tanks or basins) associated with run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system. [30 TAC 335.171(5)]

9. Wind Dispersal
   The owner or operator of a land treatment unit containing hazardous waste which could be subject to dispersal by wind must cover or otherwise manage the land treatment unit so that wind dispersal is minimized. Describe practices to control wind dispersal (e.g., cover or frequent wetting) of the hazardous waste. [30 TAC 335.171(6)]

10. Treatment Demonstration
    A description of the treatment demonstration required under 40 CFR 264.272 and 270.20(a) shall be included with the engineering report. If the owner or operator intends to conduct field tests or laboratory analyses in order to make the demonstration, he must obtain a treatment or disposal permit.

11. The owner or operator must establish an unsaturated zone monitoring program in accordance with 40 CFR 264.278 and a detailed monitoring program must be included in the application.

12. Food Chain Crops [40 CFR 264.276]

    Several conditions must be satisfied if food-chain crops are to be grown in or on the treatment zone. A demonstration must be prepared similar to the one described in the Treatment Demonstration and submitted at least 90 days prior to the planting of crops. The demonstration need not be submitted with this application. However, a description of the demonstration must be included as part of the engineering report. This demonstration may be combined with the Treatment Demonstration description, as some of the information required is identical.

G. Landfills

For Closed Landfills

1. Provide as-built plans and specifications for the final cover system, individually for each unit that is sealed, signed and dated by a licensed professional engineer with current Texas registration along with the Registered Engineering Firm's name and Registration Number would satisfy this requirement; Other as-built plans and specifications for the unit may be submitted upon request.

2. Complete Table V.G.1 - Landfills and list the landfills (and number of cells, if applicable) covered by this application. List the waste(s) managed in each unit and the rated capacity or size of the unit. If wastes are segregated in some manner, list the cell number in which wastes are placed next to each waste type.

3. Complete Table V.G.3. - Landfill Liner System and specify the type of liner used for the landfill.

4. Complete Table V.G.4. - Landfill Leachate Collection System used for the landfill.

Provide an engineering report which includes all of the information specified in 30 TAC 305.50(a)(5), (6), (9), (10), and (12), 335.173, 40 CFR 264.19, 264.300, 264.301, 264.302, 264.303(a), 264.304, 264.309, 264.312, 264.313, 264.315-264.317, and applicable requirements of 270.21. The text of the report should be written to supplement engineering plans, specifications, and test results necessary to provide a detailed description of how the landfill will comply with these standards.

For landfills at a new hazardous waste management facility or which are part of an areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(e).

For all landfills, include in the report the following information.

1. Complete Table V.G.1 - Landfills and list the landfills (and number of cells, if applicable) covered by this application. List the waste(s) managed in each unit and the rated capacity or size of the unit. If wastes are segregated in some manner, list the cell number in which wastes are placed next to each waste type.

2. If a landfill will manage ignitable or reactive waste, as indicated on Table V.G.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.312.

3. If a landfill will manage incompatible waste, as indicated on Table V.G.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.313.

4. If a landfill will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.G.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.317.

5. Describe the landfill. A plan view and cross-section of the landfill should be included with the engineering report. As appropriate, detailed plan, elevation, cross-section of landfill containment facilities shall be included with the report.

6. Containment System
We suggest that the applicant use available recognized guidance documents, such as EPA publication 530-SW-85-014, which provide design guidance for liner systems. The applicant is strongly encouraged to test each synthetic liner after installation by an electrical leak location test, such as the electric field method described in EPA Technical Guidance Document EPA/600/R-93/182, Quality Assurance and Quality Control for Waste Containment Facilities, or an equivalent method, such as those found in ASTM publications, and approved by the Executive Director. Construction above the liner may not proceed until any detected leaks are sealed.

   a. Complete Table V.G.3. - Landfill Liner System and specify the type of liner used for the landfill.

   b. In the engineering report, describe the design, installation, construction, and operation of the liner and leachate collection system. The description must demonstrate that the liner system will prevent discharge to the land, groundwater, and surface water. The following analyses should be included as attachments to the engineering report (A QAPP should be included in the report to ensure that each analysis is performed appropriately):

For artificial liners:

(1) Seaming method
(2) Surface preparation method
(3) Tensile Strength
(4) Impact Resistance
(5) Compatibility Demonstration
(6) Foundation Design (including Settlement Potential, Bearing Capacity and Stability, and Potential for Bottom Heave Blow-out)

For soil liners:

(7) Waste Migration Analysis (based on head, porosity, and permeability) for the most mobile and least attenuated waste constituents
(8) Atterberg Limits, % passing a #200 sieve, and Permeability
(9) Moisture Content
(10) Standard Proctor Density, Compaction Data

For Leachate Collection System

For incorporation into the permit, complete Table V.G.4. - Landfill Leachate Collection System and Table V.G.5 - Landfill Soil Specifications used for the landfill.

(11) Capacity of the system:

(a) rate of leachate removal

(b) capacity of sumps

(c) thickness of mounding and maximum hydraulic head

(12) Pipe Material and Strength

(13) Pipe Network Spacing and Grading

(14) Collection Sump(s) Material and Strength

(15) Drainage Media Specifications and Performance

(16) Analyses showing that pipe and pipe perforation size will prevent clogging and allow free liquid access to the pipe.

(17) Compatibility Demonstration

c. State whether the liner system components are chemically resistant to the waste and how this resistance was determined. Attach any tests or documentation to the engineering report.

d. Provide a quality assurance/quality control plan for all components to demonstrate that all components will be properly installed and will perform to design specifications.

e. Whether the leachate collection components are chemically resistant to the waste and how this resistance was determined. Attach any tests or documentation to the engineering report.

f. Provide a Response Action Plan that proposes actions to be taken in the case of exceedance of the landfill Action Leakage Rate. At a minimum the Response Action Plan must include the requirements of 40 CFR 264.304.

7. For Dikes:

a. Slope Stability Analysis;
b. Hydrostatic and Hydrodynamic Analyses
c. Ability to withstand scouring from leaking liner.

8. Landfills that receive waste on or after May 8, 1985 (or for newly-regulated units, the effective date of the new RCRA regulation) into new units and/or lateral expansions or replacements of existing units must meet the minimum technological requirements of the Hazardous and Solid Waste Amendments of 1984, unless an appropriate waiver is granted by the Commission. The owner or operator of each new landfill unit for which the construction commences after January 29, 1992, or each lateral expansion of an existing landfill unit where construction commences after July 29, 1992, or replacement of an existing landfill unit that commence reuse after July 29, 1992 must install two or more liners and leachate collection and removal system unless commission approves alternate design or operating practices. Plans and specifications for both new and existing landfills must demonstrate conformity with 30 TAC 335.173 and 40 CFR 264.301(c).

9. Site Development Plan

Describe the methods used to deposit waste in the landfill. This description should include rate of waste deposition, waste segregation, average lift size, maximum lift, average cell or trench size, maximum cell or trench size, and other information necessary to depict how the landfill will be developed. Do not include liner or leachate collection system information, closure information, or handling of special wastes. This will be included elsewhere in the report.

10. Run-on Control [30 TAC 335.173(g)]

The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the landfill during peak discharge from at least a 100-year, 24-hour storm.

In the engineering report, include the following analyses:

a. Run-on volume and depth calculations from the peak discharge of the 100-year, 24-hour storm; and

b. For ditches on the plant property, back-water calculations.

Collection and holding facilities (e.g., tanks or basins) associated with the run-on control system must be emptied or otherwise managed expeditiously. [30 TAC 335.173(i)]

11. Run-off Control [30 TAC 335.173(h)]

The owner or operator must design, construct, operate, and maintain a run-off management system to collect and control the water volume resulting from a 100-year, 24-hour storm.

Include all analyses used to calculate run-off volumes.

Collection and holding facilities (e.g., tanks or basins) associated with run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system. [30 TAC 335.173(i)]

12. Wind Dispersal [30 TAC 335.173(j)]

If the landfill contains any particulate matter which may be subject to wind dispersal, the owner or operator must cover or otherwise manage the landfill to minimize wind dispersal. Based upon the characteristics of the material to be landfilled describe the likelihood of wind dispersal occurring. Describe in detail any method and/or control mechanism used to prevent wind dispersal.

13. Liquid Waste

If liquid waste or waste containing free liquids is to be stabilized and then placed in the landfill, the procedures used to stabilize the waste must be described in the engineering report. The waste must be treated prior to landfilling using a treatment technology that does not solely involve the use of a material that functions primarily as a sorbent. Provide supporting documentation to verify that an appropriate stabilization procedure is used to comply with 30 TAC 335.175.

14. The Commission may approve an alternate design or operating practice for a landfill if the owner or operator demonstrates that such design or operating practices, together with location characteristics [40 CFR 264.301(d)]:

a. Will prevent the migration of hazardous constituents into the groundwater or surface water at least as effectively as the liners and leachate collection and removal system; and

b. Will allow detection leaks of hazardous constituents through the top liner at least as effectively.

15. Exemption from Double-Liner Requirements for Monofills [264.301(e)]

    Owners or operators of hazardous waste monofills will be exempted from the double-liner requirements if the Commission finds, based on a demonstration by the owner or operator, that alternative design and operating practices, together with location characteristics are at least as effective as a double liner in preventing migration of hazardous constituents to the groundwater or surface water. If an exemption is sought, submit detailed plans and engineering and hydrogeologic reports, as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the groundwater or surface water at any future time.

16. Above-grade Benefits

    The engineering report must evaluate the benefits, if any, associated with the construction of the landfill above existing grade at the proposed site, the costs associated with the above-grade construction, and the potential adverse effects, if any, which would be associated with the above-grade construction. [TX. Health and Safety Code 361.108]

17. Feasibility Study - Applicable to New Hazardous Waste Landfills or Areal Expansions of Existing Hazardous Waste Landfill

    In accordance with the Health and Safety Code Section 361.106 and 30 TAC Section 335.205(a)(2), provide a feasibility study demonstrating that there is no practical, economic, and feasible alternative that is reasonably available to manage the types and classes of hazardous wastes to be disposed of at a proposed new hazardous waste landfill or the areal expansion of an existing hazardous waste landfill.

H. Incinerators

Engineering Report for Combustion Units

For hazardous waste combustion unit which are subject to regulation by 40 CFR Part 63, Subpart EEE, the requirements 30 TAC Chapter 305 and Subchapters I and Q do not apply when the unit becomes subject to Resource Conservation and Recovery Act (RCRA) permit requirements after October 12, 2005 (i.e., new unit), or no longer apply when an owner or operator of an existing hazardous waste management unit demonstrates compliance with the air emission standards and limitations in 40 Code of Federal Regulations (CFR) Part 63, Subpart EEE, except for the following:

1. Those provisions the Executive Director determines are necessary to comply with 40 CFR §264.345(a) and 40 CFR §264.345(c) for Phase I sources or 40 CFR §266.102(e)(1) and (2)(iii) for Phase II sources if the permittee or applicant elects to comply with any of the options listed in 40 CFR §270.235(a) to minimize emissions of toxic compounds from startup, shutdown, and malfunction events;

2. Those standards and associated requirements for particulate matter, hydrogen chloride and chlorine gas, and non-mercury metals that a Phase II area source elects to comply with in 40 CFR §§266.105, 266.106, and 266.107;

3. Those standards for particulate matter in 40 CFR 264.343(c) remain in effect for a Phase I source incinerator that elects to comply with the alternative to the

particulate matter standard under 40 CFR 63.1206(b)(14) and 63.1219(e); and

4. Those provisions that the Executive Director may apply in 30 TAC Chapter 305, Subchapters I and Q, on a case-by-case basis. The Executive Director may require a permittee or an applicant to submit information in order to establish permit conditions under §305.50(a)(15) or (16) and §305.127(1)(B)(iii) or (4)(A) (i.e., risk-based permit conditions).

For hazardous waste combustion units subject to regulation by 40 CFR Part 63, Subpart EEE, some of the information requested in Sections V.H and V.I. will not be applicable for new units or existing units which have submitted a Notification of Compliance in accordance with 40 CFR 63.1207(j) and 63.1210(d), received a Finding of Compliance pursuant to 40 CFR 63.1206(b)(3), and have the associated RCRA permit conditions removed from the permit. Information which is not applicable or no longer applicable should not be included in the Part B application. *[Please note that the TCEQ will require a Finding of Compliance be made prior to modifying the permit by deleting redundant operating parameter limits and standards for the combustion units. Until such time as the permit is modified to delete the redundant RCRA-based operating parameter limits and standards in the permit or the permit is terminated or revoked, the permittee must comply with the RCRA-based conditions specified in the permit. More stringent risk-based permit conditions will remain in the RCRA permit.]*

For the exceptions listed in Items 1.-4., the owner and operator must provide the applicable information requested in the Part B permit application and any additional information required by the Executive Director to establish permit conditions.

As applicable, provide an engineering report which includes all of the information specified in 30 TAC 305.171-305.176, 40 CFR 264.340, 264.342-264.346, 264.347(a), and 270.19. In addition, the Executive Director may require additional information to address the requirements in 30 TAC 305.50(a)(15).

Note: Please review the information provided in the section above entitled "Engineering Report for Combustion Units" and 40 CFR 270.19(e) to determine applicability of standards and associated requirements in 40 CFR Part 264, Subpart O. If the permit contains risk-based permit conditions, please ensure that all applicable supporting information is included in the engineering report.

1. Complete Table V.H.1 - Incinerators and list the incinerators covered by this application and list the waste managed in each unit.

2. Complete Table V.H.2 - Incinerator Permit Conditions, Monitoring, and Automatic Waste Feed Cutoff Systems for each Incinerator.

3. Complete Table V.H.3 - Maximum Constituents Feed Rate for each Incinerator.

4. Complete Table V.H.4 - Maximum Allowable Emission Rates for each Incinerator.

5. For use during the shakedown period, the trial burn period and the period after completion of the initial trial burn, complete Table V.H.5 - Incinerator Permit Conditions, Monitoring, and Automatic Waste Feed Cutoff-Short-Term Operation for each new or modified Incinerator.

6. If an incinerator will manage reactive or incompatible waste, as indicated on Table V.H.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17.

7. If an incinerator will manage F020, F021, F022, F023, F026, and F027 waste, as

indicated on Table V.H.1, the DRE requirement is 99.9999%.

8. If a trial burn for a modified unit and Comprehensive Performance Test under 40 CFR Part 63, Subpart EEE (HWC MACT) (for all new and modified units) will be performed, designate one or more of the 40 CFR 261 Appendix VIII organic compounds present in the wastes to be incinerated as Principal Organic Hazardous Constituents (POHCs). Selection will be based upon the degree of difficulty of incineration of these compounds and upon their concentration or mass in the waste feed. These POHCs will be used to determine the destruction and removal efficiency (DRE) specified in the performance standards of 40 CFR 264.343 and HWC MACT. In addition, complete Table V.H.8 - Principal Organic Hazardous Constituents.

9. Submit a Quality Control/Quality Assurance Plan for all sampling, analysis, and monitoring activities which will occur in conjunction with the trial burn.

10. As applicable, facilities with existing permits may request that the Executive Director to address permit conditions that minimize emissions from startup, shutdown, and malfunction events in accordance with the options under 40 CFR 270.235 when requesting the removal of permit conditions that are no longer applicable according to 30 TAC 305.175. Please provide the relevant information needed to process the requested option to minimize emissions identified in 40 CFR 270.235(1)(a)(i)-(iii). (30 TAC 305.176)

I. Boilers and Industrial Furnaces

Engineering Report for Combustion Units

For hazardous waste combustion unit which are subject to regulation by 40 CFR Part 63, Subpart EEE, the requirements 30 TAC Chapter 305 and Subchapters I and Q do not apply when the unit becomes subject to Resource Conservation and Recovery Act (RCRA) permit requirements after October 12, 2005 (i.e., new unit), or no longer apply when an owner or operator of an existing hazardous waste management unit demonstrates compliance with the air emission standards and limitations in 40 Code of Federal Regulations (CFR) Part 63, Subpart EEE, except for the following:

1. Those provisions the Executive Director determines are necessary to comply with 40 CFR §264.345(a) and 40 CFR §264.345(c) for Phase I sources or 40 CFR §266.102(e)(1) and (2)(iii) for Phase II sources if the permittee or applicant elects to comply with any of the options listed in 40 CFR §270.235(a) to minimize emissions of toxic compounds from startup, shutdown, and malfunction events;

2. Those standards and associated requirements for particulate matter, hydrogen chloride and chlorine gas, and non-mercury metals that a Phase II area source elects to comply with in 40 CFR §§266.105, 266.106, and 266.107;

3. Those standards for particulate matter in 40 CFR 264.343(c) remain in effect for a Phase I source incinerator that elects to comply with the alternative to the particulate matter standard under 40 CFR 63.1206(b)(14) and 63.1219(e); and

4. Those provisions that the Executive Director may apply in 30 TAC Chapter 305, Subchapters I and Q, on a case-by-case basis. The Executive Director may require a permittee or an applicant to submit information in order to establish permit conditions under §305.50(a)(15) or (16) and §305.127(1)(B)(iii) or (4)(A) (i.e., risk-based permit conditions).

For hazardous waste combustion units subject to regulation by 40 CFR Part 63, Subpart EEE, some of the information requested in Sections V.H and V.I. will not be applicable for new units or existing units which have submitted a Notification of Compliance in accordance with 40 CFR 63.1207(j) and 63.1210(d), received a Finding of Compliance pursuant to 40 CFR 63.1206(b)(3), and have the associated RCRA permit conditions removed from the permit. Information which is not applicable or no longer applicable should not be included in the Part B application. *[Please note that the TCEQ will require a Finding of Compliance be made prior to modifying the permit by deleting redundant operating parameter limits and standards for the combustion units. Until such time as the permit is modified to delete the redundant RCRA-based operating parameter limits and standards in the permit or the permit is terminated or revoked, the permittee must comply with the RCRA-based conditions specified in the permit. More stringent risk-based permit conditions will remain in the RCRA permit.]*

For the exceptions listed in Items 1.-4., the owner and operator must provide the applicable information requested in the Part B permit application and any additional information required by the Executive Director to establish permit conditions.

As applicable, provide an engineering report which includes all of the information specified in 30 TAC 305.50(a)(13), 305.571-573, 40 CFR 266.100 and 266.102 (as incorporated by reference in 30 TAC 335.221 through 335.225), 266.104-266.112, and 270.22. In addition, the Executive Director may require additional information to address the requirements in 30 TAC 305.50(a)(15).

Note: Please review the information provided in the section above entitled "Engineering Report for Combustion Units" and 40 CFR 270.22 to determine applicability of standards and associated requirements in 40 CFR Part 266, Subpart H. Area sources that elect to comply with the standards and associated requirements of 40 CFR 266.105, 266.106, and 266.107 should address those elected standards and requirements in the engineering report. If the permit contains risk-based permit conditions, please ensure that all applicable supporting information is included in the engineering report.

1. Complete Table V.I.1 - Boilers and Industrial Furnaces and list the boilers and/or industrial furnaces covered by this application to be permitted and list the waste managed in each unit.
2. Complete Table V.I.2 - Boiler and Industrial Furnace Permit Conditions, Monitoring, and Automatic Waste Feed Cutoff Systems for each unit.
3. Complete Table V.I.3 - Maximum Constituent Feed Rate for each unit.
4. Complete Table V.I.4 - Maximum Allowable Emission Rates for each unit.
5. For use during the shakedown period, trial burn period and the period after completion of the initial trial burn, complete Table V.I.5 - Boiler and Industrial Furnace Permit Conditions, Monitoring, and Automatic Waste Feed Cutoff Systems-Short-Term Operation for each new or modified unit.
6. If a boiler or industrial furnace will manage reactive or incompatible waste, as indicated on Table V.I.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17.
7. If a boiler and industrial furnace will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.I.1, the DRE requirement is 99.9999%.
8. If a trial burn for modified units and Comprehensive Performance Test under 40 CFR Part 63, Subpart EEE (HWC MACT) (for all new and modified units) will be performed, designate one or more of the 40 CFR 261 Appendix VIII organic compounds present in the wastes to be incinerated as Principal Organic Hazardous Constituents (POHCs). Selection will be based upon the degree of difficulty of incineration of these compounds and upon their concentration or mass in the waste feed. These POHCs will be used to determine the destruction and removal efficiency (DRE) specified in the performance standards of 40 CFR 266.104 and HWC MACT. In addition, complete Table V.I.8 - Principal Organic Hazardous Constituents.
9. Submit a Quality Control/Quality Assurance Plan for all sampling, analysis, and monitoring activities.
10. As applicable, facilities with existing permits may request that the Executive Director to address permit conditions that minimize emissions from startup, shutdown, and malfunction events in accordance with the options under 40 CFR 270.235 when requesting the removal of permit conditions that are no longer applicable according to 30 TAC 305.571(b). Please provide the relevant information needed to process the requested option to minimize emissions identified in 40 CFR 270.235(1)(a)(i)-(iii). [30 TAC 305.572(a)(6)]

J. Drip Pads

Provide an engineering report which includes all of the information specified in 40 CFR 264.570-573 and 270.26

1. Complete Table V.J.1. - Drip Pads and list the drip pads, covered by this application, to be permitted. List the N.O.R. unit number, the waste managed in each unit, the rated capacity of each unit, and the overall dimensions of the unit (including perimeter curb or berm height) that will be in contact with the waste.

2. For either new drip pads or existing drip pads for which the owner/operator elects to comply with the synthetic liner requirement of 40 CFR 264.573(b), please complete Table V.J.2. - Drip Pad Synthetic Liner System.

3. In the engineering report, describe the design, installation, construction, and operation of the liner and leakage collection system. The description must demonstrate that the liner system will prevent discharge to the land, groundwater, and surface water. The following analyses should be included as attachments to the engineering report (A QAPP should be included in the report to ensure that each analysis is performed appropriately):

For artificial liners:

a. Seaming method
b. Surface preparation method
c. Tensile Strength
d. Impact Resistance
e. Compatibility Demonstration
f. Foundation Design (including Settlement Potential, Bearing Capacity and Stability, and Potential for Bottom Heave Blow-out)

For Leakage Collection System

g. Capacity of the system:
   (1) rate of leachate removal
   (2) capacity of sumps
   (3) thickness of mounding and maximum hydraulic head
h. Pipe Material and Strength
i. Pipe Network Spacing and Grading
j. Collection Sump(s) Material and Strength
k. Drainage Media Specifications and Performance
l. Analyses showing that pipe and pipe perforation size will prevent clogging and allow free liquid access to the pipe.
m. Compatibility Demonstration

K. Miscellaneous Units

A miscellaneous unit is a unit other than a container, tank, incinerator, boiler, industrial furnace, landfill, surface impoundment, waste pile, underground injection well, land treatment area, drip pad, or unit eligible for an R, D & D permit that is used to process, store, or dispose of hazardous waste.

For each miscellaneous unit for which an operating permit is sought, provide an engineering report which includes all of the information specified in 40 CFR 264.600-264.602, and 270.23.

1. Complete Table V.K - Miscellaneous Units and list the miscellaneous units covered by this application. List the waste managed in each unit and the rated capacity or size of the unit. If the information requested is not applicable, an explanation must be submitted.
2. Provide any other information which is descriptive of the relationship between the miscellaneous unit and the environment. Application information may include design requirements of 30 TAC 305 and 335, 40 CFR Part 264 Subparts I through O, and Part 270 that are appropriate for the miscellaneous unit or portions of the unit being permitted.
3. For a unit which involves combustion, please provide emissions data or a trial burn plan. Tables V.H.1-5 for incinerators or Tables V.I.1-5 for boilers and industrial furnaces may be adapted as appropriate to provide operation, monitoring, and emission information for a miscellaneous combustion unit.

L. Containment Buildings

Complete Table V.L. - Containment Buildings and list the containment buildings covered by this application to be permitted. List the N.O.R. unit number, whether the unit is for storage and/or processing, the waste or debris managed in each unit, the rated capacity of each unit, and the overall dimensions of the unit (including containment wall height) that will be in contact with the waste or debris.

GSI Job No. 6932

Hazardous Waste Permit Renewal Application
Ascend Performance Materials Texas Inc., Alvin, Texas

Hazardous Waste Permit No. 50189

Part B, Section V: Appendix V.A – General Engineering Report

GSI ENVIRONMENTAL

GSI Job No. 6932

PART B APPLICATION
APPENDIX V.A - GENERAL ENGINEERING REPORT

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

I, James M. McDade, a registered professional engineer in the State of Texas, certify that the Engineering Report in the Hazardous Waste Permit Renewal Application issued 9 August 2024 for the Ascend Performance Materials Texas Inc., Chocolate Bayou Plan located in Alvin, Texas, has been prepared in accordance with applicable requirements of 40 CFR Part 264, Subparts I, J, K, and N, 30 TAC 335 Subchapter F, and the TCEQ RCRA Permit Application (TCEQ-00376, Revised 1 March 2023):

- Container Storage Areas (Permit Unit Nos. 13 and 23);
- Tanks or Tank System (Permit Unit Nos. 8, 9, and 17-22);
- Surface Impoundments (Permit Unit No. 3);
- Landfills (Permit Unit Nos. 1, 2, and 16); and
- Boilers and Industrial Furnaces (Permit Unit Nos. 11 and 12).

STATE OF TEXAS
JAMES M. McDADE
115868
LICENSED
PROFESSIONAL ENGINEER

8/9/24

James M. McDade, P.E.
State of Texas Registration No. 115868
GSI Environmental Inc.
Texas Registration No. F-1198

INTRODUCTION

This section summarizes the current and proposed hazardous waste management units at the Ascend Performance Materials Texas Inc. (Ascend) facility in Alvin, Texas, which is an active commercial hazardous waste facility (Hazardous Waste Permit No. 50189). The topics listed below are in order of the Part B permit application for the General Engineering Report.

1. General Information

As provided on Table V.A and shown on Figure V.A.6, the facility currently has the following active permitted units: i) one container storage area; ii) two tank systems (total of 7 tanks); iii) one landfill, and iv) two boilers. The facility also has two closed permitted units in post-closure care, which includes a closed landfill and surface impoundment. In addition, there is one proposed container storage area with this application. Note that the Oily Water System Forebay Surface Impoundment (Permit Unit 4), Indoor Container Storage Area (Permit Unit 5), Outdoor Container Storage Area (Permit Unit 5), MHBA Tanks 337-T6, 336-T5, and 336-S1 (Permit Unit 7), and Thermal Desorption Unit (Permit Unit 10) have been closed and are not included in this application. The IWPF Container Storage Area (Permit Unit 15) was a proposed unit that was never constructed, and Ascend does not plan on constructing the unit, so it is not included in this application.

Individual engineering reports in Section V of this application have been provided for permitted hazardous waste management units at the facility, as shown below:

Permit Unit Nos.	Description	Engineering Report Section or Attachment
Section V.B: Container Storage Areas		
13	**Outdoor Container Storage Area**	**Appendix V.B.1**
23	**New Container Storage Area**	**Appendix V.B.2**
Section V.C: Tanks or Tank Systems		
8, 9	**IWPF Tanks 332T1-1 and 332T1-2**	**Appendix V.C.1**
17, 18, 19, 20, 21, and 22	**Solid Handling Unit Filtrate Tank 331T11, Decant Tank 1, Mixing Tank 331T13, 331T14, 331T15, and 331T16**	**Appendix V.C.2**
Section V.D: Surface Impoundments		
3	**IWPF Surface Impoundment**	**Appendix V.D.1**
Section V.G: Landfills		
1	**Closed Landfill**	**Appendix V.G.1**
2	**Active Landfill**	**Appendix V.G.2**
16	**New Landfill**	**Appendix V.G.3**
Section V.I: Boilers and Industrial Furnaces		
11, 12	**AN Boiler 30H5 and 31H4**	**Appendix V.I.1**

Safe handling and containment procedures are implemented at the facility in accordance with 40 CFR 270.14(b)(8) and 270.14(b)(10) as described below:

Prevention of Hazards in Unloading Operations [40 CFR 270.14(b)(8)(i)]

For the Outdoor Container Storage Area and proposed Outdoor Container Storage Area 2 (Permit Units 13 and 23), wastes are unloaded using a crane, flatbed truck and winch, forklift, or other suitable vehicle operated only by qualified personnel. At no time during the unloading process are wastes handled directly by personnel working in the Container Storage Areas.

For IWPF Tanks (Permit Units 8 and 9), Solid Handling Unit Tanks (Permit Units 17-22), and AN Boilers (Permit Units 11 and 12), wastes are directly piped to the tanks or boilers; therefore, no unloading operations are conducted, thereby effectively preventing contact between personnel and wastes at the tanks.

For Landfills (Permit Units 2 and 16), wastes are placed in the landfill in either bulk or containerized form using an excavator, backhoe, or other type of construction equipment operated only by qualified personnel. At no time during the unloading process are wastes handled directly by personnel working in the landfill areas.

Prevention of Runoff from Waste Handling Areas [40 CFR 270.14(b)(8)(ii)]

Outdoor Container Storage Area and Outdoor Container Storage Area 2 (Permit Units 13 and 23) will not handle or manage wastes containing free liquids; therefore, these units are not subject to secondary containment requirements per 40 CFR 264.175(c). Additionally, these units only manage wastes in bulk containers, such as roll-off, which are elevated above the floor of the container storage area. Containers are not in contact with precipitation or any water that could accumulate in the units. Both container storage areas are sloped to prevent accumulation of runoff and promote drainage away from the waste containers.

For the Active and New Landfill (Permit Units 2 and 16), rainfall runoff and run-on are prevented by perimeter dikes and drainage and a temporary roof structure over the active landfill that prevents rain from contacting waste materials.

For IWPF Tanks (Permit Units 8 and 9), Solid Handling Unit Tanks (Permit Units 17 – 22), and AN Boilers (Permit Units 11 and 12), wastes are contained within hard piping, which is located within a secondary containment dike; therefore, any releases from pipes would be contained within the secondary containment dike.

Prevention of Contamination of Water Supplies [40 CFR 270.14(b)(8)(iii)]

The waste management units are separated from the uppermost groundwater bearing unit by a layer of high plasticity clay or silty clay having a thickness ranging from 3 to 82 feet. As noted previously, the container storage areas will only manage wastes that do not contain free liquids; therefore, waste management activities in these units will not pose a threat to contaminating water supplies.

Landfill units are separated from the uppermost groundwater bearing unit by at least 10 ft of high plasticity clay or silty clay. In addition, the active landfills are constructed with liners and leachate collection systems and have a groundwater detection monitoring program to prevent contamination of water supplies.

All other active units are within concrete secondary containment, which will prevent contamination of water supplies.

Mitigation of Equipment Failure and Power Outages [40 CFR 270.14(b)(8)(iv)]

Equipment or power outages will not impact storage and management of wastes in the container storage areas, since these areas will be used to manage and store wastes only. Landfill units will also not be impacted by equipment failure or power outages, as those will only impact the loading of wastes into the landfill cell. Secondary containment areas for the tanks and boilers enclose each storage, treatment, and processing unit to prevent the release of wastes due to a power outage or equipment failure.

Prevention of Undue Exposure to Personnel of Hazardous Waste [40 CFR 270.14(b)(8)(v)]

In order to prevent exposure of personnel to hazardous waste, general personnel protection precautions practiced by unloading personnel include: i) wearing protective clothing, ii) eye and/or face protection, iii) hard hats, and iv) respiratory protection (as appropriate). Fire extinguishers are maintained at the unloading areas. Eye wash and safety shower units are also located in the vicinity of the unloading areas.

Prevention of Releases to Atmosphere [40 CFR 270.14(b)(8)(vi)]

All containers and tanks are handled or operated to prevent releases to the atmosphere by remaining closed except when adding or removing wastes.

Traffic Patterns, Estimated Volumes, and Descriptions of Access Roads [40 CFR 270.14(b)(10)]

The only hazardous waste transported by vehicle is transported using roll-off boxes or other large containers via truck. Approximately two to three roll-off boxes per month are transported from the process areas within the facility to the Active Landfill. The roads within the process area are paved, and after crossing "A" Street, the roads become gravel roads, as the wastes are transported through the non-process portions of the facility. All other wastes are transported via pipe.

Facility Maps Required by 40 CFR 270.14

For Figures required to meet the requirements of 40 CFR 270.14(b)(19), 270.14(c)(3), and 270,14(d)(1(i), the following table provides the regulatory citation, a summary of the requirement, and the figure provided in this application which satisfies that requirement.

Regulatory Citation (40 CFR Pt 270)	Requirement	Figure(s)
14(b)(19)	**Topographic map showing a distance of 1,000 feet around the facility.**	**Figure V.A.1**
14(b)(19)(i)	**Map scale and date.**	**All Figures**
14(b)(19)(ii)	**100-year floodplain area.**	**Figure V.A.2**
14(b)(19)(iii)	**Surface waters and intermittent streams.**	**Figure V.A.1**
14(b)(19)(iv)	**Surrounding land uses (residential, commercial, agricultural, recreational).**	**Figure V.A.3**
14(b)(19)(v)	**A wind rose (i.e., prevailing windspeed and direction).**	**Figure V.A.4**
14(b)(19)(vi)	**Orientation of the map (north arrow).**	**All Figures**

Regulatory Citation (40 CFR Pt 270)	Requirement	Figure(s)
14(b)(19)(vii)	Legal boundaries of the HWM facility site.	Figure V.A.5
14(b)(19)(viii)	Access control (fences, gates).	Figure V.A.6
14(b)(19)(ix)	Injection and withdrawal wells both on-site and off-site.	Figures V.A.7, V.A.8, and V.A.9.
14(b)(19)(x)	Buildings; treatment, storage, or disposal operations; other structures (runoff control systems, access and internal roads, storm, sanitary, and process sewerage systems, loading and unloading areas, fire control facilities).	Figures V.A.6, V.A.7, and V.A.10
14(b)(19)(xi)	Barriers for drainage or flood control.	Figures V.A.6 and V.A.7
14(b)(19)(xii)	Location of operational units where hazardous waste is (or will be) treated, stored, or disposed.	Figure V.A.6
14(c)(3)	Topographic map with showing the waste management area, property boundary, proposed "point of compliance," proposed location of groundwater monitoring wells, and info required in 40 CFR 270.14(c)(2), including identification of uppermost aquifer and aquifers hydraulically interconnected beneath the facility property, including groundwater flow direction and rate.	Figures V.A.8, and V.A.11 through V.A.19
14(c)(2)	Identification of uppermost aquifer and aquifers hydraulically interconnected beneath the facility property, including groundwater flow direction and rate.	Figures V.A.20 through V.A.30
14(d)(1)(i)	Location of solid waste management units.	Figure V.A.6
176	Location of container holding ignitable or reactive waste at least 50 ft from facility property line. Reactive waste treated in a tank of 2,500-gal capacity located at least 15 ft from the public ways, streets, alleys, or an adjoining property line.	Figure V.A.6

2. Features to Mitigate Unsuitable Site Characteristics

As discussed in the Site Selection Report (Part B, Section II of this renewal application), the property meets the requirements of 30 TAC 335, Subchapter G (Location Standards for Hazardous Waste Storage, Processing, or Disposal) and is suitable for hazardous waste permitting. No additional engineering design, construction, or operational requirements are needed for the proposed units to meet the location standards of 30 TAC 335 Subchapter G.

3. Construction Schedules

The Outdoor Container Storage Area 2 (Permit Unit 23) is the only proposed unit that will be constructed in the near-term. This unit is already constructed and is in <90-day hazardous waste service (NOR Unit 114) as a container storage area. Therefore, no construction of the unit is required at this time. Ascend has not yet projected when the New Landfill (Permit Unit 16) will be construction, but Ascend will notify TCEQ regarding changes to the schedule via correspondence, and any such changes to the construction schedule will not trigger a modification of the permit.

4. Detailed Plans and Specifications

Plans and specifications for all current and proposed permitted units, including dimensions and materials of construction, are provided in each unit Appendix. All plans and specifications were prepared and sealed by licensed professional engineers registered in the State of Texas.

GSI Job No. 6932

PART B APPLICATION
APPENDIX V.A - GENERAL ENGINEERING REPORT

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

TABLES

Table V.A. - Facility Waste Management Handling Units

TCEQ Permit Unit No. [1]	Unit Name	NOR No.[1]	Unit Description[3]	Capacity	Unit Status[2]
01	Closed Landfill	006	Landfill	258,000 cu yd	Post-Closure
02	Active Landfill	051	Landfill	54,000 cu yd	Active
03	Closed IWPF Surface Impoundment	005	Surface Impoundment	20,000,000 gal (when active)	Post-Closure
04	Oily Water System Forebay	016	Surface Impoundment – Clean Closed	120,000 gal (when active)	Closed
05	Indoor Container Storage Area	018	Container Storage Area – Clean Closed	3,960 gal (corresponding to 29 tons)	Closed
06	Outdoor Container Storage Area	019	Container Storage Area – Clean Closed	22,000 gal (when active)	Closed
07	MHBA Tanks 337-T6, 336-T5, and 336-S1	025	Tanks – Clean Closed Under Interim Status	4,119 gal (when active)	Closed
08	IWPF Tank 332T1-1	059	Tank	1,000,000 gal	Active
09	IWPF Tank 332T1-2	060	Tank	1,000,000 gal	Active
10	Thermal Desorption Unit	072	Thermal Processing Unit – Clean Closed Inactive	5 tons/hr	Closed
11	AN Boiler 30H5	079	Boiler	12,250 lb/hr	Active
12	AN Boiler 31H4	080	Boiler	12,250 lb/hr	Active

TCEQ Permit Unit No. [1]	Unit Name	NOR No.[1]	Unit Description[3]	Capacity	Unit Status[2]
13	Outdoor Container Storage Area	078	Container Storage Area	1,500 tons	Active
15	IWPF Container Storage Area	103	Container Storage Area	1,283 cu yd	Never Built
16	New Landfill	116	Landfill	60,000 cu yd	Proposed (not yet built)
17	Solids Handling Unit Filtrate Tank 331T11	121	Tank	15,000 gal	Active
18	Solids Handling Unit Decant Tank 1	TBD	Tank	7,000 gal	Proposed (not yet built)
19	Solids Handling Unit Mixing Tank 331T13	123	Tank	20,000 gal	Active
20	Solids Handling Unit Mixing Tank 331T14	124	Tank	20,000 gal	Active
21	Solids Handling Unit Mixing Tank 331T15	125	Tank	20,000 gal	Active
22	Solids Handling Unit Mixing Tank 331T16	126	Tank	20,000 gal	Active
23	Outdoor Container Storage Area 2	114	Container Storage Area	370 tons	Proposed

1. Permitted Unit No. and NOR No. cannot be reassigned to new units or used more than once and all units that were in the Attachment D of a previously issued permit must be listed.

2. Unit Status options: Active, Closed, Inactive (built but not managing waste), Proposed (not yet built), Never Built, Transferred, Post-Closure.

3. If a unit has been transferred, the applicant should indicate which facility/permit it has been transferred to in the Unit Description column of Table V.A.

Table V.B. - Container Storage Area

Permit Unit No.	Container Storage Area	N.O.R. No.	Waste Nos.[4]	Rated Capacity[3]	Dimensions	Containment Volume (including rainfall for unenclosed areas)	Unit will manage Ignitable[1], Reactive[1], or Incompatible[2] waste (state all that apply)	Unit Status
13	Outdoor Container Storage Area	078	1, 7, 19, 20, 23, 31, 32, 56, 76, 81, 90	1,500 tons	206 ft by 178 ft pad	Not required	No	Active
23	Outdoor Container Storage Area 2	114	1, 7, 14, 15, 17 18, 23, 31, 32, 56, 76, 90, 98, 106	370 tons	323 ft by 182 ft pad	Not required	No	Proposed

1. Containers managing ignitable or reactive waste must be located at least 15 meters (50 feet) from the facility's property line.
2. Incompatible waste must be separated from other waste or materials stored nearby in other containers, piles, open tanks, or surface impoundments by means of a dike, berm, wall, or other device.
3. Container Storage Areas need to include in capacity calculations any nonhazardous wastes and universal wastes managed in the unit in addition to hazardous wastes.
4. from Table IV.B, first column

Table V.C. - Tanks and Tank Systems

Permit Unit No.	Tank	N.O.R. No.	Storage and/or Processing	Waste Nos.[1]	Rated Capacity	Dimensions	Containment Volume (including rainfall for unenclosed areas)	Unit will manage Ignitable, Reactive, or Incompatible waste (state all that apply)	Unit Status
8	IWPF Tank 332T1-1	059	Both	7, 8, 9, 10, 12, 14, 16, 18, 27, 31, 33, 34, 36, 37, 41, 44, 50, 52, 53, 55, 57, 58, 59, 60, 61, 65, 66, 67, 68, 69, 70, 71, 73, 74, 77, 82, 83, 86, 87, 88, 94, 96, 97, 99, 100, 102, 104, 105, 112	1 million gallons	82 ft diameter, 34 ft high	1.5 million gallons	No - Ignitable Yes - Reactive No - Incompatible	Active

Permit Unit No.	Tank	N.O.R. No.	Storage and/or Processing	Waste Nos.[1]	Rated Capacity	Dimensions	Containment Volume (including rainfall for unenclosed areas)	Unit will manage Ignitable, Reactive, or Incompatible waste (state all that apply)	Unit Status
9	IWPF Tank 332T1-2	060	Both	7, 8, 9, 10, 12, 14, 16, 18, 27, 31, 33, 34, 36, 37, 41, 44, 50, 52, 53, 55, 57, 58, 59, 60, 61, 65, 66, 67, 68, 69, 70, 71, 73, 74, 77, 82, 83, 86, 87, 88, 94, 96, 97, 99, 100, 102, 104, 105, 112	1 million gallons	82 ft diameter, 34 ft high	1.5 million gallons	INo - Ignitable Yes - Reactive No - Incompatible	Active
17	Solids Handling Unit Filtrate Tank 331T11	121	Both	7, 10, 12, 13, 18, 31, 74, 78, 113	15,000 gallons	9 ft diameter, 16.5 ft high	71,522 gallons	Yes - Ignitable Yes - Reactive No - Incompatible	Active

Permit Unit No.	Tank	N.O.R. No.	Storage and/or Processing	Waste Nos.[1]	Rated Capacity	Dimensions	Containment Volume (including rainfall for unenclosed areas)	Unit will manage Ignitable, Reactive, or Incompatible waste (state all that apply)	Unit Status
18	Solids Handling Unit Decant Tank 1	TBD	Both	7, 10, 12, 13, 18, 31, 74, 113	7,000 gallons	9 ft diameter, 22 ft high	71,522 gallons	Yes - Ignitable Yes - Reactive No - Incompatible	Proposed
19	Solids Handling Unit Mixing Tank 331T13	123	Both	7, 10, 12, 13, 18, 31, 74, 78, 113	20,000 gallons	46 ft long, 8.5 ft wide	71,522 gallons	Yes - Ignitable Yes - Reactive No - Incompatible	Active
20	Solids Handling Unit Mixing Tank 331T14	124	Both	7, 10, 12, 13, 18, 31, 74, 113	20,000 gallons	46 ft long, 8.5 ft wide	71,522 gallons	Yes - Ignitable Yes - Reactive No - Incompatible	Active
21	Solids Handling Unit Mixing Tank 331T15	125	Both	10, 12, 13, 18, 31, 74, 78, 113	20,000 gallons	46 ft long, 8.5 ft wide	71,522 gallons	Yes - Ignitable Yes - Reactive No - Incompatible	Active
22	Solids Handling Unit Mixing Tank 331T16	126	Both	7, 10, 12, 13, 18, 31, 74, 113	20,000 gallons	46 ft long, 8.5 ft wide	71,522 gallons	Yes - Ignitable Yes - Reactive No - Incompatible	Active

Permit Unit No.	Tank	N.O.R. No.	Storage and/or Processing	Waste Nos.[1]	Rated Capacity	Dimensions	Containment Volume (including rainfall for unenclosed areas)	Unit will manage Ignitable, Reactive, or Incompatible waste (state all that apply)	Unit Status

1. from Table IV.B, first column

Table V.D.1. - Surface Impoundments

Permit Unit No.	Surface Impoundment	N.O.R No.	Waste Nos.[1]	Rated Capacity	Dimensions	Distance from lowest liner to groundwater	Action Leakage Rate (if required)	Unit will manage Ignitable, Reactive, Incompatible, or F020, F021, F022, F023, F026, and F027 Waste (state all that apply)	Unit Status
03	Closed IWPF Surface Impoundment	005	1, 8, 9, 10, 14, 18, 33, 34, 37, 41, 42, 44, 50, 66	20,000,000 (when active)	525 ft wide, 750 ft long (entire unit)	3 to 82 ft	Not applicable	No	Post-Closure

1. From Table IV.B, first column
2. Dimensions should be provided as average length, width and depth, also include the surface acreage for the unit.

Table V.D.6. - Surface Impoundment Liner System

Surface Impoundment	Primary Liner			Secondary Liner			Clay Liner		
	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness
Not applicable									

Table V.G.1. - Landfills

Permit Unit No.	Landfill	N.O.R. No.	Waste Nos.[1]	Rated Capacity	Dimensions[2]	Distance from lowest liner to groundwater	Action Leakage Rate (if required)	Unit will manage Ignitable, Reactive, Incompatible, or F020, F021, F022, F023, F026, and F027 Waste (state all that apply)	Unit Status
01	Closed Landfill	006	1, 5, 6, 7, 15, 16, 17, 20, 21, 22, 23, 24, 25, 28, 29, 31, 35, 40, 43, 45, 46, 47, 48	258,000 cu yd	9.2 acres	10 to 40 ft	Not Required	No	Post-Closure
02	Active Landfill	051	1, 5, 6, 7, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 28, 29, 31, 35, 40, 43, 45, 46, 47, 48, 52, 54, 62, 63, 75, 80, 89, 91, 92, 93, 95, 98, 101, 103, 106, 107, 108, 109, 110, 111	54,000 cu yd estimated total waste volume	1305 ft x 530 ft (entire unit)	20 to 30 ft	300 gpd/ cell	No	Active

Permit Unit No.	Landfill	N.O.R. No.	Waste Nos.[1]	Rated Capacity	Dimensions[2]	Distance from lowest liner to groundwater	Action Leakage Rate (if required)	Unit will manage Ignitable, Reactive, Incompatible, or F020, F021, F022, F023, F026, and F027 Waste (state all that apply)	Unit Status
16	New Landfill	116	1, 5, 6, 7, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25, 28, 29, 31, 35, 40, 43, 45, 46, 47, 48, 52, 54, 62, 63, 75, 80, 89, 91, 92, 93, 95, 98, 101, 103, 106, 107, 108, 109, 110, 111	60,000 cu yd estimated total waste volume	1279 ft x 643 ft (entire unit)	10 to >30 ft	111 gpd/ cell	No	Proposed

1from Table IV.B, first column
2Dimensions should be provided as average length, width and depth, also include the surface acreage for the unit.

Table V.G.3. - Landfill Cover and Liner System

Permit Unit No.*	Landfill	Primary Liner			Secondary Liner			Clay Liner		
		Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness
02	Active Landfill	HDPE	< 1E-07 cm/sec	100 mil	HDPE	< 1E-07 cm/sec	80 mil	- Compacted Clay - % Passing No. 200 Sieve: 30% - Plasticity Index: 15% - Liquid Limit: 30%	< 1E-07 cm/sec	3 ft
16	New Landfill	HDPE	< 1E-10 cm/sec	80 mil	HDPE	< 1E-10 cm/sec	80 mil	- Compacted Clay - % Passing No. 200 Sieve: 30% - Plasticity Index: 15% - Liquid Limit: 30%	< 1E-07 cm/sec	3 ft

* This number should match the Permit Unit No. given on Table V.G.1.

Table V.G.4. - Landfill Leachate Collection System

	Primary Leachate Collection System					Secondary Leachate Collection System				
Landfill	Drainage Media	Collection Pipes (including risers)	Filter Fabric	Geofabric	Sump Material	Drainage Media	Collection Pipes (including risers)	Filter Fabric	Geofabric	Sump Material
Active Landfill (Permit Unit 02)	Sand/ Gravel with permeability > 1E-02 cm/sec	Perforated stainless steel, HDPE, or other appropriate material	Spun-bonded needle punched polypropylene	Polyethylene	Stainless steel, HDPE, or other appropriate material	Sand/ Gravel with permeability > 1E-02 cm/sec	Perforated stainless steel, HDPE, or other appropriate material	Spun-bonded needle-punched polypropylene	Polyethylene	Stainless steel, HDPE, or other appropriate material
New Landfill (Permit Unit 16)	Sand/ Gravel with permeability > 1E-02 cm/sec	HDPE	Nonwoven needle-punched polypropylene	Polyethylene	HDPE	HDPE 200 mil Double-sided Geocomposite	HDPE	Nonwoven needle-punched polypropylene	Polyethylene	HDPE

Table V.G.5.- Landfill Material and Construction Specifications

Unit(s): Proposed New Landfill (Permit Unit 16)

Cell(s) All cells

Property/Parameter	Proposed Sampling Frequency[1]	Test Methods
Soil Liner and Cover Specifications		
Laboratory Standard Proctor Density and optimum moisture content[2]	1 test per 5000 cubic yards	ASTM D-698 or an equivalent method
Field density and moisture control tests on constructed soil liners[3]	1 test per 10,000 square ft	ASTM D-1556, ASTM D-2167, ASTM, D-2922, or an equivalent method
Liquid Limit[4]	1 test per 1000 cubic yards	ASTM D-4318 or an equivalent method
Plasticity Index[4]	1 test per 1000 cubic yards	ASTM D-4318 or an equivalent method
Percent passing No. 200 sieve[5]	1 test per 1000 cubic yards	ASTM D-1140 or an equivalent method
Soil liner thickness and slope determinations[6]	1 test per 10,000 square ft	Instrument Survey Measurements
Hydraulic conductivity measurements expressed in terms of cm/sec[7]	1 test per acre per lift	ASTM-5093, ASTM 2434, Technical Guidance No. 3, or an equivalent method
Waste Containment Dike Specifications		
Laboratory Standard Proctor Density and optimum moisture content[2]	1 test per 5000 cubic yards	ASTM D-698 or an equivalent method
Field density and moisture control tests on constructed soil liners[3]	1 test per 10,000 square ft	ASTM D-1556, ASTM D-2167, ASTM, D-2922, or an equivalent method
Liquid Limit[4]	1 test per 1000 cubic yards	ASTM D-4318 or an equivalent method
Plasticity Index[4]	1 test per 1000 cubic yards	ASTM D-4318 or an equivalent method
Percent passing No. 200 sieve[5]	1 test per 1000 cubic yards	ASTM D-1140 or an equivalent method
Soil liner thickness and slope determinations[6]	1 test per 10,000 square ft	Instrument Survey Measurements
Hydraulic conductivity measurements expressed in terms of cm/sec[7]	1 test per acre per lift	ASTM-5093, ASTM 2434, Technical Guidance No. 3, or an equivalent method

Leachate Collection/ Leak Detection System material		
Non-syntheic material sieve analysis tests[8]	1 per 400 cubic yards	
Hydraulic conductivity measurements expressed in units of cm/sec[9]	4 samples per drainage layer	ASTM-5093, ASTM 2434, Technical Guidance No. 3, or an equivalent method
Drainage layer thickness determinations[10]	1 test per 10,000 square ft	Instrument Survey Measurements or an equivalent method
Drainage pipe slope determinations[11]	1 test per 20 ft	Instrument Survey Measurements

1. NOTE: Construction testing frequencies must meet or exceed minimum requirements for the property or parameter tested listed below:
2. At a minimum frequency of at least one (1) representative sample from each 5000 cubic yards of soil.
3. At a minimum frequency of at least one (1) per every 10,000 square feet of each lift placed.
4. At a minimum frequency of at least one (1) per 1,000 cubic yards of soils for a minimum of two (2) tests per layer per cell.
5. At a minimum frequency of at least one of at least one (1) per every 1,000 cubic yards of soil and a minimum of two (2) testers per layer per cell
6. At a minimum frequency of at least one (1) determination by appropriate surveying techniques per every 10,000 square feet of soil liner installed.
7. At a minimum frequency of one per acre per lift.
8. At a minimum rate of one (1) per 400 cubic yards
9. At a minimum frequency of four (4) representative samples collected from each compacted drainage layer
10. At a minimum frequency of at least one (1) per 10,000 square feet of drainage layer installed.
11. At a minimum frequency one (1) per twenty (20) feet of drainage pipe

** Testing frequency in this table will supercede testing listed in the Construction Quality Assurance Plan.

Table V.I.1. - Boilers/Industrial Furnaces

Permit Unit No.	Boilers/Industrial Furnaces	N.O.R. No.	Waste Nos.[1]	Waste Physical Form (Pumpable or Non-pumpable)	Reactive, Incompatible, or F020, F021, F022, F023, F026, or F027 Waste	Unit Status
11	AN Boiler 30H5	79	13	Pumpable	Reactive	Active
12	AN Boiler 31H4	80	13	Pumpable	Reactive	Active

1. From the first column of Table IV.B.

* If the unit is already permitted, use the established "Permit Unit No." If the unit is not yet permitted, the number given here for the unit will become the "Permit Unit No." The numbers should be in an order that will be convenient for the facility operator.

Table V.I.2. - Boiler/Industrial Furnace Permit Conditions, Monitoring and Automatic Waste Feed Cutoff Systems

Unit Name/Number Use a table for each unit and fill in all columns with the appropriate information

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	AWFCO Y/N[2]
Operating Parameters					
Maximum Total Hazardous Waste Feed Rate *[Additional hazardous waste feed limits shall be added as determined necessary based upon feed mechanism and/or waste-specific needs]*	Instantaneous	*Flow Meter*	HCN Feed Piping	12,250 lb/hr	Y
Maximum Total Pumpable Hazardous Waste Mass Feed Rate *[Not applicable for Tier I or Tier I adjusted metals control limits]*	Not applicable	Not applicable	Not applicable	Not applicablelb/hr	N
Minimum Primary Combustion Chamber Temperature	Instantaneous	Thermocouple [or other device]	Combustion Chamber Exit	1,540 ˚F	Y
Minimum Secondary Combustion Chamber Temperature	Not applicable	Not applicable	Not applicable	Not applicable ˚F	N
Maximum Secondary and/or Primary Combustion Chamber Temperature *[Include if using Tier II, III metals controls only]*	Not applicable	Not applicable	Not applicable	Not applicable ˚F	N
Maximum Flue Gas Temperature at PM Control Device Inlet *[Tier II and Tier III Metals only as applicable]*	Not applicable	Not applicable	Not applicable	Not applicable ˚F	N
Maximum Combustion Gas Velocity Indicator *[If condition is something other than "maximum combustion gas velocity", write specific name of condition]*	Instantaneous	Flow meters, thermocouple system	Combustion air and AOC flows w/ Combustion Chamber Temp.	437,633 acfm	Y
Atomization parameters *[as necessary]*	Not applicable	Not applicable	Not applicable	Not applicable	N
Feed Rates: (Metals, Total Chlorine, and Ash)	Instantaneous	Flow Meters and WAP[3]	HCN Feed Piping	Limits specified in Table V.I.3	N

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	AWFCO Y/N[2]
or Mass Flow Meter	Not applicable	Not applicable	Not applicable	Not applicable	N
Secondary Combustion Zone Pressure *[or other method for fugitives monitoring]*	Not applicable	Not applicable	Not applicable	Not applicable	N
Primary Combustion Zone Pressure *[or other method for fugitives monitoring]*	Not applicable	Not applicable	Not applicable	Not applicable	N
CEMS Monitoring Parameters					
Stack Oxygen	Instantaneous	CEMS	Stack	No Limit(for correction to 7% O2)	N
Stack CO	Continuous HRA	CEMS	Stack	100 ppmv HRA, 7% O2, dry basis	Y
Stack THC	Not applicable	Not applicable	Not applicable	Not applicable	N
APCD Parameters					
Pressure drop across Baghouse *[or fabric filter]*	Not applicable	Not applicable	Not applicable	Not applicable in W.C.	N
[Wet Scrubbers:]					
Ionizing Wet Scrubber minimum Voltage	Not applicable	Not applicable	Not applicable	kilovolts (kV) Not applicable	No

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	AWFCO Y/N[2]
Minimum liquid to flue gas ratio (L/G)	Not applicable	Not applicable	Not applicable	Not applicable gallons/1000 actual cubic feet (acf)	No
Minimum scrubber blowdown	Not applicable	Not applicable	Not applicable	Not applicable gallons/min	No
Minimum scrubber water pH	Not applicable	Not applicable	Not applicable	Not applicable	No
[Venturi Scrubbers:]					
Venturi scrubber minimum liquid to gas ratio (L/G)	Not applicable	Not applicable	Not applicable	Not applicable gallons/1000 actual cubic feet (acf)	No
Venturi differential gas pressure across venturi scrubber	Not applicable	Not applicable	Not applicable	Not applicable in W.C.	No
[Dry Scrubbers:]					
Minimum alkaline reagent *[insert name of reagent here, such as lime]* flow to the dry scrubber	Not applicable	Not applicable	Not applicable	Not applicable pounds per minute	No
Maximum flue gas flow rate	Not applicable	Not applicable	Not applicable	Not applicable acfm	No
[Absorbers:]					
Absorber minimum pH of incoming liquid	Not applicable	Not applicable	Not applicable	Not applicable	No
Absorber minimum liquid to gas ratio (L/G)	Not applicable	Not applicable	Not applicable	Not applicable gallons/1000 actual cubic feet (acf)	No

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	AWFCO Y/N[2]
Other Air Pollution Control Devices permit conditions as necessary	Not applicable	Not applicable	Not applicable	Not applicable	No

1. *Instantaneous* as defined in 40 CFR 266.102(e)(6)(i)(A) shall mean a value which occurs at any time. A value shall be determined by the monitoring device no less than every 15 seconds.
   Continuous monitor is one which continuously samples or measures the regulated parameter without interruption and evaluates the detector response at least once each 15 seconds, and computes and records the average value at least every 60 seconds.
   Hourly Rolling Average as defined in 40 CFR 266.102(e)(6)(ii).
   For carcinogenic metals and lead feed rates: *Instantaneous* as defined above or, *Rolling average* as defined in 40 CFR 266.102(e)(6)(ii)
2. *AWFCO*: *Automatic Waste Feed Cutoff*. For AWFCOs indicated by "Y", the Permit Limit in the table triggers an AWFCO.
3. The respective specific gravity and constituent concentration of each stream associated with a volumetric rate must be known to determine the mass feed rate.

Table V.I.3 - Maximum Constituent Feed Rate (Permit Unit 11)

The total feed rate of constituents to the boiler/industrial furnace(s) shall not exceed the following limitations in grams per hour (g/hr) or tons per year (T/yr), as noted. The metals limitations have been evaluated through risk assessment. The ash and chlorine limits are based upon testing or regulatory limits.

Constituent	Maximum Allowable Feed Rate In All Feedstreams Hourly Basis (g/hr)	Maximum Allowable Feed Rate In All Hazardous Waste Feedstreams Hourly Basis (g/hr)[1]	Maximum Allowable Feed Rate in All Pumpable Hazardous Waste Feedstreams Hourly Basis (g/hr)[1]	Maximum Allowable Feed Rate in All Feedstreams Annual Basis (T/yr)
Arsenic	7.92E-01	Not Applicable	Not Applicable	7.65E-03
Beryllium	6.08E+00	Not Applicable	Not Applicable	5.87E-02
Cadmium	2.00E+01	Not Applicable	Not Applicable	1.93E-01
Total Chromium	2.00E+01	Not Applicable	Not Applicable	1.54E-01
Antimony	3.96E+03	Not Applicable	Not Applicable	1.53E-01
Barium	3.96E+03	Not Applicable	Not Applicable	3.82E+00
Lead	3.11E+03	Not Applicable	Not Applicable	1.35E+01
Mercury	1.26E+02	Not Applicable	Not Applicable	1.50E-03
Silver	8.28E+01	Not Applicable	Not Applicable	8.00E-01
Thallium	8.28E+02	Not Applicable	Not Applicable	1.53E-01
Total Chlorine	7.78E+03	Not Applicable	Not Applicable	Not Applicable
Ash	1,200	Not Applicable	Not Applicable	Not Applicable
(Additional Constituent)				

Table V.I.3 - Maximum Constituent Feed Rate (Permit Unit 12)

The total feed rate of constituents to the boiler/industrial furnace(s) shall not exceed the following limitations in grams per hour (g/hr) or tons per year (T/yr), as noted. The metals limitations have been evaluated through risk assessment. The ash and chlorine limits are based upon testing or regulatory limits.

Constituent	Maximum Allowable Feed Rate In All Feedstreams Hourly Basis (g/hr)	Maximum Allowable Feed Rate In All Hazardous Waste Feedstreams Hourly Basis (g/hr)[1]	Maximum Allowable Feed Rate in All Pumpable Hazardous Waste Feedstreams Hourly Basis (g/hr)[1]	Maximum Allowable Feed Rate in All Feedstreams Annual Basis (T/yr)
Arsenic	7.92E-01	Not Applicable	Not Applicable	7.65E-03
Beryllium	6.08E+00	Not Applicable	Not Applicable	5.87E-02
Cadmium	2.00E+01	Not Applicable	Not Applicable	1.93E-01
Total Chromium	2.00E+01	Not Applicable	Not Applicable	1.54E-01
Antimony	3.96E+03	Not Applicable	Not Applicable	1.53E-01
Barium	3.96E+03	Not Applicable	Not Applicable	3.82E+00
Lead	3.11E+03	Not Applicable	Not Applicable	1.35E+01
Mercury	1.26E+02	Not Applicable	Not Applicable	1.50E-03
Silver	8.28E+01	Not Applicable	Not Applicable	8.00E-03
Thallium	8.28E+02	Not Applicable	Not Applicable	1.53E-01
Total Chlorine	7.78E+03	Not Applicable	Not Applicable	Not Applicable
Ash	1,200	Not Applicable	Not Applicable	Not Applicable

1. Not applicable for Tier I or Tier I adjusted metals feed rate screening limits.

[Hourly feed rate limits must comply with the requirements of 40 CFR 266.106 for carcinogenic metals and non-carcinogenic metals. As applicable, the feed rate limit for chromium may be specified as hexavalent and total chromium limits.]

Table V.I.4. - Maximum Allowable Emission Rates

[Applicant to use a table for each operating mode as applicable and for each unit]

Carcinogenic Constituent	Compliance Tier	Maximum Allowable Emission Rate[1]	Units[2]
Arsenic	Tier I Adjusted	Not Applicable	g/hr
Beryllium	Tier I Adjusted	Not Applicable	g/hr
Cadmium	Tier I Adjusted	Not Applicable	g/hr
Chromium, Total	Tier I Adjusted	Not Applicable	g/hr
Non-Carcinogenic Constituent	Compliance Tier	Maximum Allowable Emission Rate[1]	Units[2]
Antimony	Tier I Adjusted	Not Applicable	g/hr
Barium	Tier I Adjusted	Not Applicable	g/hr
Lead	Tier I Adjusted	Not Applicable	g/hr
Mercury	Tier I Adjusted	Not Applicable	g/hr
Silver	Tier I Adjusted	Not Applicable	g/hr
Thallium	Tier I Adjusted	Not Applicable	g/hr
Hydrogen Chloride	Tier I Adjusted	Not Applicable	g/hr
Free Chlorine	Tier I Adjusted	Not Applicable	g/hr
Particulate Matter	Tier I Adjusted	0.08	grains/dscf

1. Not applicable for Tier I or Tier I adjusted feed rate screening limits.
2. *g/hr* denotes grams per hour. *Grains/dscf* denotes grains per dry standard cubic foot (standard conditions: 760 mm Hg, 68 ˚F) after correction to a stack gas concentration of 7% oxygen.

Note: Site-specific dispersion modeling factor `x.xxx *[insert dispersion factor for Tier III as applicable]* micrograms per cubic meter per grams per second emission rate.

Table V.I.5 - Boiler/Industrial Furnace Permit Conditions, Monitoring and Automatic Waste Feed Cutoff Systems - Short-Term Operation

Unit Name/ Number: *Not Applicable*

Parameters	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
Operating Parameters								
Maximum Total Hazardous Waste Feed Rate *[Additional hazardous waste feed limits shall be added as determined necessary based upon feed mechanism and/or waste-specific needs]*			Feed System	lb/hr			Yes	Yes
Maximum Total Pumpable Hazardous Waste Mass Feed Rate *[Not applicable for Tier I or Tier I adjusted metals screening limits]*			Feed System	lb/hr				
Minimum Primary Combustion Chamber Temperature		Thermocouple *[or other device]*	Primary Chamber Exit	˚F				
Minimum Secondary Combustion Chamber Temperature		Thermocouple *[or other device]*	Secondary Chamber Exit	˚F			Yes	No
Maximum Secondary and/or Primary Combustion Chamber Temperature *[Include if using Tier II/ III metals controls.]*		Thermocouple *[or other device]*	Secondary Chamber Exit	˚F			Yes	Yes
Maximum Flue Gas Temperature at PM Control Device Inlet *[Tier II/III metals controls as applicable.]*		Thermocouple *[or other device]*	At entrance to PM Control Device	˚F			Yes	Yes

Parameters	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-trail Burn-Shakedown	Trail Burn	Post Trail Burn		
Maximum Combustion Gas Velocity Indicator *[If condition is something other than "maximum combustion gas velocity", write specific name of condition]*							Yes	Yes
Atomization parameters *[as necessary]*								*[as appropriate]*
Feed Rates: (Metals, Total Chlorine, and Ash)		Volumetric Flow Meter[3] or Mass Flow Meter	Feed Systems	Limits Specified in Table			No	No
CEMS Monitoring Parameters								
Stack Oxygen	C	CEMS	Stack	No Limit (for correction to 7% O2)			No	No
Stack CO	C, HRA	CEMS	Stack	100 ppmv HRA, 7% O2, dry basis			Yes	Yes
Stack THC *[If specified in the permit]*	C, HRA	CEMS		20 ppmv HRA, 7% O2, dry basis			Yes	Yes
APCD PARAMETERS								
Pressure drop across Baghouse *[or fabric filter]*				in. W.C.				

Parameters	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-trail Burn-Shakedown	Trail Burn	Post Trail Burn		
Wet Scrubbers:]								
Ionizing Wet				kilovolts (kV)				
Scrubber minimum voltage								
Minimum liquid to flue gas ratio (L/G)				gallons/1000 actual cubic feet (acf)				
Minimum scrubber blowdown				gallons/min				
Minimum scrubber water pH								
[Venturi Scrubbers:]								
Venturi scrubber minimum liquid to gas ratio (L/G)				gallons/1000 actual cubic feet minute (acfm)				

Parameters	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-trail Burn-Shakedown	Trail Burn	Post Trail Burn		
Minimum differential gas pressure across venturi scrubber				in. W.C.				
[Dry Scrubbers:]								
Minimum alkaline reagent [insert name of reagent here, such as lime] flow to the dry scrubber				pounds per minute				
Maximum flue gas flow rate				acfm				
[Absorbers:]								
Absorber minimum pH of incoming liquid								

Parameters	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-trail Burn-Shakedown	Trail Burn	Post Trail Burn		
Absorber minimum liquid to gas ratio (L/G)				gallons/1000 actual cubic feet (acf)				
Other Air Pollution Control Devices permit conditions as necessary								

1. **(I)** *Instantaneous* as defined in 40 CFR 266.102(e)(6)(i)(A) shall mean a value which occurs at any time. A value shall be determined by the monitoring device no less than every 15 seconds.

   (C) *Continuous monitor* is one which continuously samples or measures the regulated parameter without interruption, and evaluates the detector response at least once each 15 seconds, and computes and records the average value at least every 60 seconds.

   (HRA) *Hourly Rolling Average* as defined in 40 CFR 266.102(e)(6)(i)(B).

   - For carcinogenic metals and lead feed rates: *Instantaneous* as defined above or, *Rolling average* as defined in 40 CFR 266.102(e)(6)(ii).

2. AWFCO: *Automatic Waste Feed Cutoff*. For AWFCOs indicated by "Y", the Permit Limit in the table triggers an AWFCO. During the Trial Burn phase, AWFCOs will be as necessary to ensure protection of human health and the environment.

3. The respective specific gravity and constituent concentration of each stream associated with a volumetric rate must be known to determine the mass feed rate

Table V.I.8 - Principal Organic Hazardous Constituents

List the wastes for which the trial burn demonstration will be made and the principal organic hazardous constituents in each waste.

Waste	Principal Organic Hazardous Constituents
HCN, byproduct Hydrogen Cyanide	Hydrogen Cyanide (HCN)

GSI Job No. 6932

PART B APPLICATION
APPENDIX V.A - GENERAL ENGINEERING REPORT

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

FIGURES

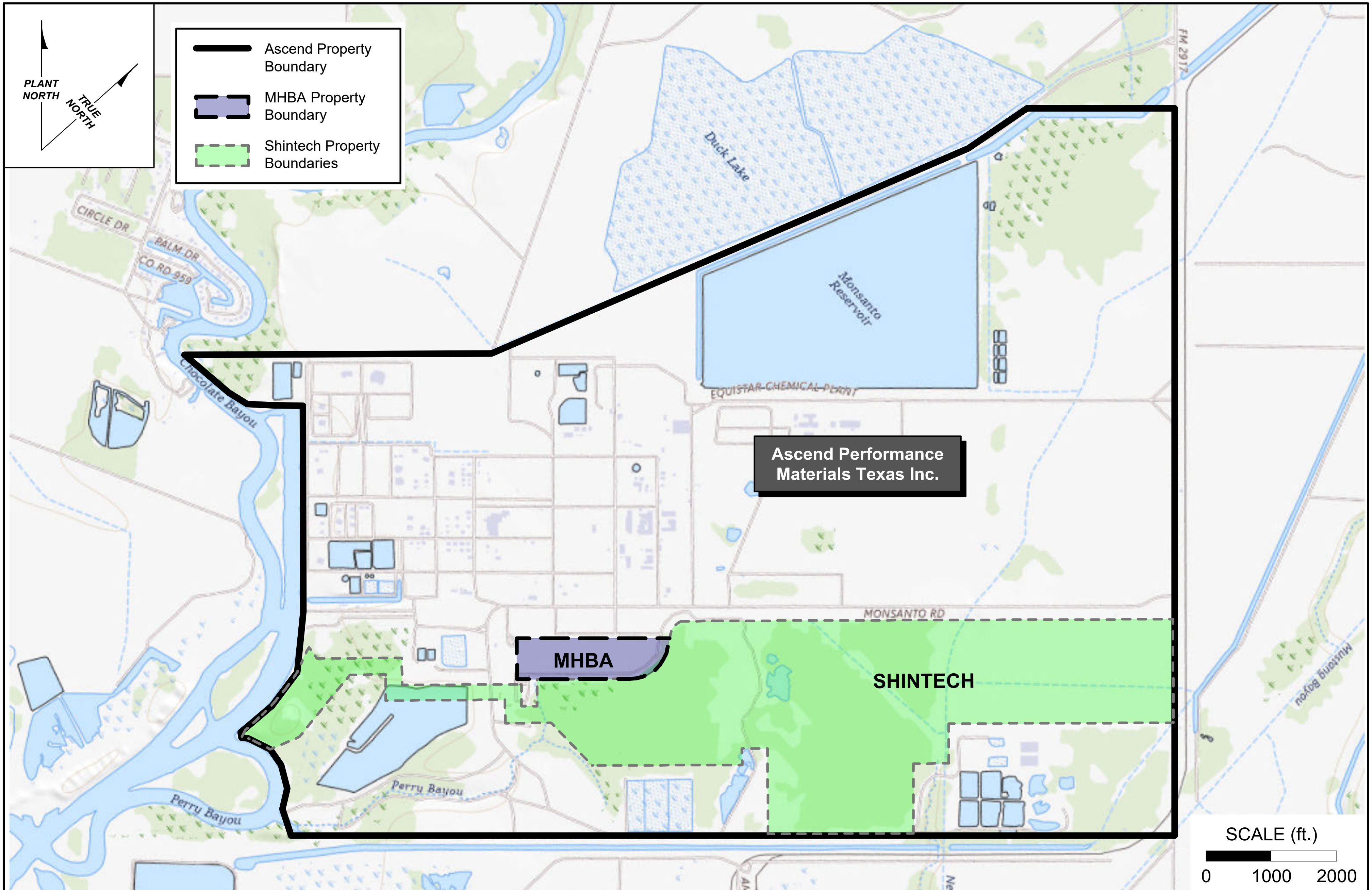
GSI Job No. 6932

PART B APPLICATION
APPENDIX V.A - GENERAL ENGINEERING REPORT

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

FIGURES



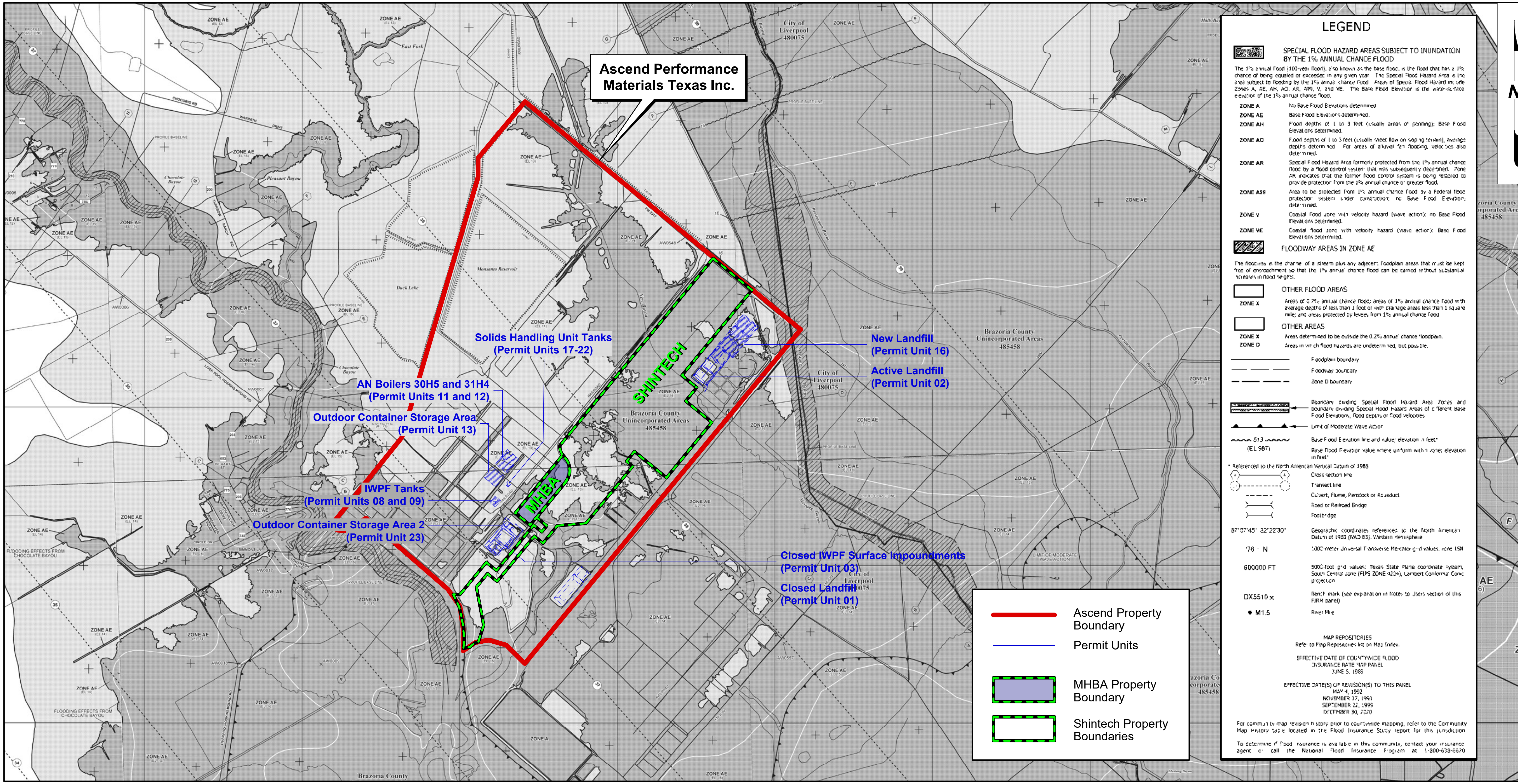
USGS The National Map (via ESRI Online): National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed May, 2020.

GSI ENVIRONMENTAL
Texas Geoscience Firm
Registration Number: 50243

GSI Job No.	6932	Drawn By:	CDM
Map ID:	005_01	Chk'd By:	WMC
Issued:	9-Aug-2024	Aprv'd By:	JMM
Scale:	As Shown		**FIGURE V.A.1**

SITE LOCATION TOPOGRAPHIC MAP

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas



Notes:

1. Zone A = Base floodplain where no base flood elevation has been determined.
   Zone AE = Base floodplain where base flood elevations are provided.
   Zone X (shaded) = Area of moderate flood hazard, usually between the 100-yr and 500-yr floods,
   Zone X (unshaded) = Area of minimal flood hazard, usually above 500-yr floods.
2. Map Reference: FEMA, 2020. Flood Insurance Rate Maps, Brazoria County, Texas, and Incorporated Areas, Panels 315, 320, and 480, Map Numbers 48039C0315K, 48039C0320K, and 48039C0480K, Federal Emergency Management Agency, 30 December 2020.

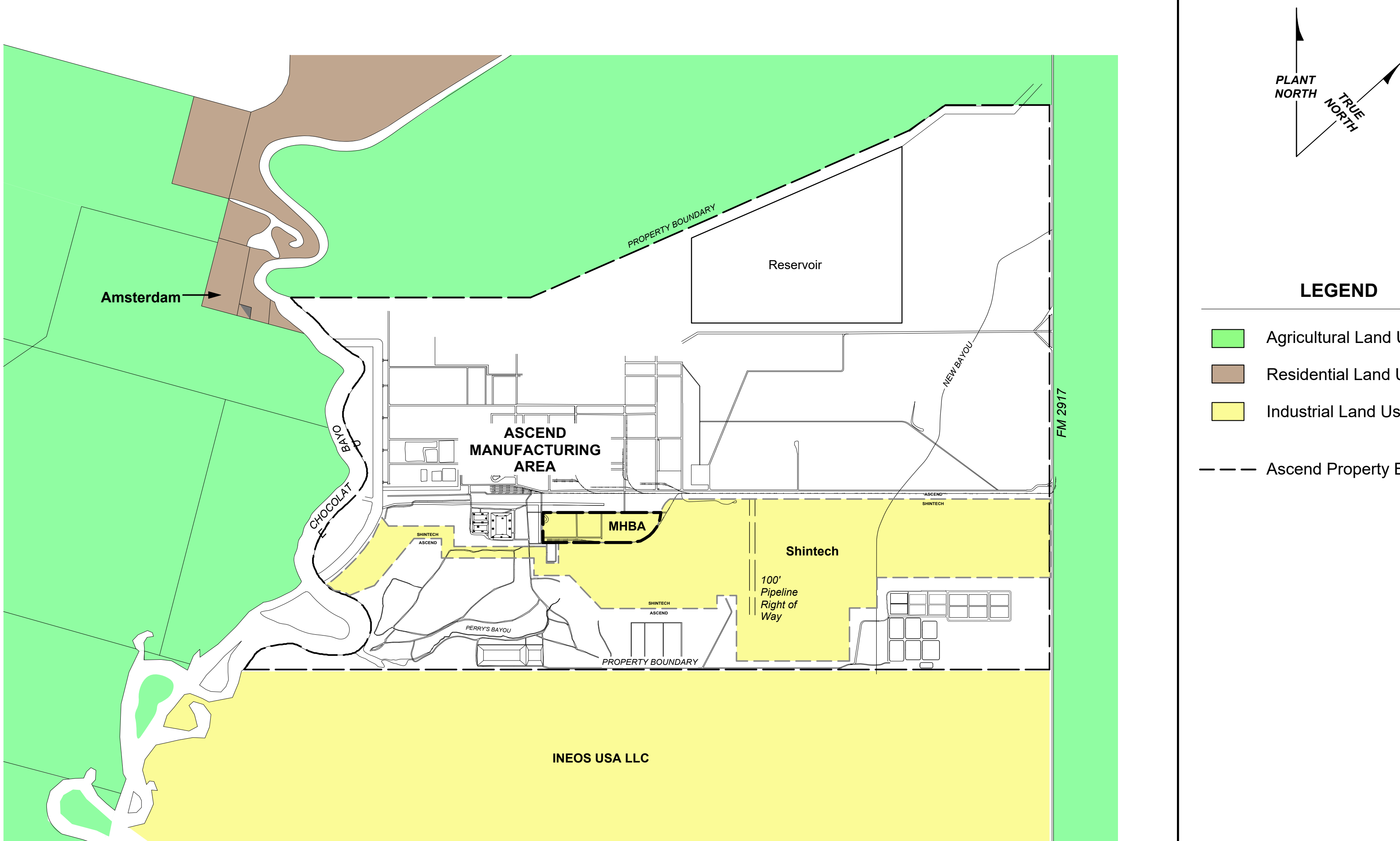
SCALE (ft.)
0 1500 3000

GSI ENVIRONMENTAL
Texas Geoscience Firm Registration Number: 50243

LOCATION OF 100-YEAR FLOODPLAIN

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No:	6932	Drawn By:	CDM
Map ID:	005_02	Chk'd By:	WMC
Issued	9-Aug-2024	Appv'd By:	JMM
Scale:	As Shown		**Figure V.A.2**



LEGEND

- Agricultural Land Use
- Residential Land Use
- Industrial Land Use
- Ascend Property Boundary

SCALE (ft.)

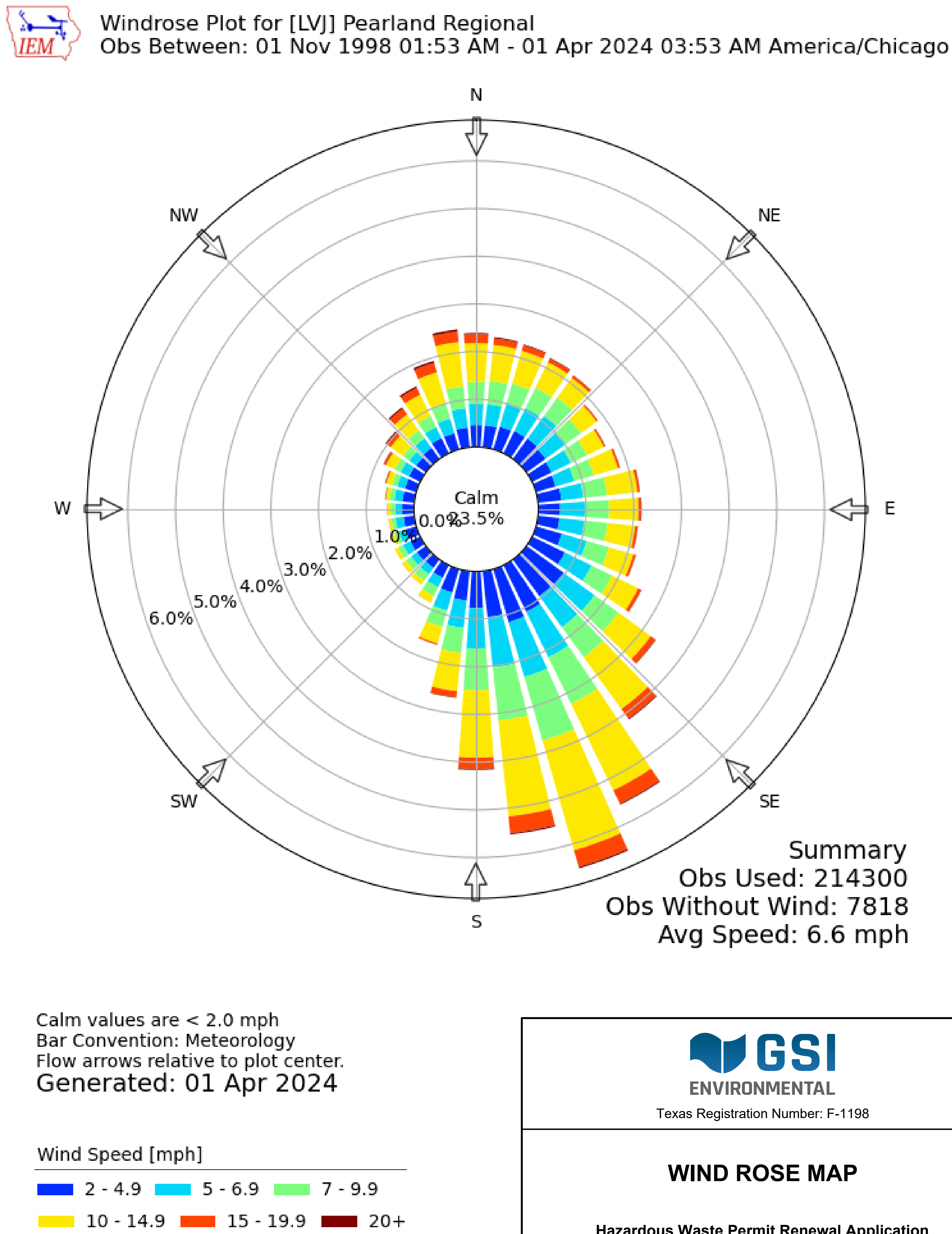
0 1500 3000

GSI ENVIRONMENTAL
Texas Geoscience Firm
Registration Number: 50243

GSI Job No.	6932	Drawn By:	CDM
Map ID:	005_03	Chk'd By:	MW
Issued:	9-Aug-2024	Aprv'd By:	JMM
Scale:	As Shown	FIGURE V.A.3	

LAND USE IN VICINITY OF ASCEND CHOCOLATE BAYOU PLANT

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas



Note:
The wind rose map was obtained from the Iowa State University Environmental Mesonet website. The wind measurements were obtained from 1998 to 2024 at Pearland Regional Airport, located approximately 18 miles north of the Ascend Chocolate Bayou facility.

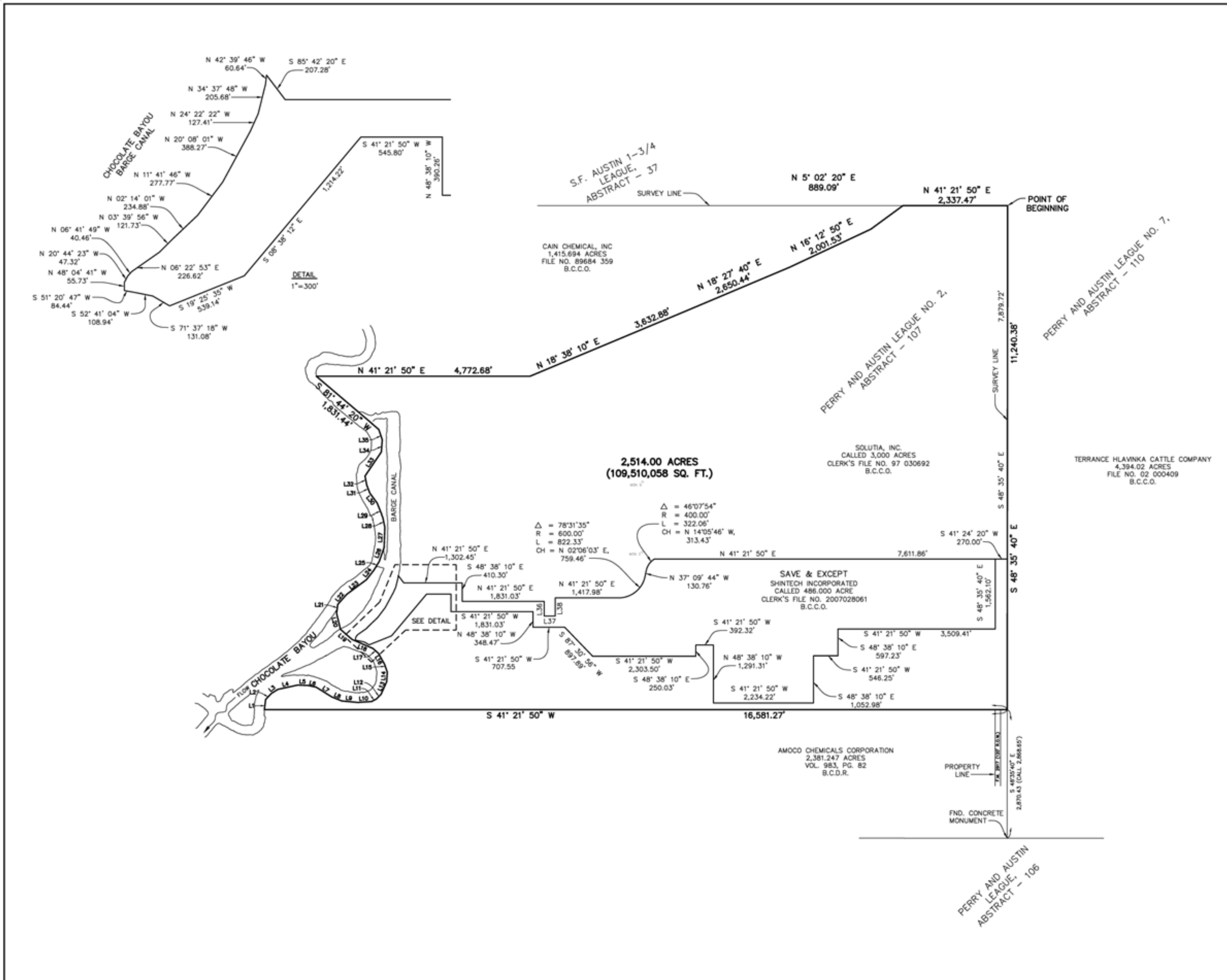
GSI ENVIRONMENTAL

Texas Registration Number: F-1198

WIND ROSE MAP

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No: 6932		Drawn By: CDM	
Issued: 005_04		Chk'd By: MW	
Revised: 9-Aug-2024		Appv'd By: JMM	
Scale: As Shown		**Figure V.A.4**	



LINE TABLE		
LINE	BEARING	DISTANCE
1	N 41°07'40" W	228.88
2	N 05°22'10" W	183.13
3	N 09°01'40" E	172.21
4	N 29°08'30" E	453.84
5	N 43°26'30" E	230.23
6	N 53°26'30" E	184.98
7	N 73°19'50" E	406.20
8	N 63°24'20" E	243.41
9	N 46°53'00" E	357.98
10	N 37°27'40" E	309.37
11	N 13°58'40" E	124.21
12	N 03°54'20" W	144.28
13	N 24°48'52" W	311.79
14	N 44°52'30" W	211.41
15	N 67°36'30" W	192.71
16	N 78°24'10" W	270.84
17	S 83°13'50" W	164.33
18	S 64°48'30" W	508.63
19	S 82°22'00" W	341.89
20	N 62°21'20" W	366.77
21	N 41°14'10" W	204.06
22	N 07°05'10" W	299.01
23	N 04°49'00" E	549.47
24	N 10°26'40" W	259.89
25	N 16°52'20" W	237.89
26	N 29°22'30" W	334.12
27	N 46°53'30" W	446.27
28	N 60°07'30" W	216.77
29	N 70°28'40" W	343.20
30	N 85°08'30" W	274.86
31	N 69°18'00" W	198.58
32	N 59°07'50" W	201.12
33	N 14°37'20" W	648.68
34	N 43°56'50" W	271.27
35	N 67°25'50" W	245.27
36	S 48°38'10" E	328.47
37	N 41°21'50" E	244.83
38	N 48°38'10" W	406.52

NOTES:

1. BEARINGS SHOWN HEREON ARE BASED ON THE DEED RECORDED IN CLERK'S FILE NO. 97-030692 IN THE BRAZORIA COUNTY CLERK'S OFFICE.
2. AT THE REQUEST OF THE CLIENT THIS TRACT HAS NOT BEEN SURVEYED ON THE GROUND AND IS BASED SOLELY ON RECORDED OWNERSHIP DEEDS.
3. A SEPARATE METES AND BOUNDS DESCRIPTION HAS BEEN PREPARED IN CONNECTION WITH THIS SURVEY EXHIBIT.

THE WILSON SURVEY GROUP
PROFESSIONAL LAND SURVEYORS
2006 E. BROADWAY PEARLAND, TEXAS
(281) 485-3991 FAX (281) 485-3998

SOLUTIA, INC.

EXHIBIT TO SHOW A 2,514.00 ACRE SOLUTIA TRACT IN THE PERRY AND AUSTIN LEAGUE NO. 2, ABSTRACT NO. 107, IN BRAZORIA COUNTY, TEXAS

CAD FILE 09-135.DWG
PLOT DATE 06/26/09
DWN C.L.H.
CKD M.D.M.
APPD M.D.M.
SCALE 1"=1000'
JOB NO. 09-135
SHEET 1 OF 1

Ascend Performance Materials LLC, Alvin, Texas
RCRA Permit No. HW-50189-000

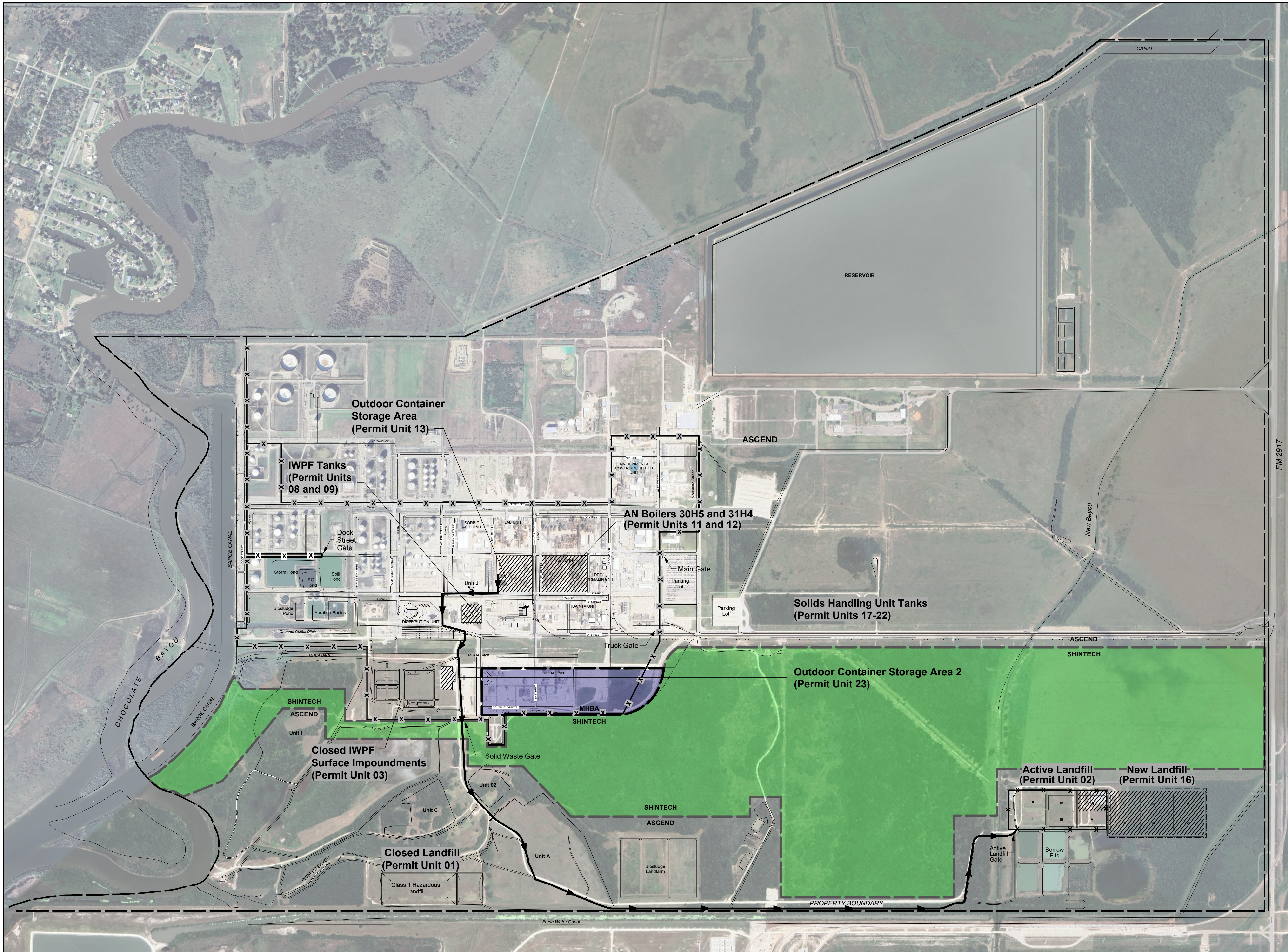
Attachment B, Figure B.1
RCRA Permit Renewal Application
10 January 2010

GSI ENVIRONMENTAL
Texas Geoscience Firm
Registration Number: 50243

GSI Job No.	6932	Drawn By:	CDM
Map ID:	005_05	Chk'd By:	MW
Issued:	9-Aug-2024	Aprv'd By:	JMM
Scale:	Not to Scale		FIGURE V.A.5

SITE LEGAL BOUNDARIES MAP

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Inc., Alvin, Texas



LEGEND

- Load/unloading areas
- Road to Active Landfill
- Fence line
- Ascend Property Boundary
- MHBA Property Boundary
- Shintech Property Boundary

Notes:

1) Primary roads are 20 ft wide, paved with asphalt or concrete, and designed for a 14,000-lb bearing capacity.
2) Secondary roads are paved with crushed limestone and designed for an 8,000-lb bearing capacity.
3) A 14-mph speed limit applies to all plant roads.
4) Base maps compiled from Solutia drawing No. 340GA2 issued 4-June-1992, and aerial photographs obtained from Aerial Viewpoint, Inc., Negative No. 87B-1922, flight date April-1987, and Negative No. 2, flight date 26-January-1993.
5) Aerial background extracted from Google Earth Pro. Image dated 12/16/2023.

SCALE (ft.)
0 600 1200

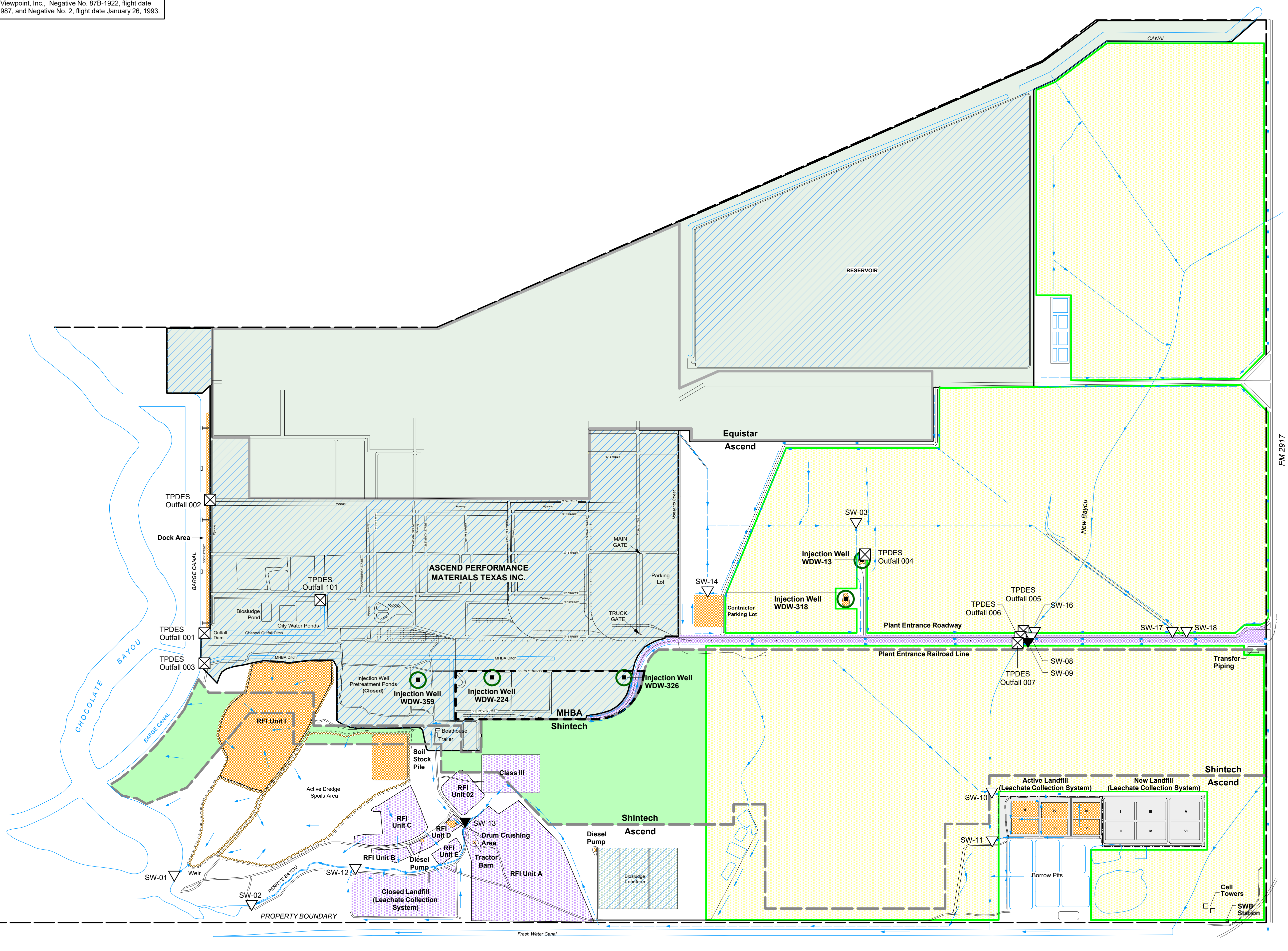
GSI ENVIRONMENTAL
Texas Geoscience Firm Registration Number: 50243

LOCATION OF HAZARDOUS WASTE MANAGEMENT UNITS

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No:	6932	Drawn By:	CDM
Map ID:	005_06	Chk'd By:	MW
Revised:	9-Aug-2024	Appv'd By:	JMM
Scale:	As Shown	**FIGURE V.A.6**	

Base maps compiled from Monsanto drawing No. 340GA2 issued June 4,1992, and aerial photographs obtained from Aerial Viewpoint, Inc., Negative No. 87B-1922, flight date April 1987, and Negative No. 2, flight date January 26, 1993.



LEGEND

- Facility subject to General Permit for stormwater discharges associated with industrial activity Stormwater sampling required.
- Area of Ascend property draining to outfalls under NPDES Permit No. TX0003875 or to Deep Well Facility (UIC permit Nos. WDW-13, WDW-318, WDW-326, and WDW-224).
- Area leased to cattle rancher, not used for industrial activity.
- Facility subject to General Permit for stormwater discharges associated with industrial activity. No stormwater sampling required if materials kept from contact with precipitation (e.g., cover, within piping surrounding by berms or dikes).
- Surface Runoff Flow Direction
- Drainage Structure or Ephemeral Stream
- Continuous Stream
- SW-10 Stormwater Discharge Point
- SW-13 Stormwater Discharge Point to be sampled during annual stormwater monitoring and quarterly visual monitoring.
- Injection Well
- Discharge Point for TPDES Permit.
- Dikes
- Ascend Property Boundary
- MHBA Property Boundary
- Shintech Property Boundary

NOTE:
Surface water flow directions determined from site surveys performed on 8,10,16-March-1993, 11-February-1999, and 4-October-2001.

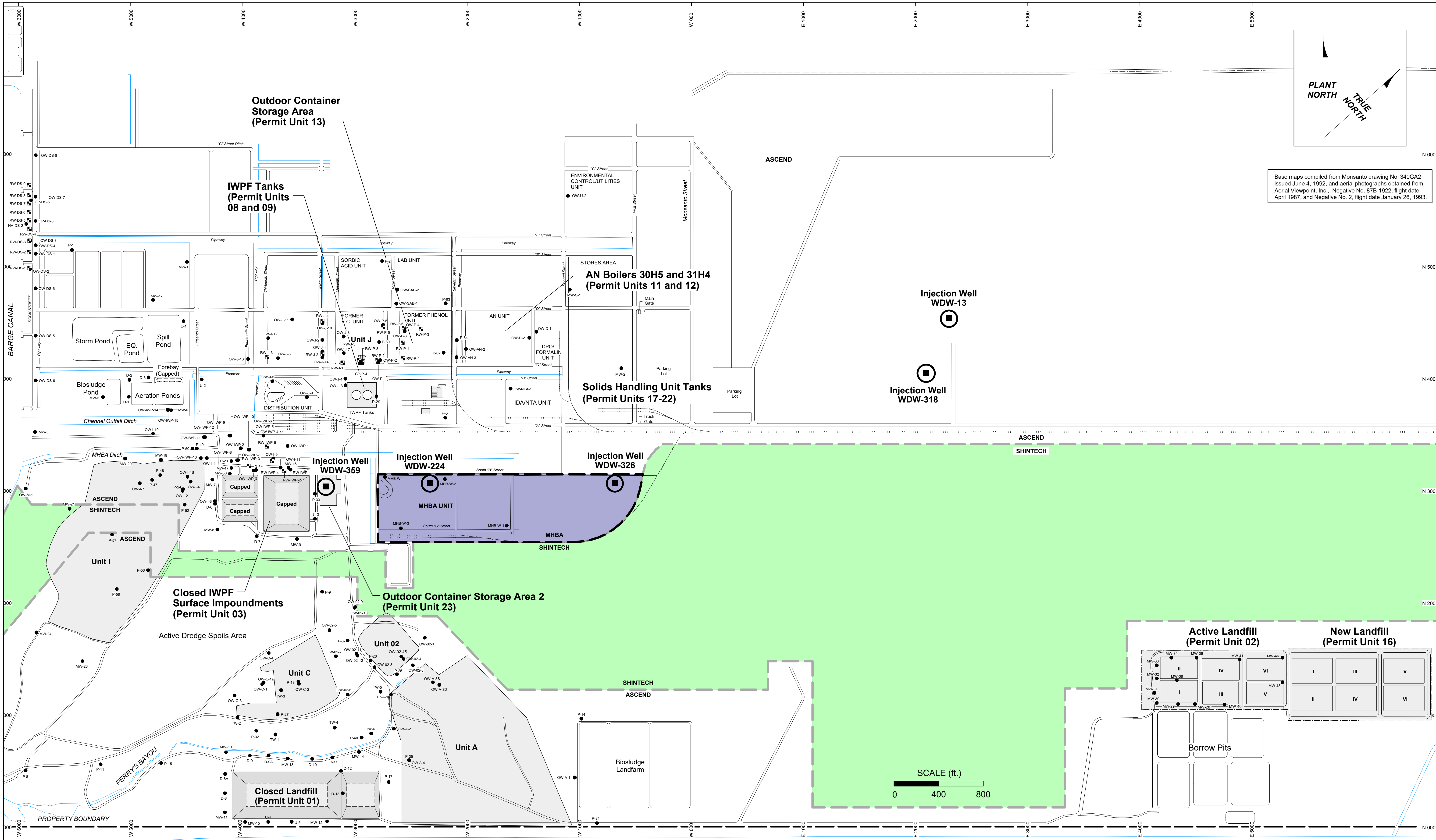
SCALE (ft.)
0 600 1200

GSI ENVIRONMENTAL
Texas Geoscience Firm Registration Number: 50243

STORMWATER DRAINAGE PATTERNS AND LOCATION OF INJECTION WELLS

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No:	6932	Drawn By:	CDM
Map ID:	005_07	Chk'd By:	MW
Issued:	9-Aug-2024	Appv'd By:	JMM
Scale:	As Shown		**FIGURE V.A.7**



LEGEND

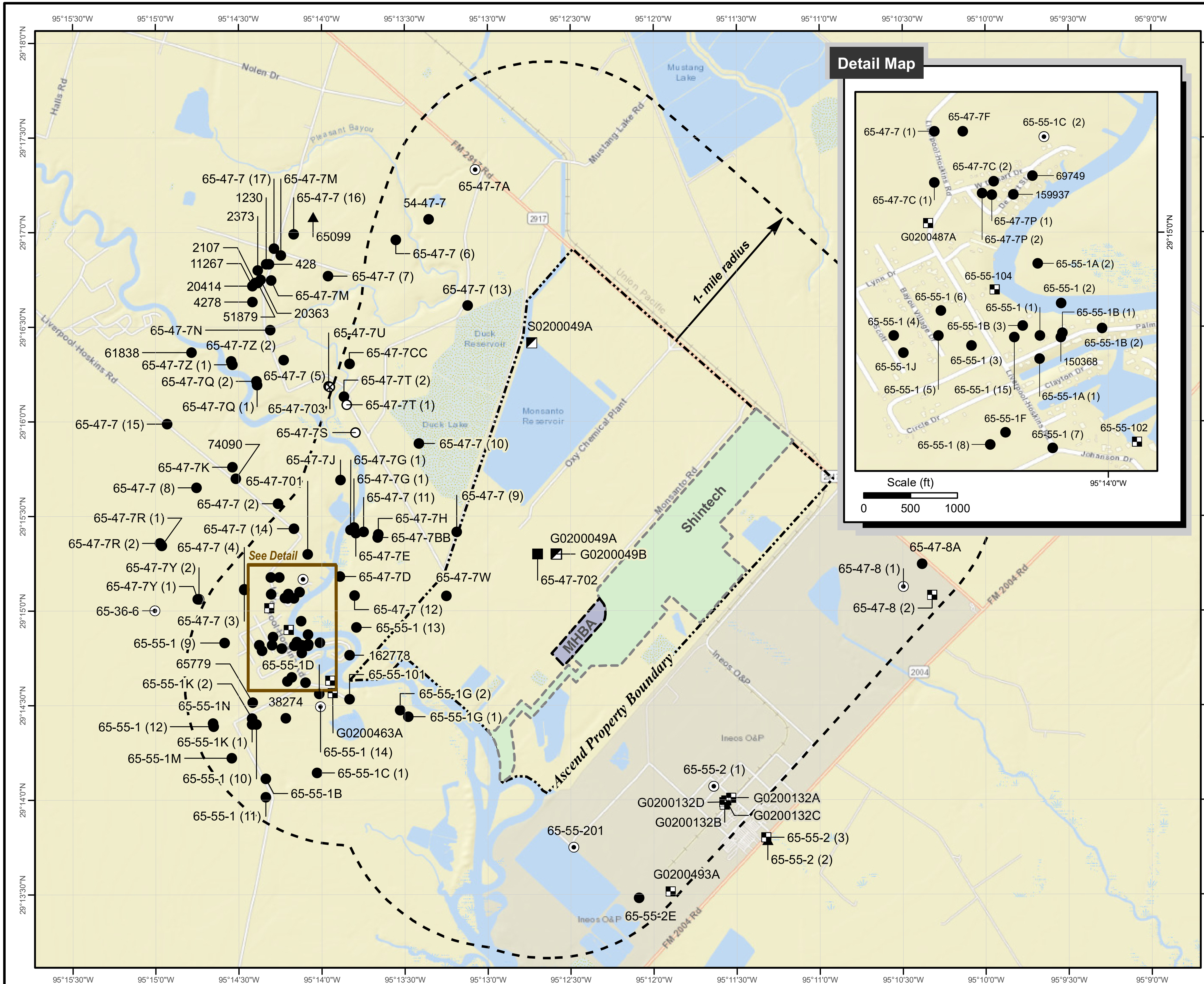
- Monitoring Well Location
- Recovery Well Location (not active)
- Injection Well Location
- Ascend Property Boundary
- MHBA Property Boundary
- Shintech Property Boundary

GSI ENVIRONMENTAL
Texas Geoscience Firm
Registration Number: 50243

GSI Job No.	6932	Drawn By:	CDM
Map ID:	005_08	Chk'd By:	MW
Issued:	9-Aug-2024	Aprv'd By:	JMM
Scale:	As Shown		FIGURE V.A.8

LOCATION OF MONITORING AND RECOVERY WELLS

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas



N

LEGEND

- Potable Water Well used by Ascend
- Public Supply
- Purpose not specified
- Test Well
- Wells for Agricultural/Irrigation Purposes
- Wells for Commercial Purposes
- Wells for Domestic Purposes
- Wells for Industrial Purposes
- Ascend Property Boundary
- MHBA Property Boundary
- Shintech Property Boundary

Notes

1) Well location information provided by Banks Environmental Data, May 17, 2024. Well information provided in Attachment C.7.
2) Background Imagery: Provided by ArcGIS Map Services, World Street Map, 4/26/2017,

Scale (ft)
0 1500 3000

Projected Coordinate System
Datum: NAD 1983
STP: Texas South Central, 4204 (ft)

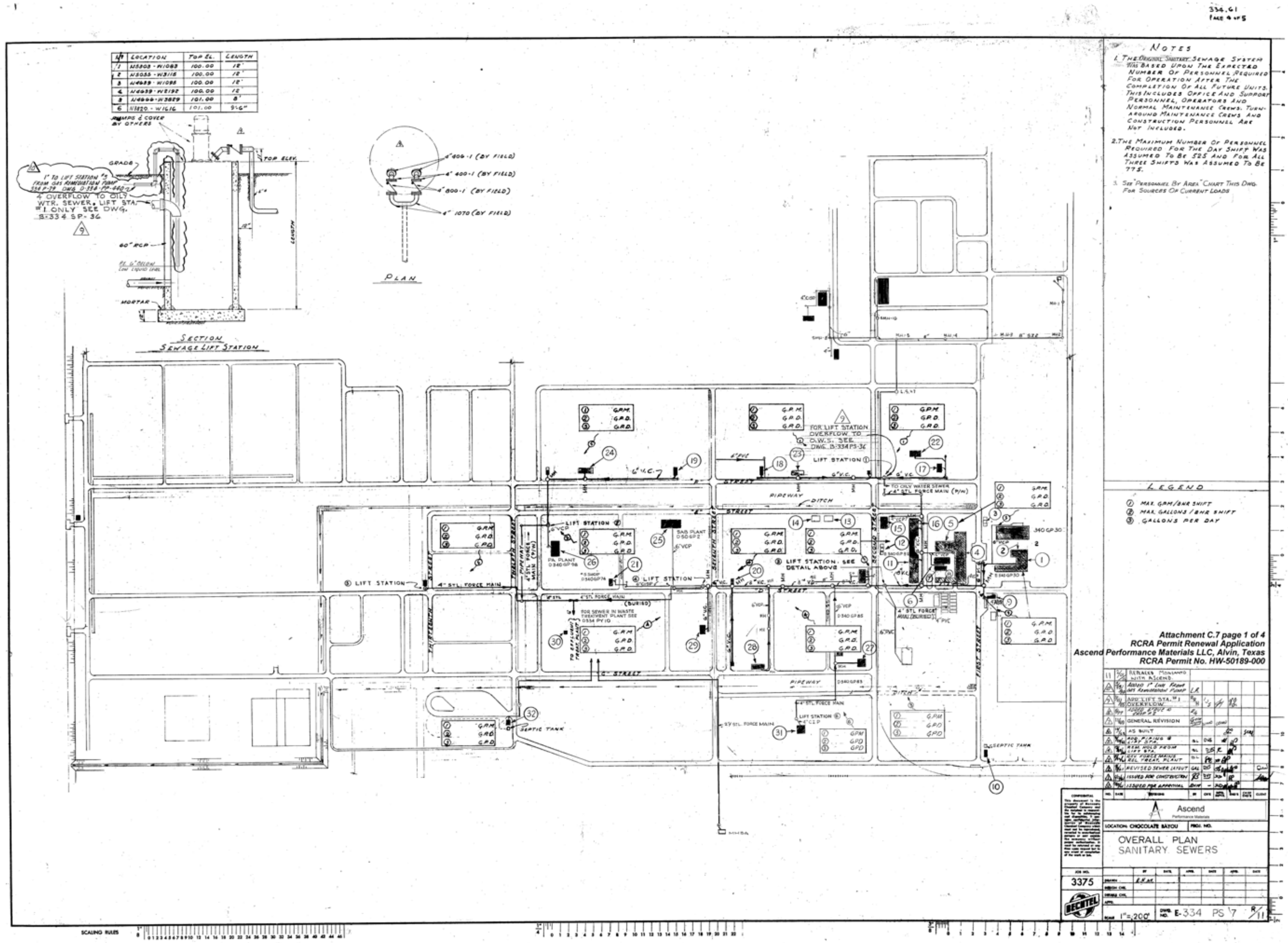
GSI ENVIRONMENTAL
Texas Registration Number: F-1198

LOCATION OF WATER WELLS

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Inc., Alvin, Texas

GSI Job No.	6932	Drawn By:	CDM
Issued:	9-Aug-2024	Chk'd By:	MW
Map ID:	**005_09**	Appv'd By:	JMM

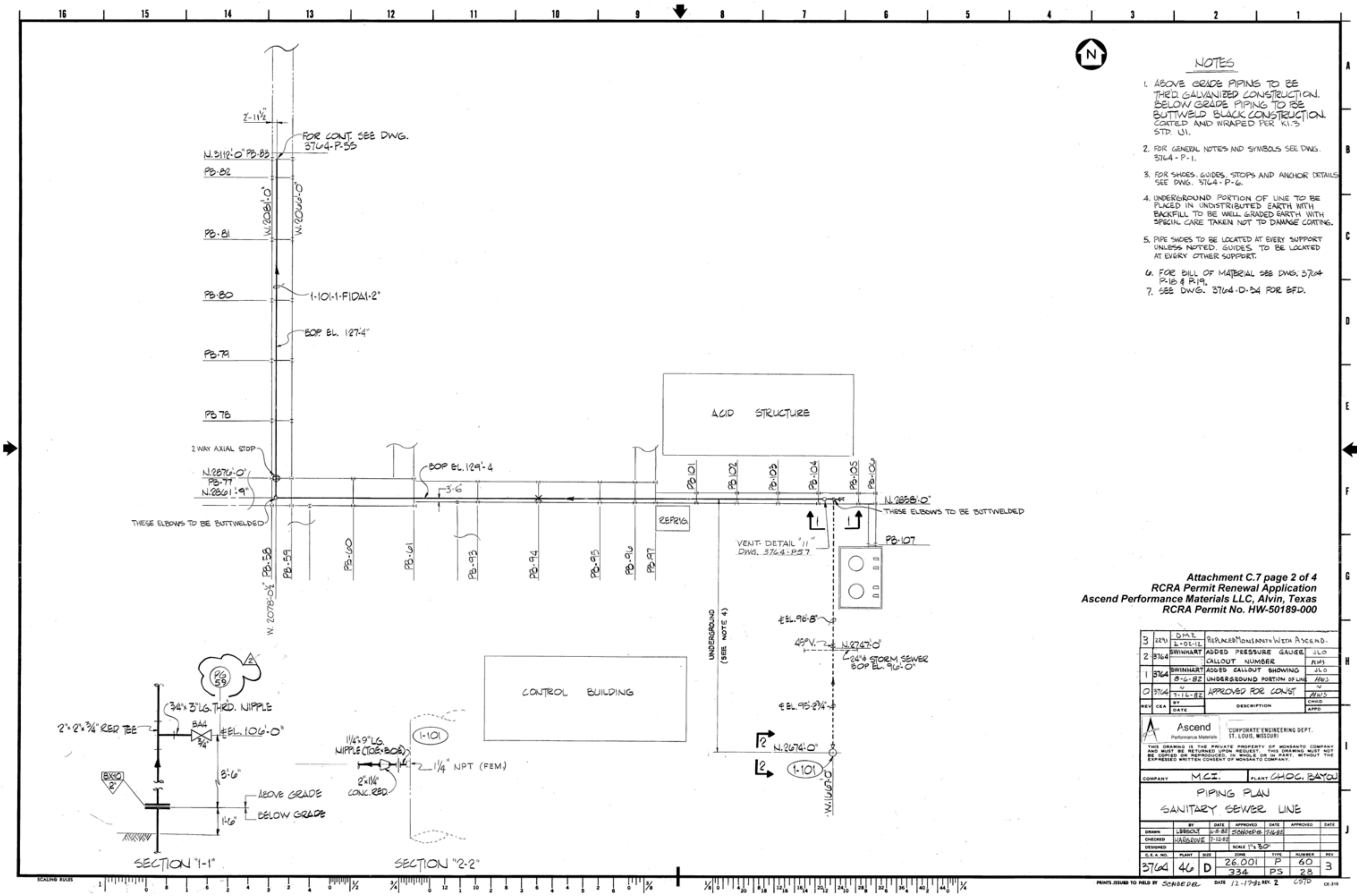
FIGURE V.A.9



GSI ENVIRONMENTAL Texas Geoscience Firm Registration Number: 50243	GSI Job No. 6932	Drawn By: CDM		
	Map ID: 005_10	Chk'd By: MW		
	Issued: 9-Aug-2024	Aprv'd By: JMM		
	Scale: Not to Scale	FIGURE V.A.10a		

OVERALL PLAN SANITARY SEWERS

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Inc., Alvin, Texas



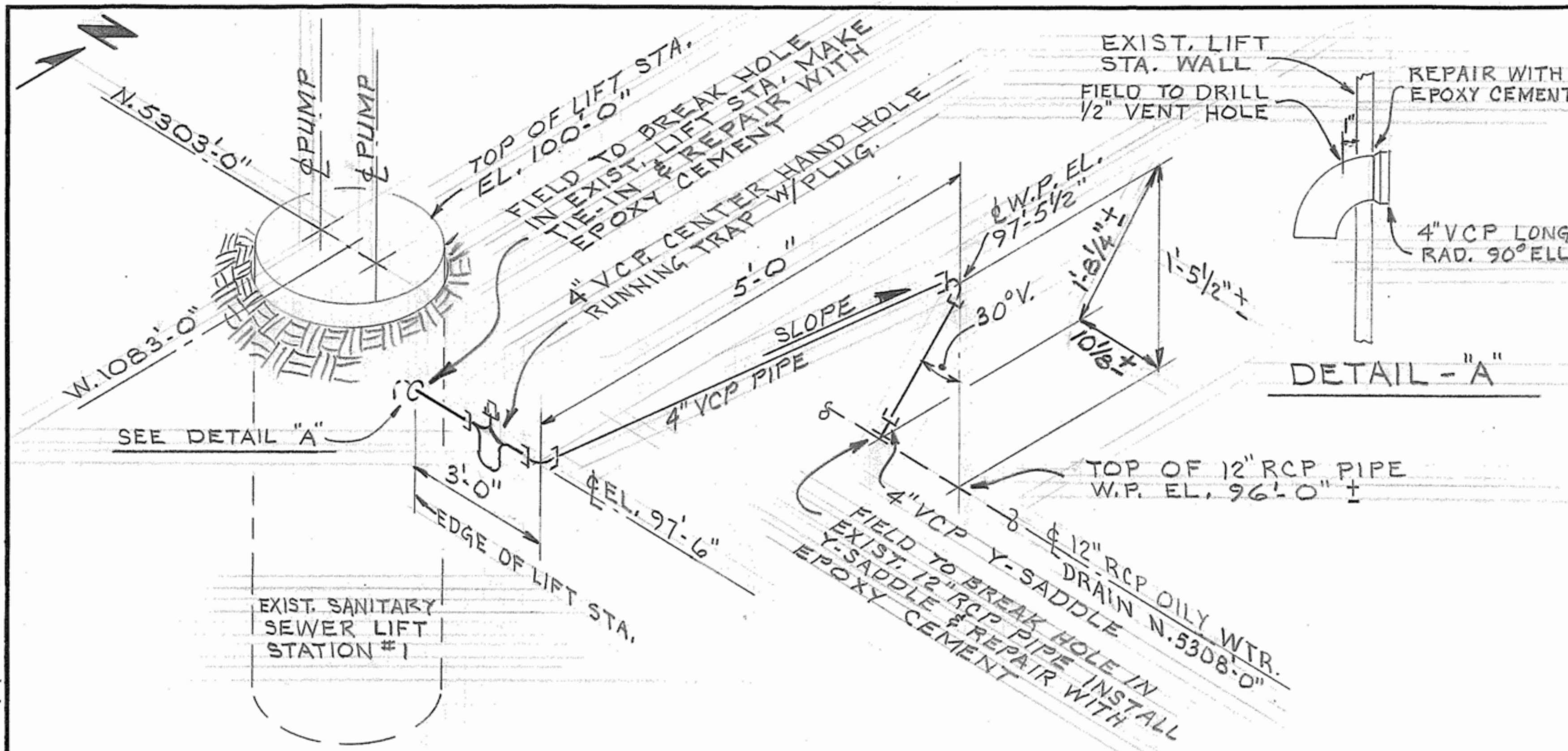
Attachment C.7 page 2 of 4
RCRA Permit Renewal Application
Ascend Performance Materials LLC, Alvin, Texas
RCRA Permit No. HW-50189-000

GSI ENVIRONMENTAL
Texas Geoscience Firm
Registration Number: 50243

GSI Job No.	6932	Drawn By:	CDM
Map ID:	005_10	Chk'd By:	MW
Issued:	9-Aug-2024	Aprv'd By:	JMM
Scale:	Not to Scale	FIGURE V.A.10b	

PIPING PLAN SANITARY SEWER LINE

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Inc., Alvin, Texas



REF. DWGS.

E-334PS-7 PLAN SANITARY SEWER
E-340 GP-10 PLAN UNDERGROUND

COMPANY CONFIDENTIAL
This drawing is the property of Monsanto Company and must be accounted for. Information hereon is confidential and must not be reproduced, revealed to unauthorized persons or sent outside the company without proper authorization.

Attachment C.7 page 3 of 4
RCRA Permit Renewal Application
Ascend Performance Materials LLC, Alvin, Texas
RCRA Permit No. HW-50189-000

NO.	W.O. NO.	DATE	REVISION	DR.	CK'D.	DRAFT. SUPV.	ENG'R.	PROCESS	PROD.
1		2-1-12	REPLACED MONSANTO WITH ASCEND	DMZ					

N32653

DRAWN	RRH DATE 3-14-85
CHECKED	SPURLOCK 3-20-85
DRAFT. SUPV.	[signature] 5-23-85
ENG'R.	VAL LANIER 5/23/85
PROCESS	
PROD.	
SCALE	NONE

Ascend Performance Materials
PLANT ENGINEERING
Chocolate Bayou
ALVIN, TEXAS

SANITARY SEWER LIFT STATION #1 OVERFLOW

W.O. NO. 678 278
DEPT. ENV. CONTROL
AREA UTILITIES
DWG. NO. B-334PS-36 R/1

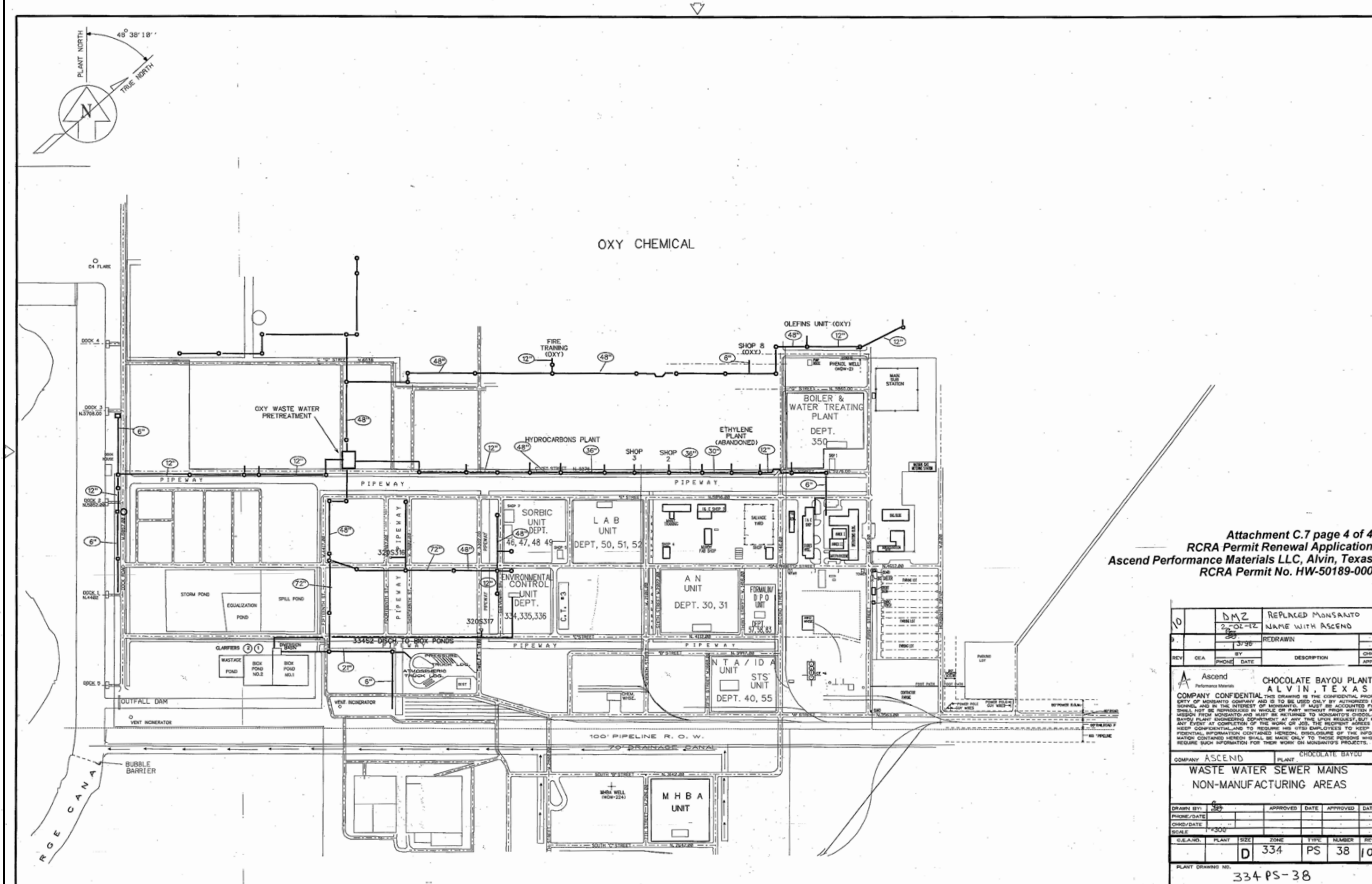
GSI ENVIRONMENTAL
Texas Geoscience Firm
Registration Number: 50243

GSI Job No.	6932	Drawn By:	CDM
Map ID:	005_10	Chk'd By:	MW
Issued:	9-Aug-2024	Aprv'd By:	JMM
Scale:	Not to Scale		**FIGURE V.A.10c**

SANITARY SEWER LIFT STATION #1 OVERFLOW

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Inc., Alvin, Texas

Attachment C.7 page 4 of 4
RCRA Permit Renewal Application
Ascend Performance Materials LLC, Alvin, Texas
RCRA Permit No. HW-50189-000



10	DMZ 2-02-12 REPLACED MONSANTO NAME WITH ASCEND
	3/96 REDRAWN

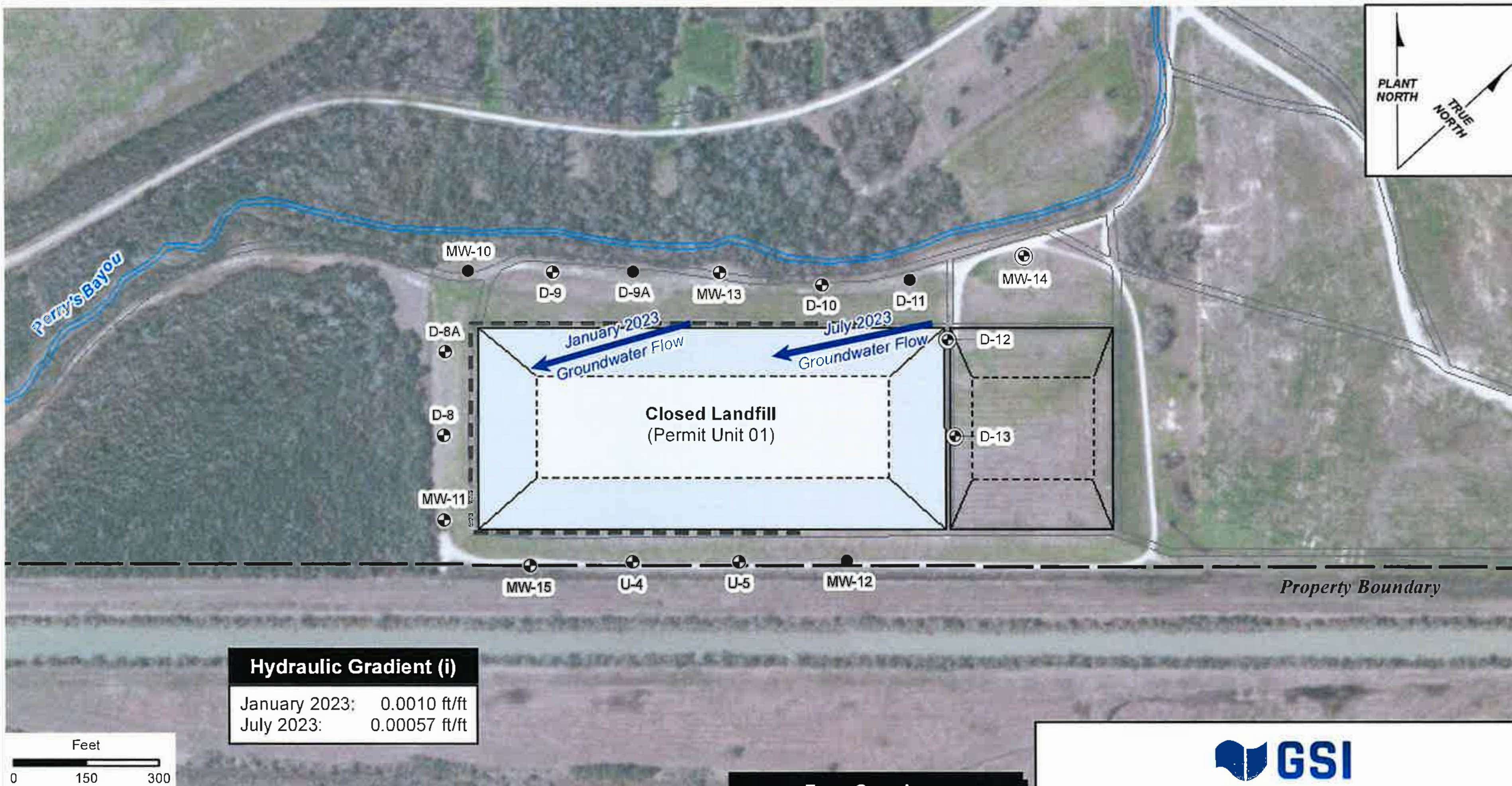
Ascend Performance Materials
CHOCOLATE BAYOU PLANT
ALVIN, TEXAS
COMPANY CONFIDENTIAL
COMPANY ASCEND PLANT CHOCOLATE BAYOU
WASTE WATER SEWER MAINS
NON-MANUFACTURING AREAS

SIZE	ZONE	TYPE	NUMBER	REV
D	334	PS	38	10

PLANT DRAWING NO. 334 PS-38

PLOTTED ON AND AT: 13-MAR-1996 11:22 PLOTTED BY: QPLYNG

GSI ENVIRONMENTAL Texas Geoscience Firm Registration Number: 50243					
	GSI Job No.	6932	Drawn By:	CDM	**WASTE WATER SEWER MAINS NON-MANUFACTURING AREAS**
	Map ID:	005_10	Chk'd By:	MW	**Hazardous Waste Permit Renewal Application**
	Issued:	9-Aug-2024	Aprv'd By:	JMM	Hazardous Waste Permit No. 50189
	Scale:	Not to Scale	**FIGURE V.A.10d**		Ascend Performance Materials Inc., Alvin, Texas



LEGEND

- Point of Compliance monitoring well location
- Background monitoring well location (not sampled, gauged for water level only)
- Observation well location (not sampled, gauged for water level only)
- Point of Compliance
- Representative groundwater flow direction during semi-annual static water level surveys (see Figures 4 and 5)

Notes

1. Only wells in the Groundwater Detection Monitoring Program are shown.
2. Projected Coordinate System: NAD 1983, State Plane Texas South Central 4204 (ft).
3. Background Imagery: USGS Topo Maps (Map Service) represents U.S. Geological Survey Map, Mustang Bayou, Texas (1974) and Hoskins Mound, Texas (1974); Quadrangle: 7.5 minute.
4. Boundaries and roads from the 1992 basemap may not match the locations physically observed on the land surface, as roads and surfaces may have not been accurately surveyed in 1992 or those features may have changed over time.

Texas Geoscience
Firm Registration No. 50243

STATE OF TEXAS
DANIELLE M. KINGHAM
GEOLOGY
11084
LICENSED
PROFESSIONAL GEOSCIENTIST

Signature: DMKingham
Date: 3/1/2024

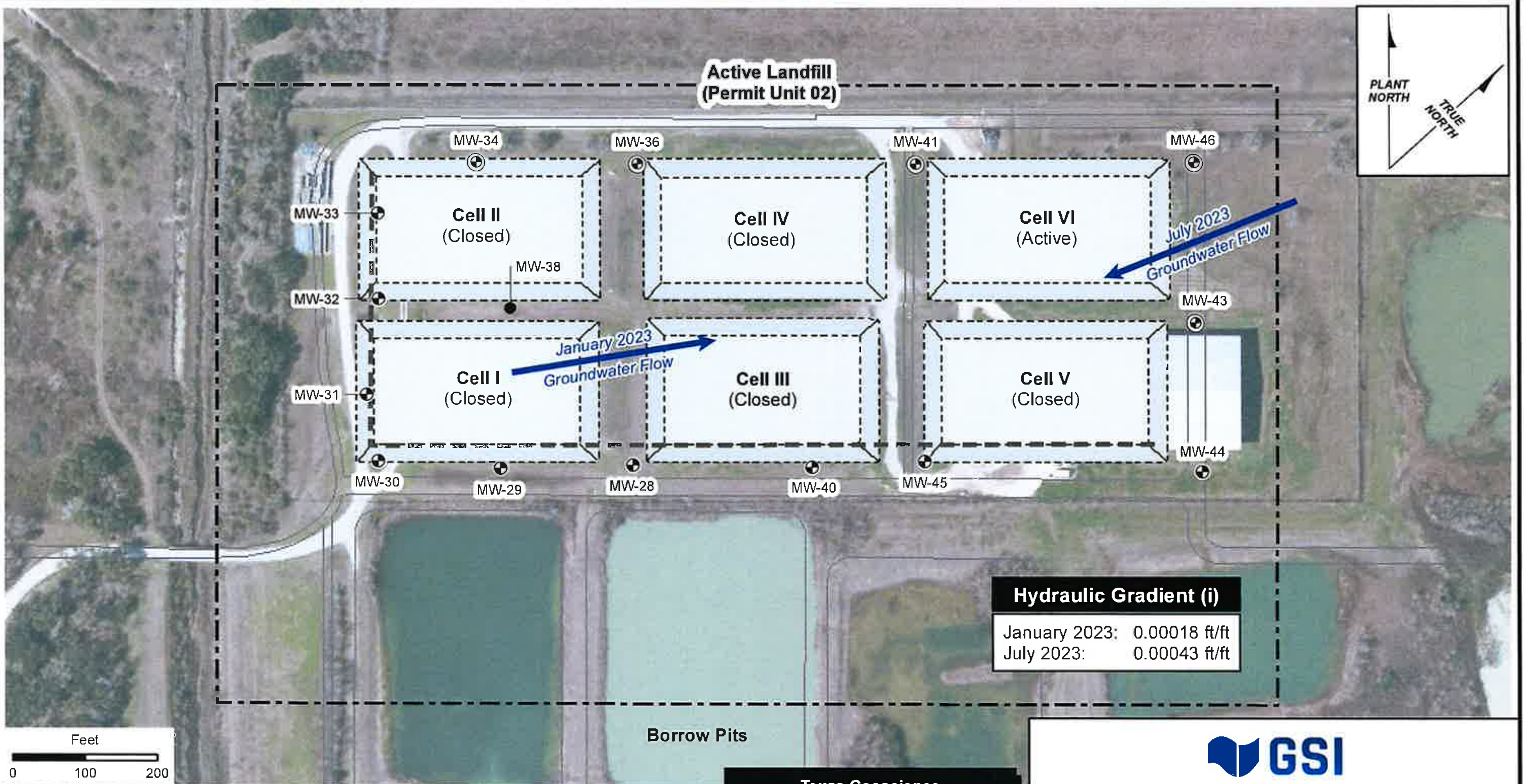
GSI ENVIRONMENTAL
Texas Registration Number: F-1198

MONITORING WELL NETWORK AND 2023 GROUNDWATER FLOW DIRECTIONS: CLOSED LANDFILL

Groundwater Detection Monitoring Program
Ascend Performance Materials Texas Inc., Alvin, Texas
Hazardous Waste Permit No. 50189

GSI Job No.	6476	Drawn By:	CDM
Issued:	1-Mar-2024	Chk'd By:	EGK
Map ID:	001_02	Appv'd By:	DBK

FIGURE 2



LEGEND

Point of Compliance monitoring well location	Point of Compliance
Background monitoring well location (not sampled, gauged for water level only)	Boundary of permitted area
Observation well location (not sampled, gauged for water level only)	Representative groundwater flow direction during semi-annual static water level surveys (see Figures 4 and 5)

Notes

1. Cells I, II, III, IV, and V are closed.
2. Cell VI is currently accepting waste.
3. Projected Coordinate System: NAD 1983, State Plane Texas South Central 4204 (ft).
4. Background Imagery: USGS Topo Maps (Map Service) represents U.S. Geological Survey Map, Mustang Bayou, Texas (1974) and Hoskins Mound, Texas (1974); Quadrangle: 7.5 minute.
5. Boundaries and roads from the 1992 basemap may not match the locations physically observed on the land surface, as roads and surfaces may have not been accurately surveyed in 1992 or those features may have changed over time.

Texas Geoscience Firm Registration No. 50243

STATE OF TEXAS
DANIELLE M. KINGHAM
GEOLOGY
11084
LICENSED
PROFESSIONAL GEOSCIENTIST

Signature: DMKingham
Date: 3/1/2024

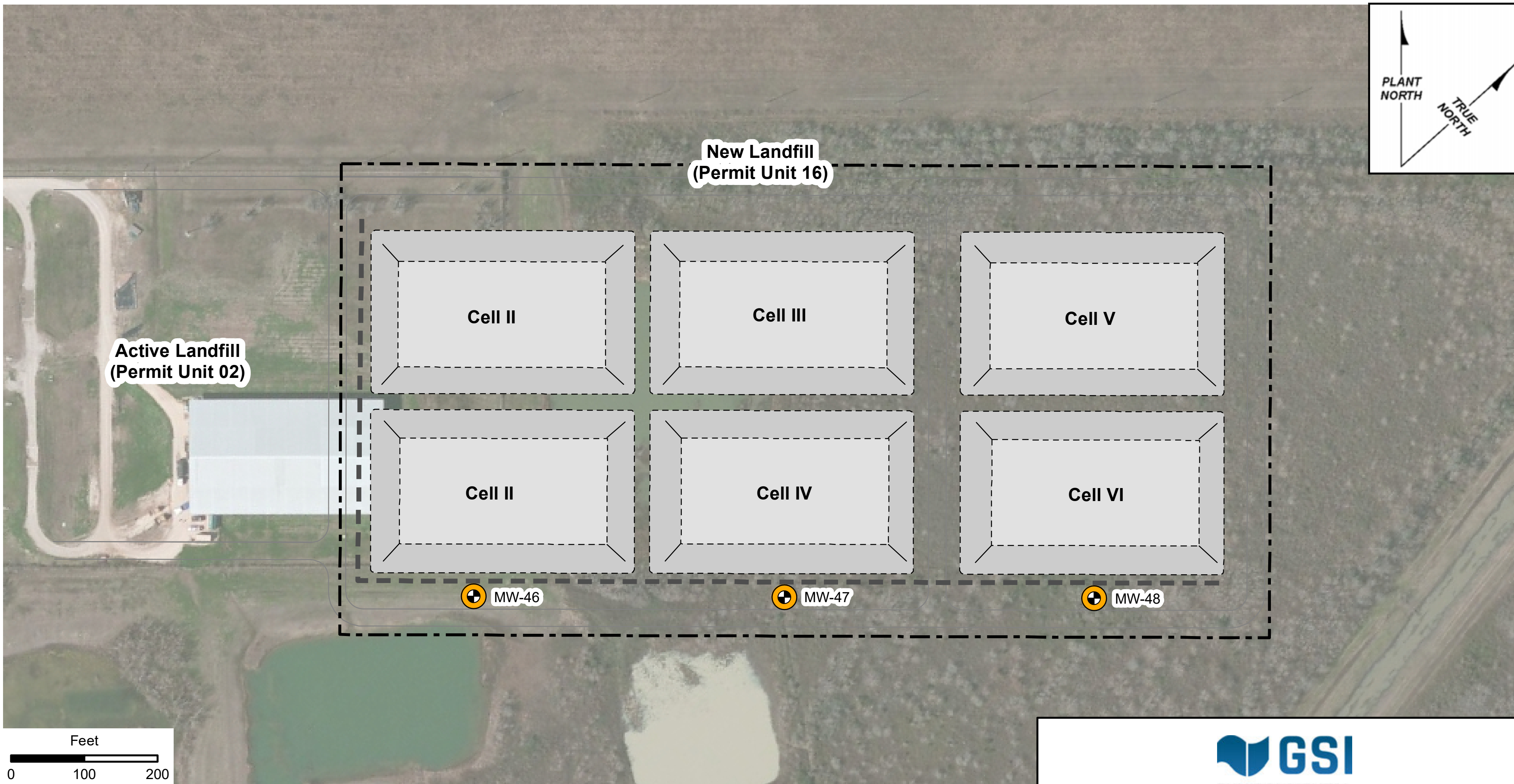
GSI ENVIRONMENTAL
Texas Registration Number: F-1198

MONITORING WELL NETWORK AND 2023 GROUNDWATER FLOW DIRECTIONS: ACTIVE LANDFILL

Groundwater Detection Monitoring Program
Ascend Performance Materials Texas Inc., Alvin, Texas
Hazardous Waste Permit No. 50189

GSI Job No.	6476	Drawn By:	CDM
Issued:	1-Mar-2024	Chk'd By:	EGK
Map ID:	001_03	Appv'd By:	DBK

FIGURE 3



LEGEND

- Proposed Point of Compliance monitoring well location
- Point of Compliance
- Boundary of permitted area

Notes

1. Projected Coordinate System: NAD 1983, State Plane Texas South Central 4204 (ft).
2. Background Imagery: USGS Topo Maps (Map Service) represents U.S. Geological Survey Map, Mustang Bayou, Texas (1974) and Hoskins Mound, Texas (1974); Quadrangle: 7.5 minute.
3. Boundaries and roads from the 1992 basemap may not match the locations physically observed on the land surface, as roads and surfaces may have not been accurately surveyed in 1992 or those features may have changed over time.

GSI ENVIRONMENTAL

Texas Geoscience Firm Registration Number: 50243

MONITORING WELL NETWORK FOR NEW LANDFILL (PERMIT UNIT 16)

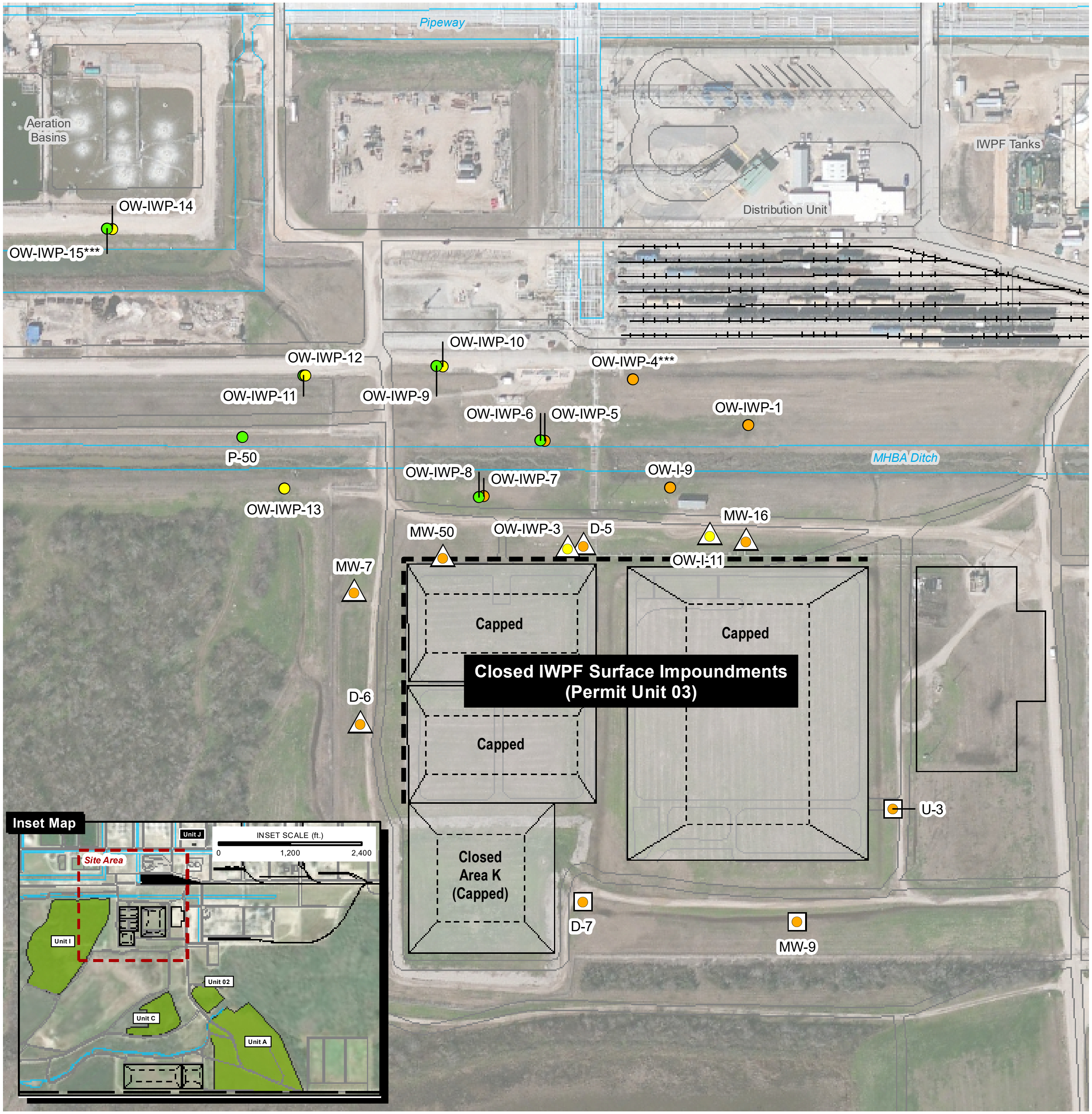
Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189

Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No.	6932	Drawn By:	CDM
Issued:	9-Aug-2024	Chk'd By:	MW
Map ID:	005_13	Appv'd By:	JMM

FIGURE V.A.13



PLANT NORTH

TRUE NORTH

LEGEND

- Point of Compliance well location
- Corrective Action Observation well location
- Background well location
- Well location: screened in the Upper Zone of the GWBU
- Well location: screened in the Middle Zone of the GWBU
- Well location: screened in the Lower Zone of the GWBU
- Point of Compliance for Closed IWPF Surface Impoundments

Feet

0 120 240

Notes:

1. GWBU = Groundwater bearing unit.
2. *** = Wells may be removed from the compliance plan and will not be included in regular monitoring.
3. PCS: NAD 1983, STP Texas South Central 4204 (ft).
4. Basemaps compiled from Solutia drawing No. 340GA2 issued 4-June-1992, and aerial photographs obtained from Aerial Viewpoint, Inc., Negative No. 87B-1922, flight date April-1987, and Negative No. 2, flight date 26-January-1993.
5. Boundaries and roads from the 1992 basemap may not match the locations physically observed on the land surface, as roads and surfaces may have not been accurately surveyed in 1992 or those features may have changed over time.

GSI ENVIRONMENTAL

Texas Geoscience Firm Registration Number: 50243

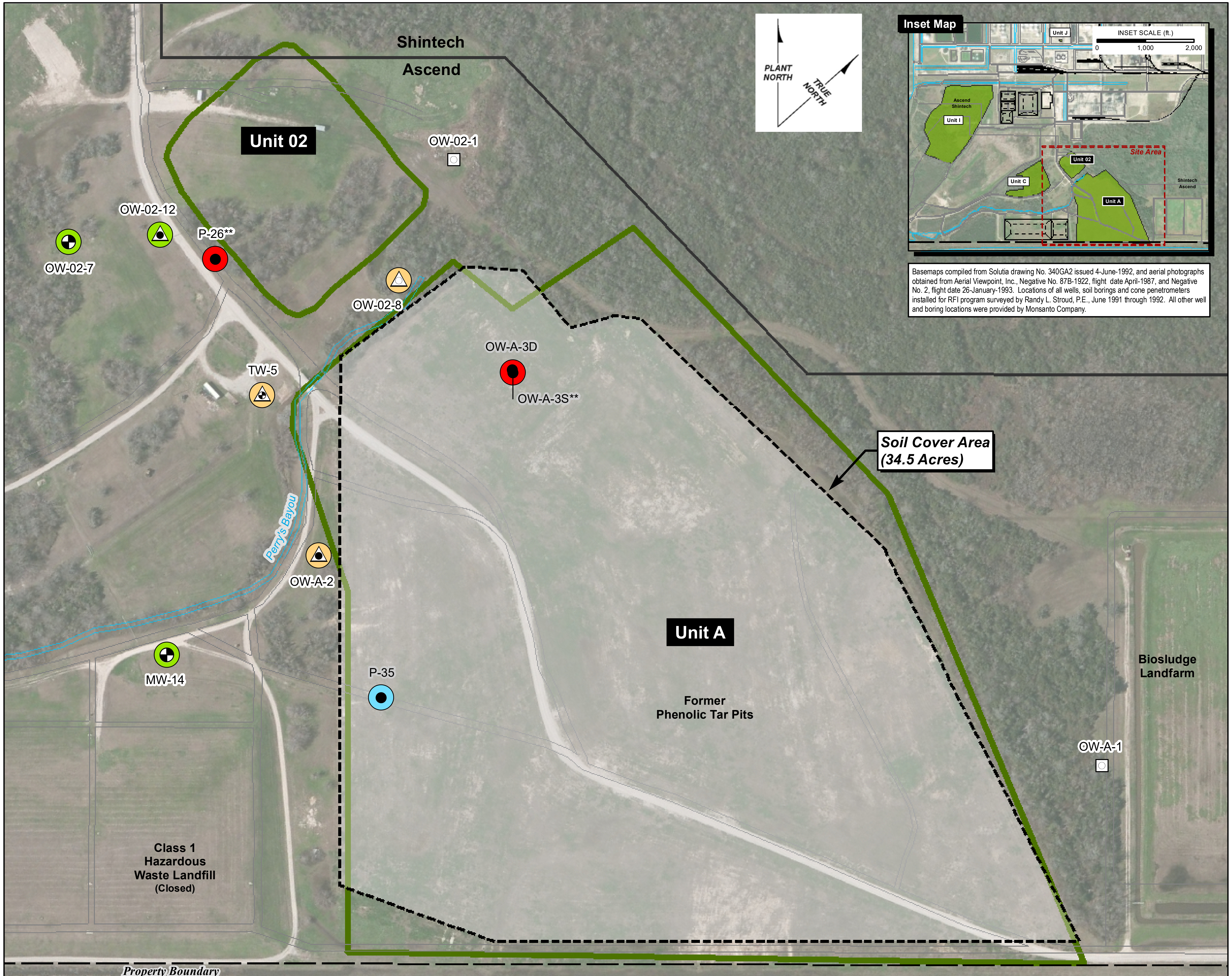
LOCATION OF PERMIT UNIT 03 (CLOSED IWPF SURFACE IMPOUNDMENTS) AND LAYOUT OF GROUNDWATER CORRECTIVE ACTION MONITORING SYSTEM

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189

Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No.: 6932	Drawn by: CDM	**FIGURE V.A.14**
Date: 9-Aug-2024	Chk'd by: MW	
Revised:	Appv'd by: JMM	Map ID: 005_14



LEGEND

- Point of Compliance well location
- Corrective Action Observation well location
- Background well location
- Plume stability monitoring well
- Concentration trend monitoring well
- Existing monitoring well not included in regular sampling program
- Benzene not detected above the sample detection limit specified during most recent sampling event
- Benzene detected below GWPS during most recent sampling event
- Benzene detected above GWPS during most recent sampling event
- NAPL present during most recent sampling event
- Unit A and Unit 02 boundaries
- Soil cover area

Notes

1. * = Duplicate samples taken; ** = NAPL well.
2. GWPS = Groundwater Protection Standard.
3. NAPL = Non-aqueous phase liquid.
4. PCS: NAD 1983, STP Texas South Central 4204 (ft).
5. Boundaries and roads from the 1992 basemap may not match the locations physically observed on the land surface, as roads and surfaces may have not been accurately surveyed in 1992 or those features may have changed over time.

Feet
0 100 200

Projected Coordinate System
Datum: NAD 1983
UTM: Zone 18N (meters)

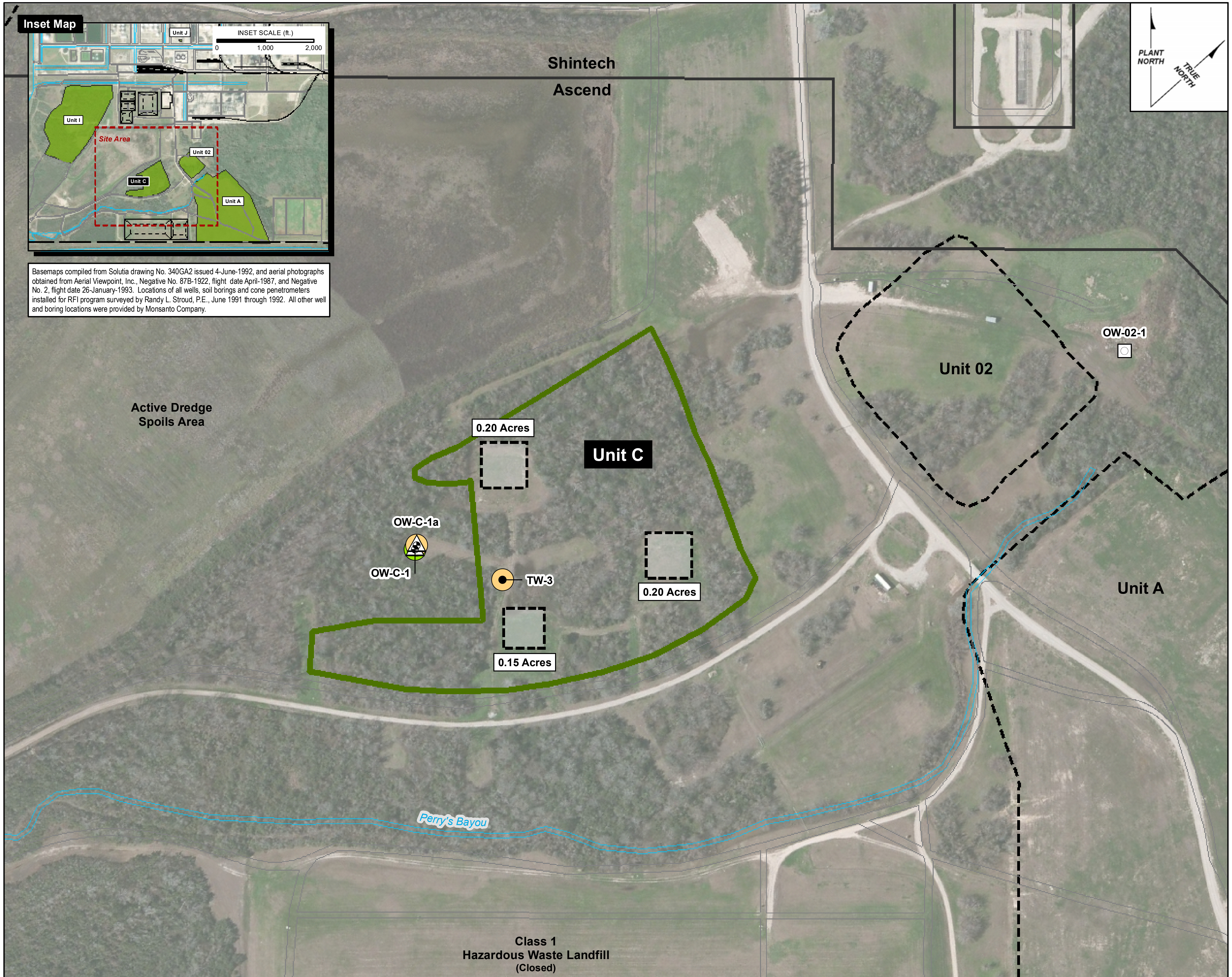
GSI ENVIRONMENTAL
Texas Geoscience Firm Registration Number: 50243

LOCATION OF UNIT A AND LAYOUT OF GROUNDWATER CORRECTIVE ACTION MONITORING SYSTEM

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No. 6932	Drawn By: CDM
Issued: 9-Aug-2024	Chk'd By: MW
Map ID: 005_15	Appv'd By: JMM

FIGURE V.A.15



LEGEND

- Point of Compliance well location
- Background well location
- Corrective Action Observation well location
- Plume stability monitoring well
- Concentration trend monitoring well
- No COCs detected above the detection limit specified: January 2023
- No COCs detected above GWPS: January 2023
- One or more COCs detected above GWPS: January 2023
- Unit C boundary
- Other Solid Waste Management Unit (SWMU) boundary
- Soil cover area

Notes

1. GWPS = Groundwater Protection Standard.
2. COC = Constituent of Concern.
3. PCS: NAD 1983, STP Texas South Central 4204 (ft).
4. Boundaries and roads from the 1992 basemap may not match the locations physically observed on the land surface, as roads and surfaces may have not been accurately surveyed in 1992 or those features may have changed over time.

Feet

0 100 200

Projected Coordinate System
Datum: NAD 1983
UTM: Zone 18N (meters)

GSI ENVIRONMENTAL
Texas Geoscience Firm Registration Number: 50243

LOCATION OF UNIT C AND LAYOUT OF GROUNDWATER CORRECTIVE ACTION MONITORING SYSTEM

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No.	6932	Drawn By:	CDM
Issued:	9-Aug-2024	Chk'd By:	MW
Map ID:	005_16	Appv'd By:	JMM

FIGURE V.A.16

Basemaps compiled from Solutia drawing No. 340GA2 issued 4-June-1992, and aerial photographs obtained from Aerial Viewpoint, Inc., Negative No. 87B-1922, flight date April-1987, and Negative No. 2, flight date 26-January-1993. Locations of all wells, soil borings and cone penetrometers installed for RFI program surveyed by Randy L. Stroud, P.E., June 1991 through 1992. All other well and boring locations were provided by Monsanto Company.

LEGEND

- Point of Compliance well location
- Background well location
- Corrective Action Observation well location
- Plume stability monitoring well
- Concentration trend monitoring well
- No COCs detected above the detection limit specified: January 2023
- No COCs detected above GWPS: January 2023
- One or more COCs detected above GWPS: January 2023
- Unit I boundary
- Other Solid Waste Management Unit (SWMU) boundary
- Soil cover area

Notes

1. GWPS = Groundwater Protection Standard.
2. NAPL = Non-aqueous Phase Liquid.
3. COC = Constituent of Concern.
4. ** = Historically a NAPL well; *** = Wells may be removed from the compliance plan and will not be included in regular monitoring.
5. PCS: NAD 1983, STP Texas South Central 4204 (ft).
6. Boundaries and roads from the 1992 basemap may not match the locations physically observed on the land surface, as roads and surfaces may have not been accurately surveyed in 1992 or those features may have changed over time.

Feet
0 100 200

Projected Coordinate System
Datum: NAD 1983
UTM: Zone 18N (meters)

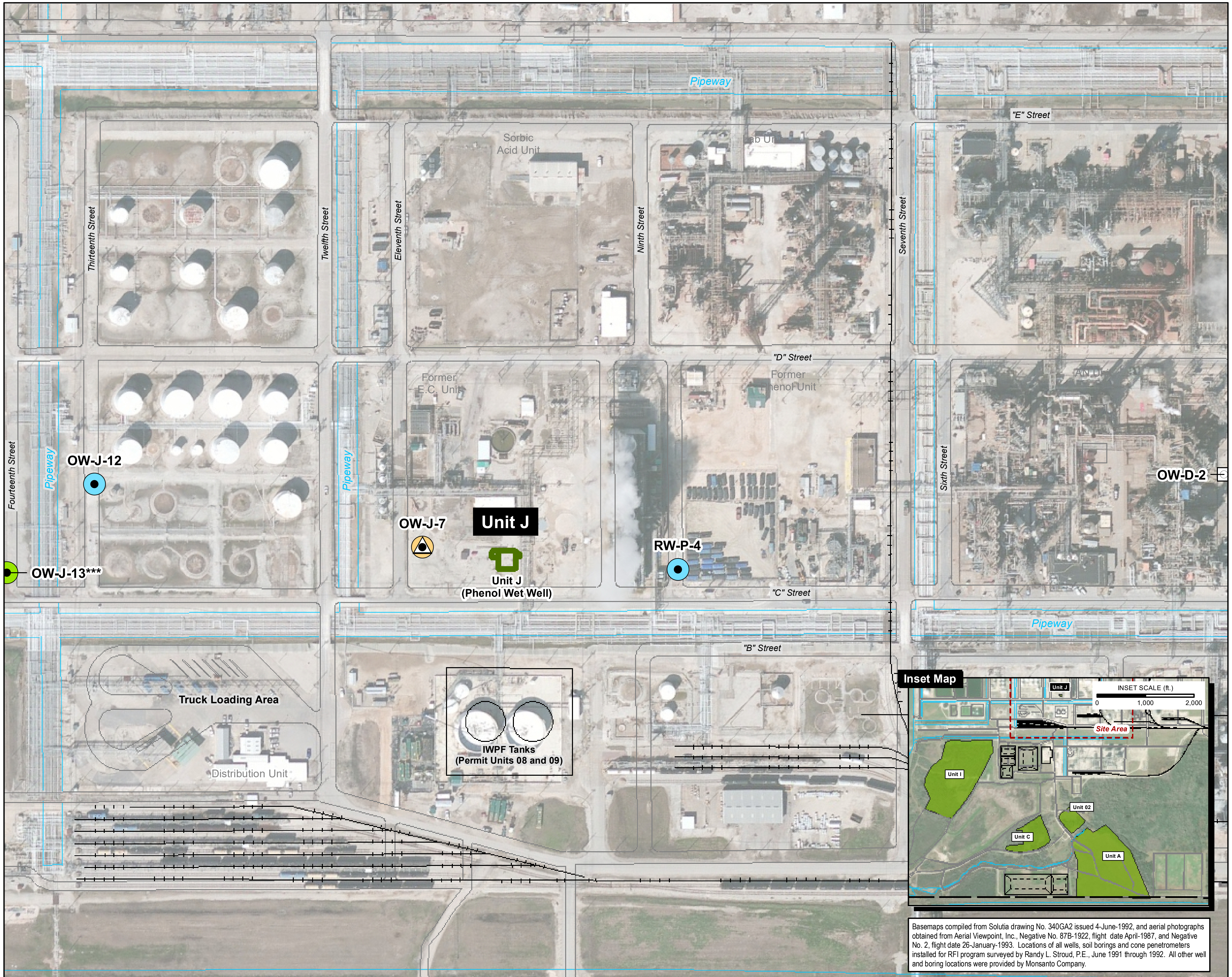
GSI ENVIRONMENTAL
Texas Geoscience Firm Registration Number: 50243

LOCATION OF UNIT I AND LAYOUT OF GROUNDWATER CORRECTIVE ACTION MONITORING SYSTEM

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No.	6932	Drawn By:	CDM
Issued:	9-Aug-2024	Chk'd By:	MW
Map ID:	005_17	Appv'd By:	JMM

FIGURE V.A.17



Basemaps compiled from Solutia drawing No. 340GA2 issued 4-June-1992, and aerial photographs obtained from Aerial Viewpoint, Inc., Negative No. 87B-1922, flight date April-1987, and Negative No. 2, flight date 26-January-1993. Locations of all wells, soil borings and cone penetrometers installed for RFI program surveyed by Randy L. Stroud, P.E., June 1991 through 1992. All other well and boring locations were provided by Monsanto Company.

PLANT NORTH

TRUE NORTH

LEGEND

- Point of Compliance well location
- Background well location
- Corrective Action Observation well location
- Plume stability monitoring well
- Concentration trend monitoring well
- No COCs detected above the detection limit specified: January 2023
- No COCs detected above GWPS: January 2023
- One or more COCs detected above GWPS: January 2023
- Unit J boundary

Notes

1. GWPS = Groundwater Protection Standard.
2. COC = Constituent of Concern.
3. *** = Wells may be removed from the compliance plan and will not be included in regular monitoring.
4. PCS: NAD 1983, STP Texas South Central 4204 (ft).
5. Boundaries and roads from the 1992 basemap may not match the locations physically observed on the land surface, as roads and surfaces may have not been accurately surveyed in 1992 or those features may have changed over time.

Feet

0 100 200

Projected Coordinate System
Datum: NAD 1983
UTM: Zone 18N (meters)

GSI ENVIRONMENTAL

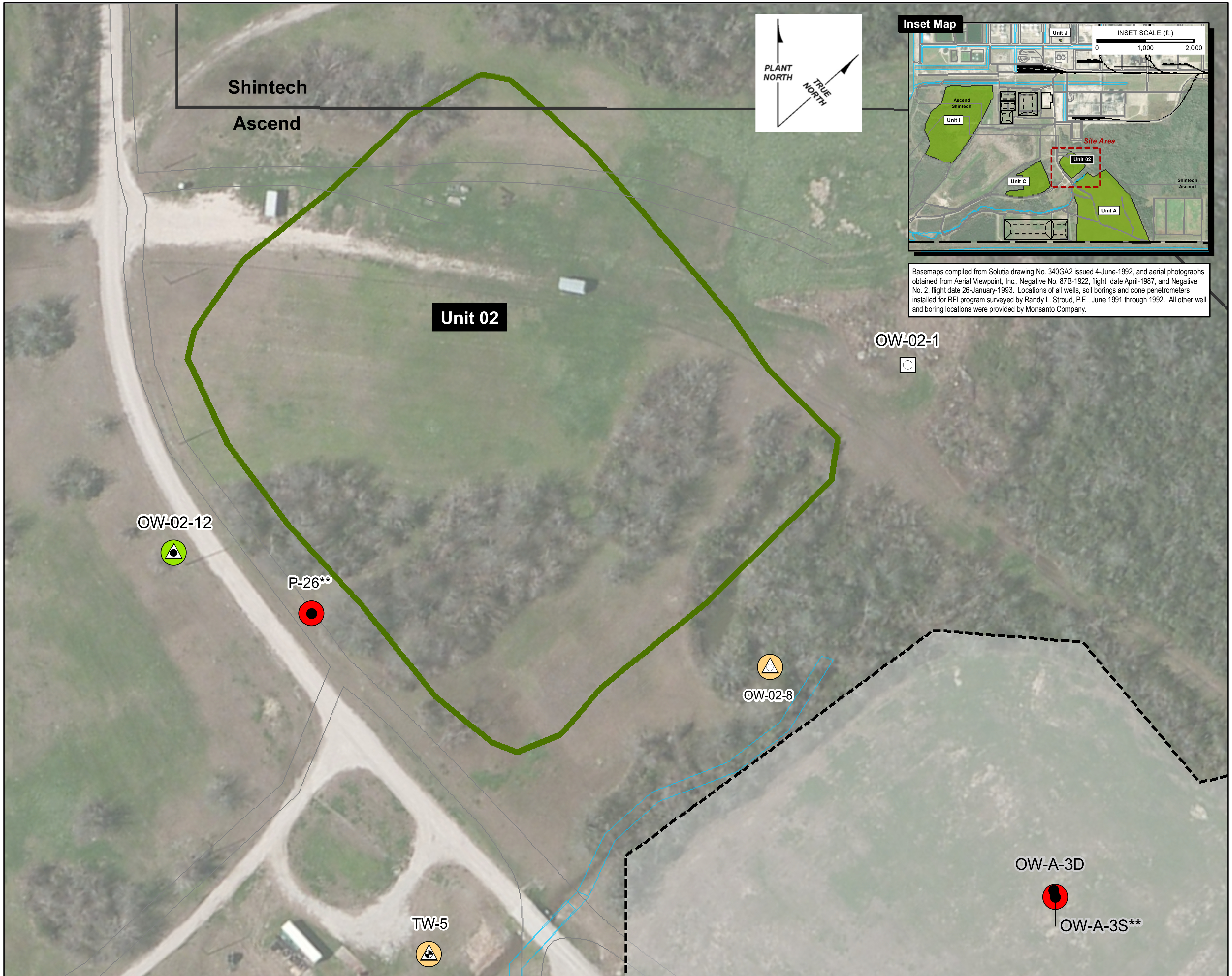
Texas Geoscience Firm Registration Number: 50243

LOCATION OF UNIT J AND LAYOUT OF GROUNDWATER CORRECTIVE ACTION MONITORING SYSTEM

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No. 6932	Drawn By: CDM
Issued: 9-Aug-2024	Chk'd By: MW
Map ID: 005_18	Appv'd By: JMM

FIGURE V.A.18



LEGEND

- Point of Compliance well location
- Corrective Action Observation well location
- Background well location
- Plume stability monitoring well
- Concentration trend monitoring well
- Existing monitoring well not included in regular sampling program
- Benzene not detected above the sample detection limit specified during most recent sampling event
- Benzene detected below GWPS during most recent sampling event
- Benzene detected above GWPS during most recent sampling event
- NAPL present during most recent sampling event
- Unit A and Unit 02 boundaries
- Soil cover area

Notes

1. * = Duplicate samples taken; ** = NAPL well.
2. GWPS = Groundwater Protection Standard.
3. NAPL = Non-aqueous phase liquid.
4. PCS: NAD 1983, STP Texas South Central 4204 (ft).
5. Boundaries and roads from the 1992 basemap may not match the locations physically observed on the land surface, as roads and surfaces may have not been accurately surveyed in 1992 or those features may have changed over time.

Feet
0 40 80

Projected Coordinate System
Datum: NAD 1983
UTM: Zone 18N (meters)

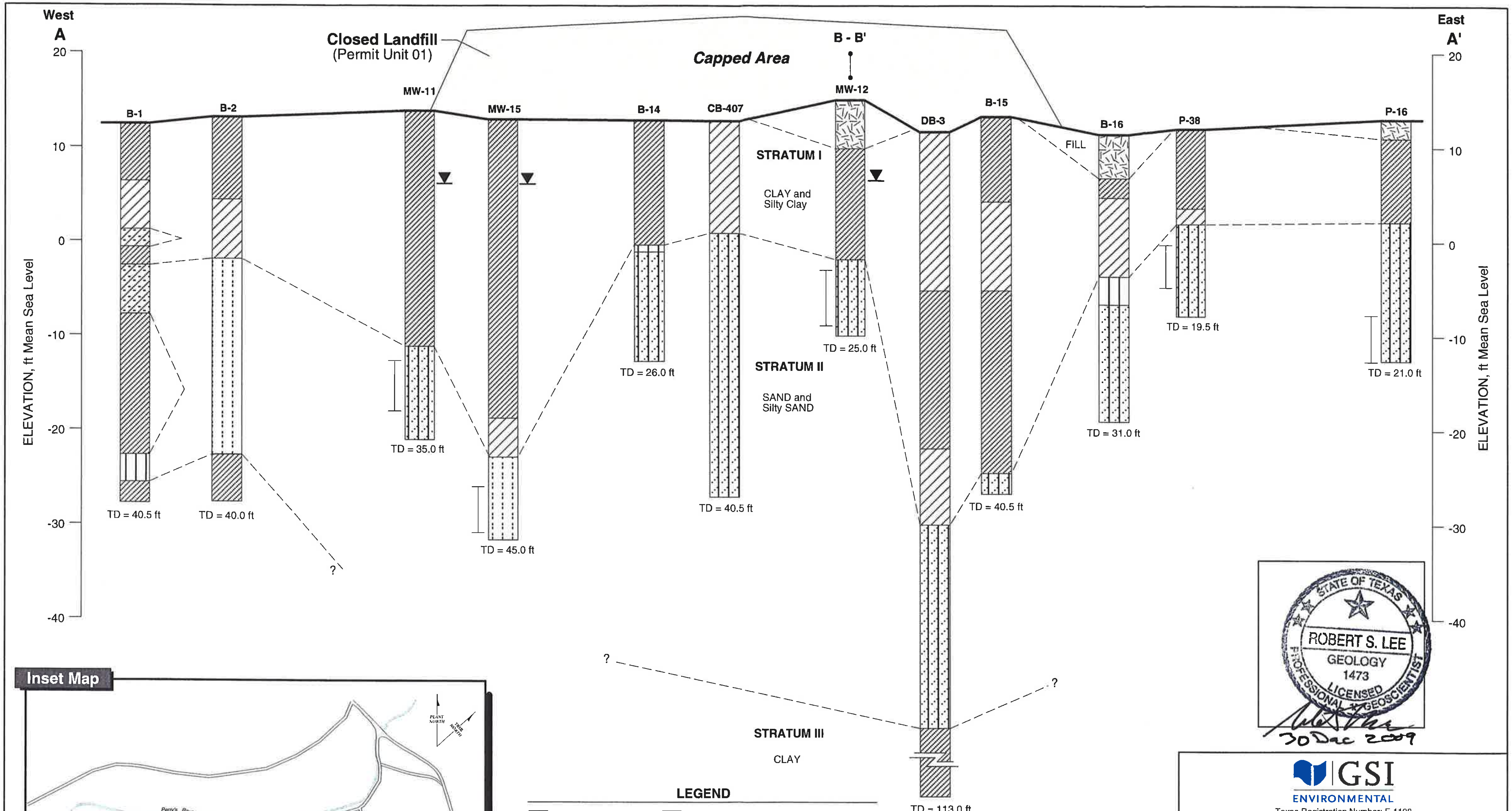
GSI ENVIRONMENTAL
Texas Geoscience Firm Registration Number: 50243

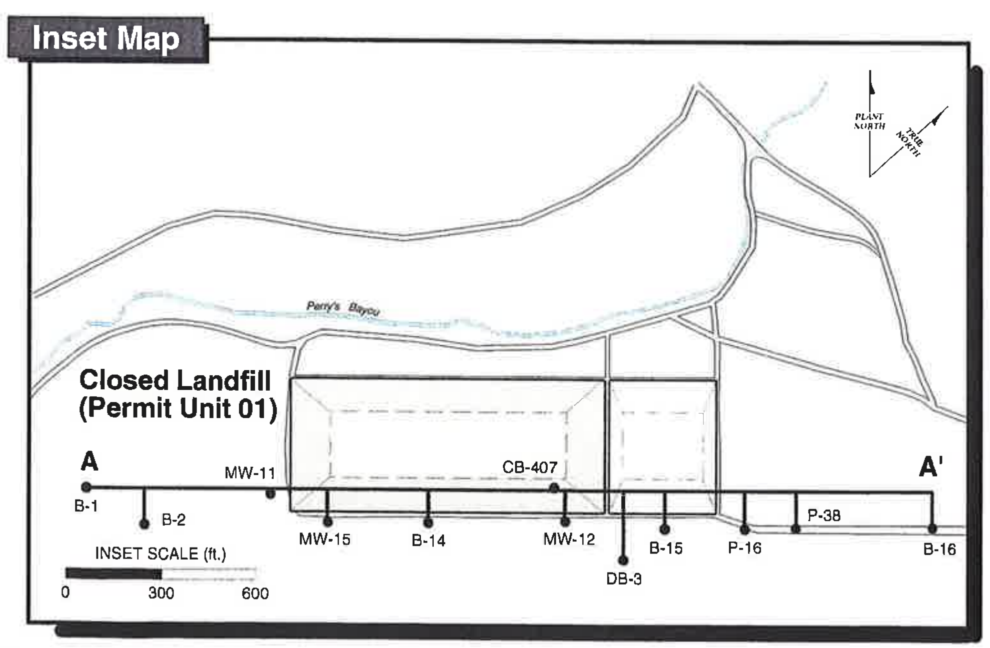
LOCATION OF UNIT 02 AND LAYOUT OF GROUNDWATER CORRECTIVE ACTION MONITORING SYSTEM

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No.	6932	Drawn By:	CDM
Issued:	9-Aug-2024	Chk'd By:	MW
Map ID:	005_19	Appv'd By:	JMM

FIGURE V.A.19





LEGEND

- FILL
- CLAY (CH)
- Silty CLAY (CL)
- SILT (ML)
- Poorly-graded SAND (SP)
- Clayey SAND (SC)
- Silty SAND (SM)
- Screened interval
- TD Total depth of boring ft below ground surface (BGS).
- Static water level, as measured on 19 July 2009. Water levels only reported for wells where water levels are collected semi-annually

HORIZONTAL SCALE, ft.

0 100 200 300 400

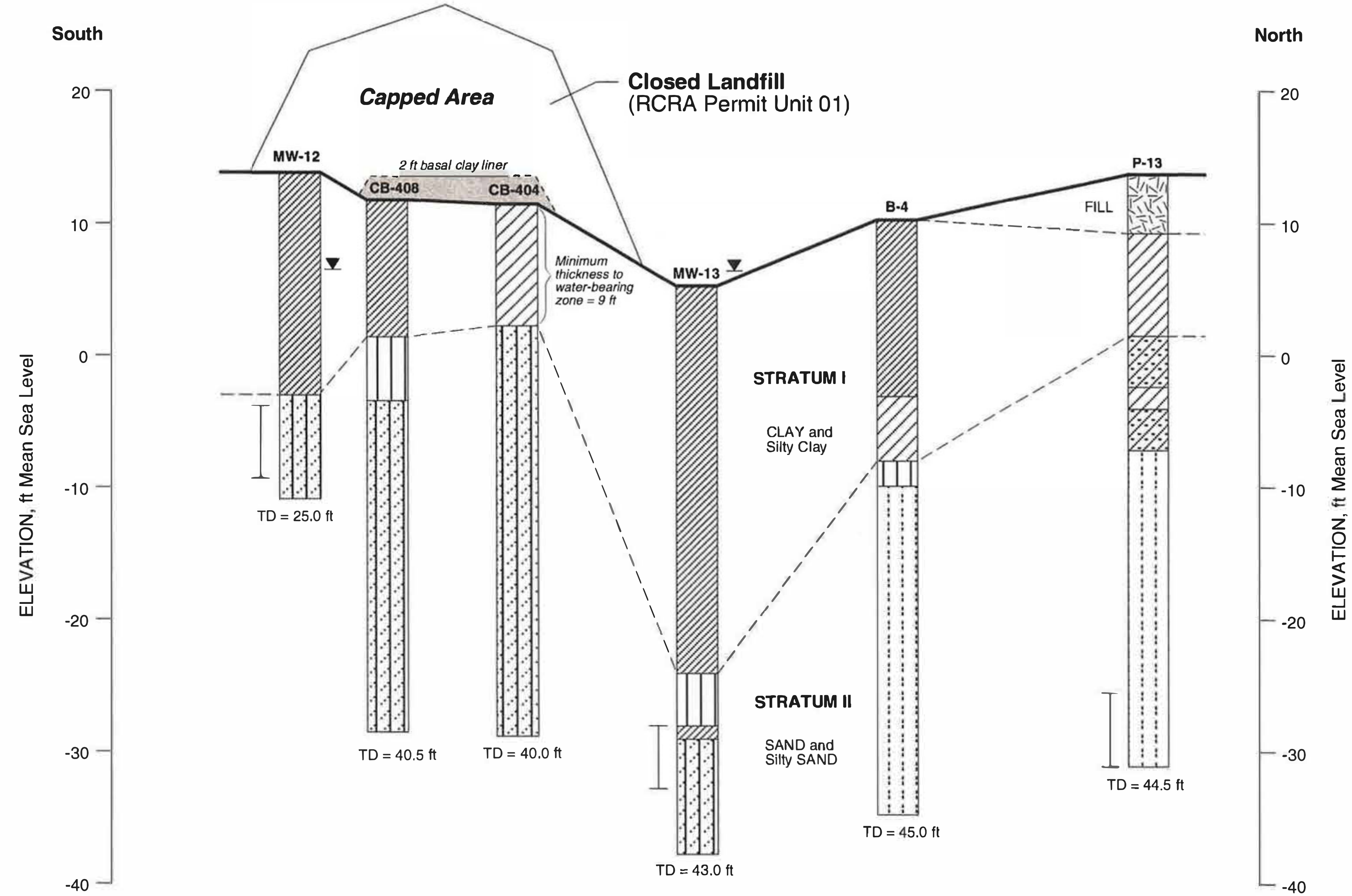
VERTICAL SCALE: 1 INCH = 10 ft
VERTICAL EXAGGERATION: 20X

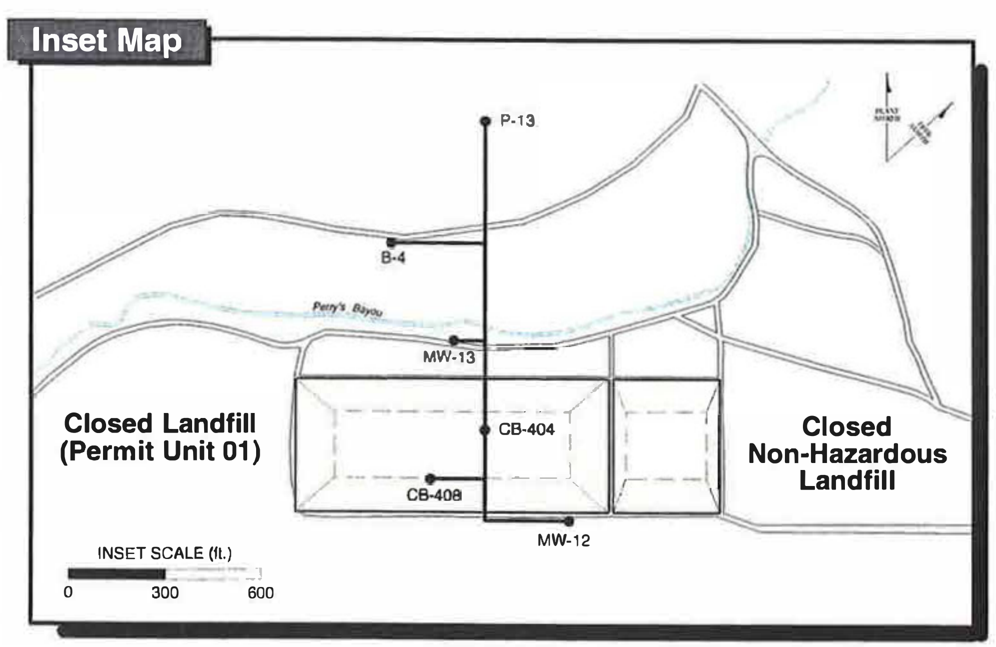
Note:
The upper casing for monitoring wells MW-12 and MW-15 have been extended due to cap construction.

GSI ENVIRONMENTAL
Texas Registration Number: F-1198

GEOLOGIC CROSS-SECTION
WEST-EAST ORIENTATION:
CLOSED LANDFILL (PERMIT UNIT 01)
RCRA Permit Renewal Application
RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

GSI Job No:	G-3379	Drawn By:	DLB
Issued:	31-Dec-09	Chk'd By:	JMM
Revised:	——	Appv'd By:	RSL
Scale:	As Shown		**FIGURE VI.8**





HORIZONTAL SCALE, ft.

0 100 200 300 400

VERTICAL SCALE: 1 INCH = 10 ft
VERTICAL EXAGGERATION: 20X

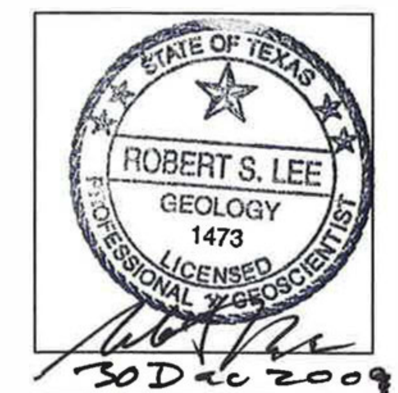
Note:

1) The upper casing for monitoring well MW-12 has been extended due to cap construction.

2) Groundwater elevation for MW-13 is above ground surface elevation; however, not above the top of casing elevation.

LEGEND

- FILL
- CLAY (CH)
- Silty CLAY (CL)
- SILT (ML)
- Poorly-graded SAND (SP)
- Clayey SAND (SC)
- Silty SAND (SM)
- Screened interval
- TD Total depth of boring ft below ground surface (BGS).
- ▼ Static water level, as measured on 19 July 2009. Water levels only reported for wells where water levels are collected semi-annually



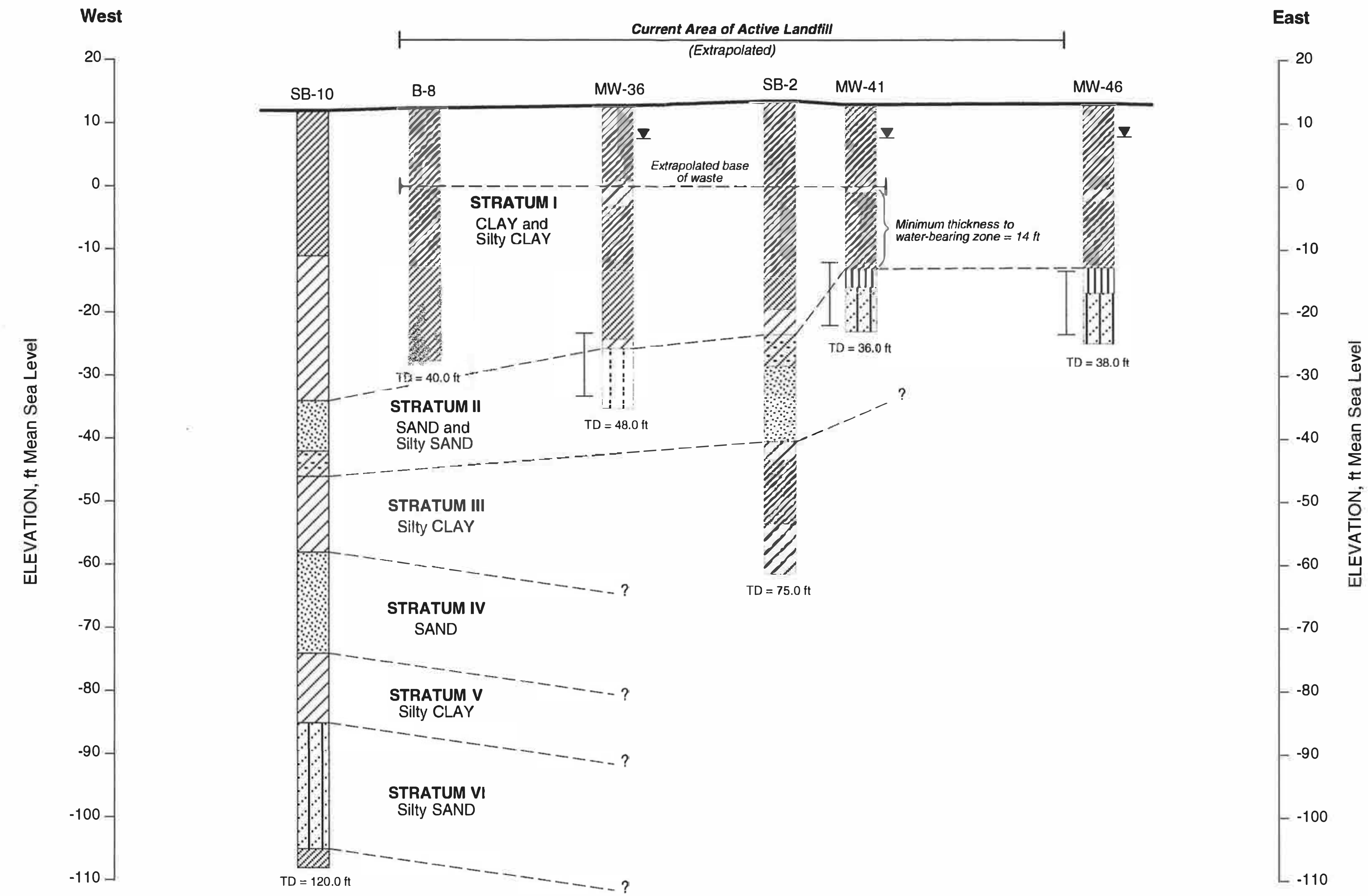
GSI ENVIRONMENTAL
Texas Registration Number: F-1198

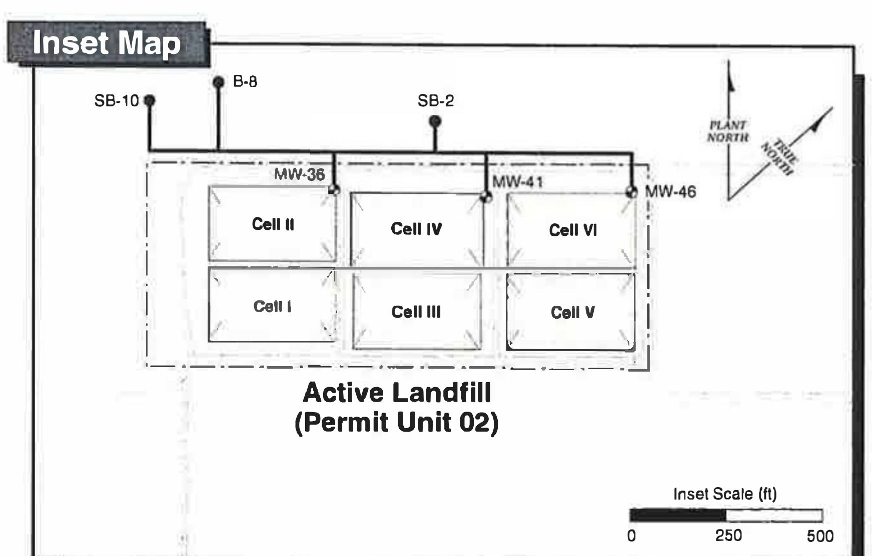
GEOLOGIC CROSS-SECTION SOUTH-NORTH ORIENTATION: CLOSED LANDFILL (PERMIT UNIT 01)

RCRA Permit Renewal Application
RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

GSI Job No:	G-3379	Drawn By:	DLB
Issued:	31-Dec-09	Chk'd By:	JMM
Revised:	———	Appv'd By:	RSL
Scale:	As Shown		FIGURE VI.9

FIGURE V.A.21, previously submitted as Figure VI.9





STATE OF TEXAS
ROBERT S. LEE
GEOLOGY
1473
LICENSED
PROFESSIONAL GEOSCIENTIST
30 Dec 2009

LEGEND

- CLAY (CH)
- Silty CLAY (CL)
- SAND (SW)
- Poorly-graded SAND (SP)
- SILT (ML)
- Clayey SAND (SC)
- Silty SAND (SM)
- Screened interval
- TD Total depth of boring ft below ground surface (BGS).
- Static water level, as measured on 19 July 2009. Water levels only reported for wells where water levels are collected semi-annually

HORIZONTAL SCALE, ft.

0 100 200 300 400

VERTICAL SCALE: 1 INCH = 10 ft
VERTICAL EXAGGERATION: 20X

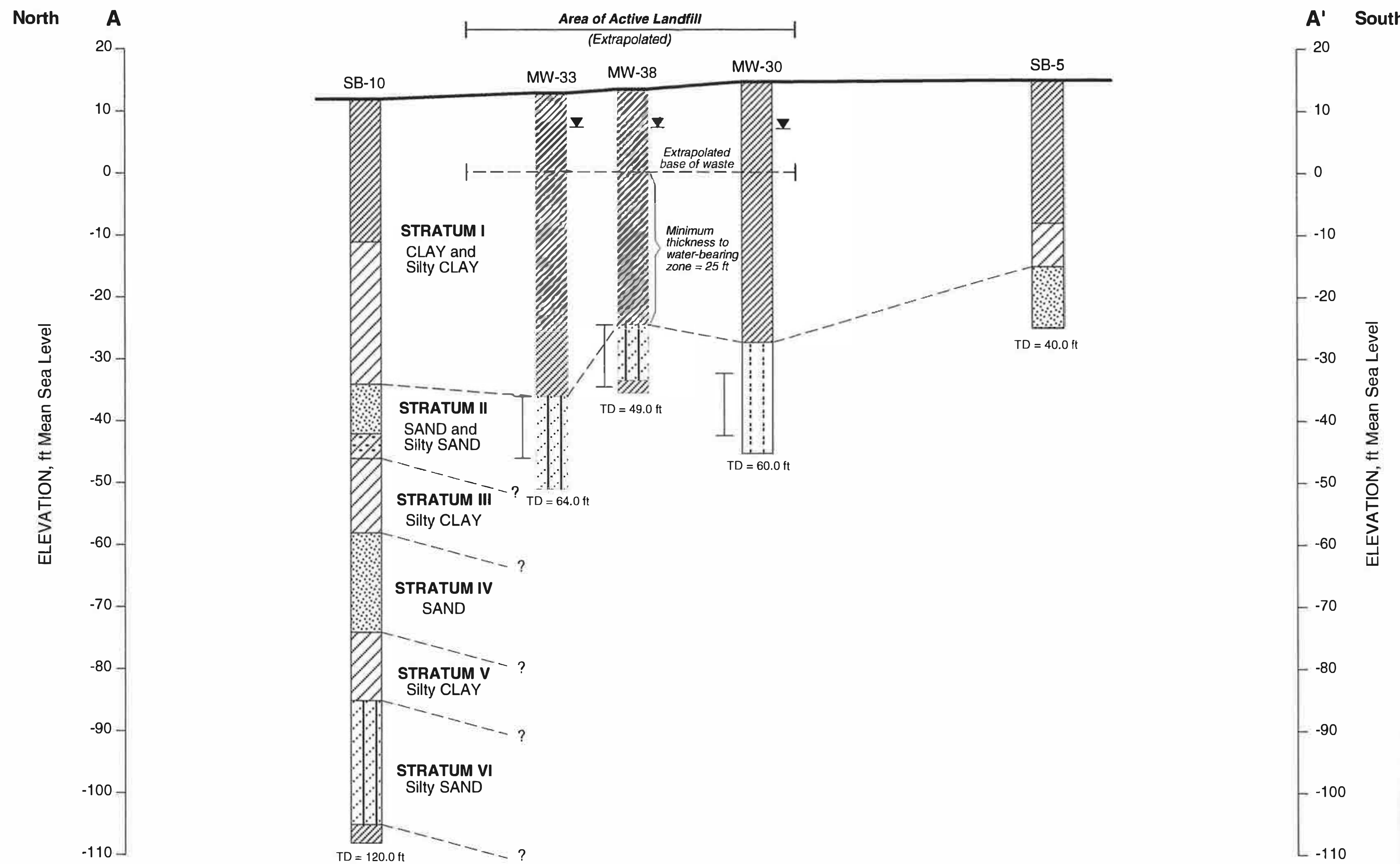
GSI ENVIRONMENTAL
Texas Registration Number: F-1198

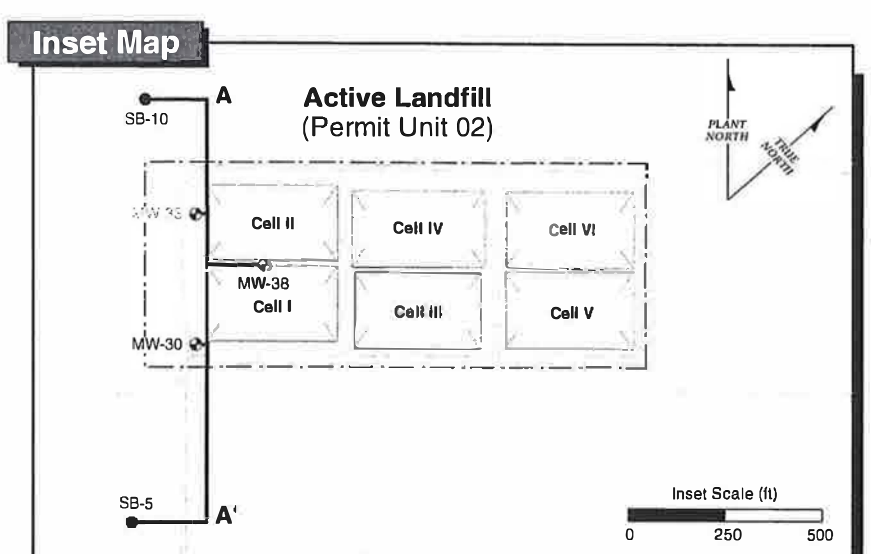
GEOLOGIC CROSS-SECTION WEST-EAST ORIENTATION: ACTIVE LANDFILL (PERMIT UNIT 02)

RCRA Permit Renewal Application
RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

GSI Job No:	G-3379	Drawn By:	DLB
Issued:	31-Dec-09	Chk'd By:	JMM
Revised:	———	Appv'd By:	RSL
Scale:	As Shown		**FIGURE VI.10**

FIGURE V.A.22, previously submitted as Figure VI.9





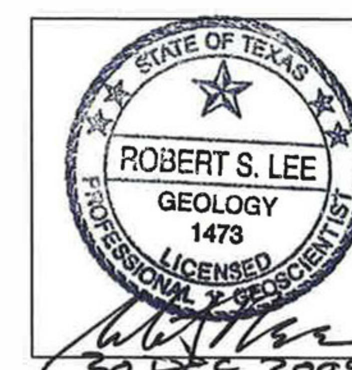
LEGEND

- CLAY (CH)
- Silty CLAY (CL)
- SAND (SW)
- Poorly-graded SAND (SP)
- Clayey SAND (SC)
- Silty SAND (SM)
- Screened interval
- TD Total depth of boring ft below ground surface (BGS).
- Static water level, as measured on 19 July 2009. Water levels only reported for wells where water levels are collected semi-annually

HORIZONTAL SCALE, ft.

0 100 200 300 400

VERTICAL SCALE: 1 INCH = 10 ft
VERTICAL EXAGGERATION: 20X



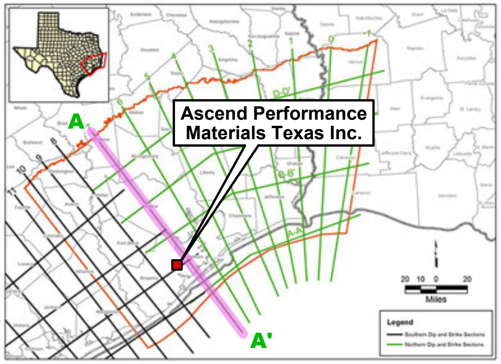
GSI ENVIRONMENTAL
Texas Registration Number: F-1198

GEOLOGIC CROSS-SECTION NORTH-SOUTH ORIENTATION: ACTIVE LANDFILL (PERMIT UNIT 02)

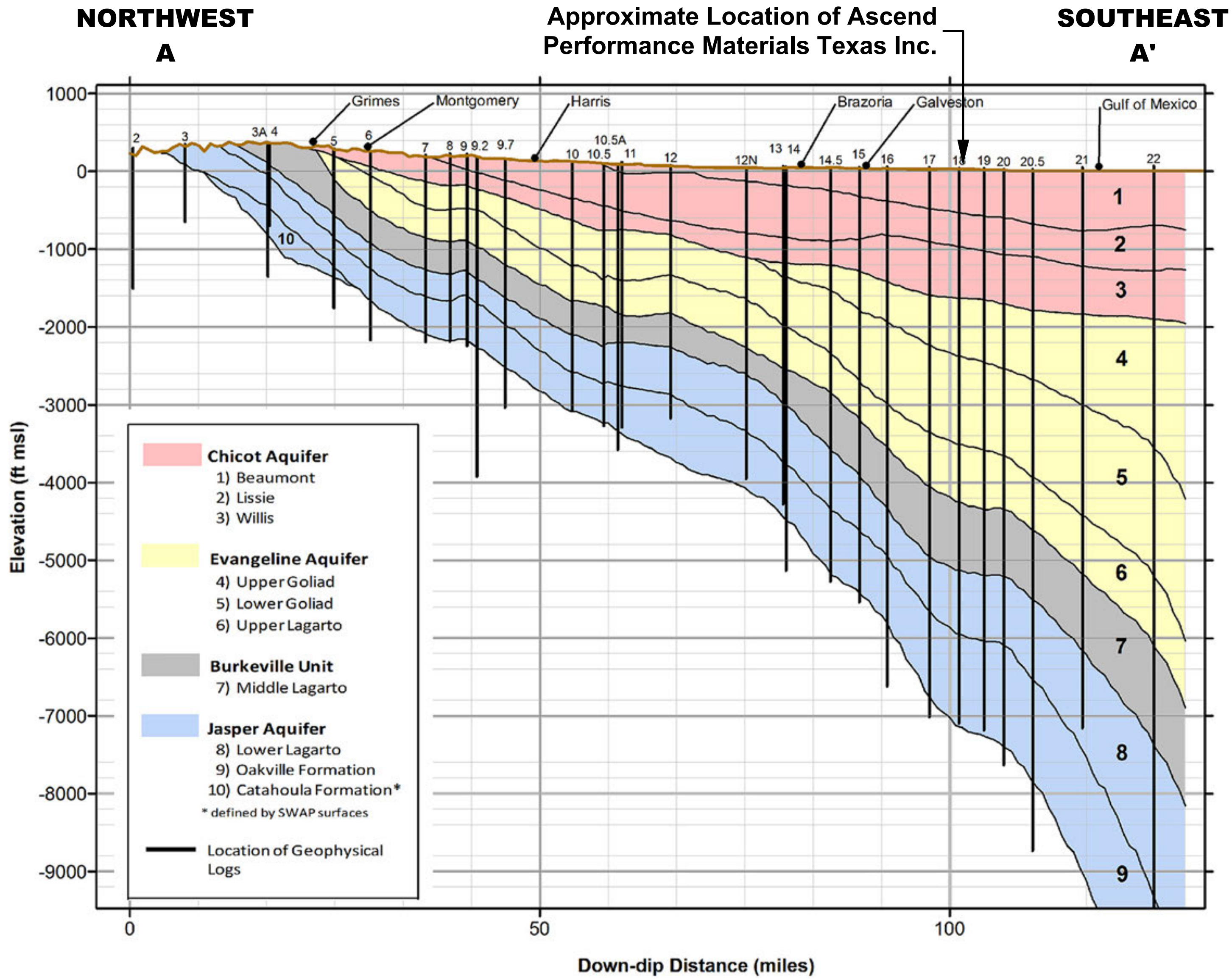
RCRA Permit Renewal Application
RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

GSI Job No:	G-3379	Drawn By:	DLB
Issued:	31-Dec-09	Chk'd By:	JMM
Revised:	———	Appv'd By:	RSL
Scale:	As Shown		FIGURE VI.11

FIGURE V.A.23, previously submitted as Figure VI.11



(modified from Young et al., 2012)



(modified from Young et al., 2012)

GSI ENVIRONMENTAL

Texas Geoscience Firm Registration Number: 50243

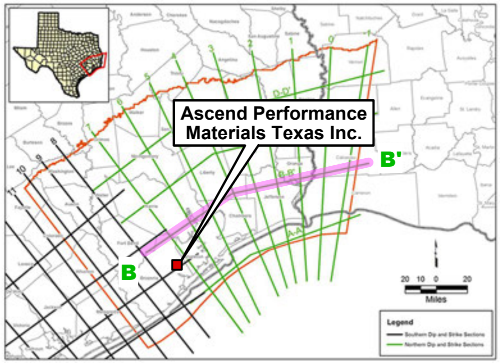
GSI Job No.	6932	Drawn By:	CDM
Map ID:	005_24	Chk'd By:	MW
Issued:	9-Aug-2024	Aprv'd By:	JMM
Scale:	As Shown	**Figure V.A.24**	

HYDROGEOLOGIC DIP CROSS-SECTION: A-A'

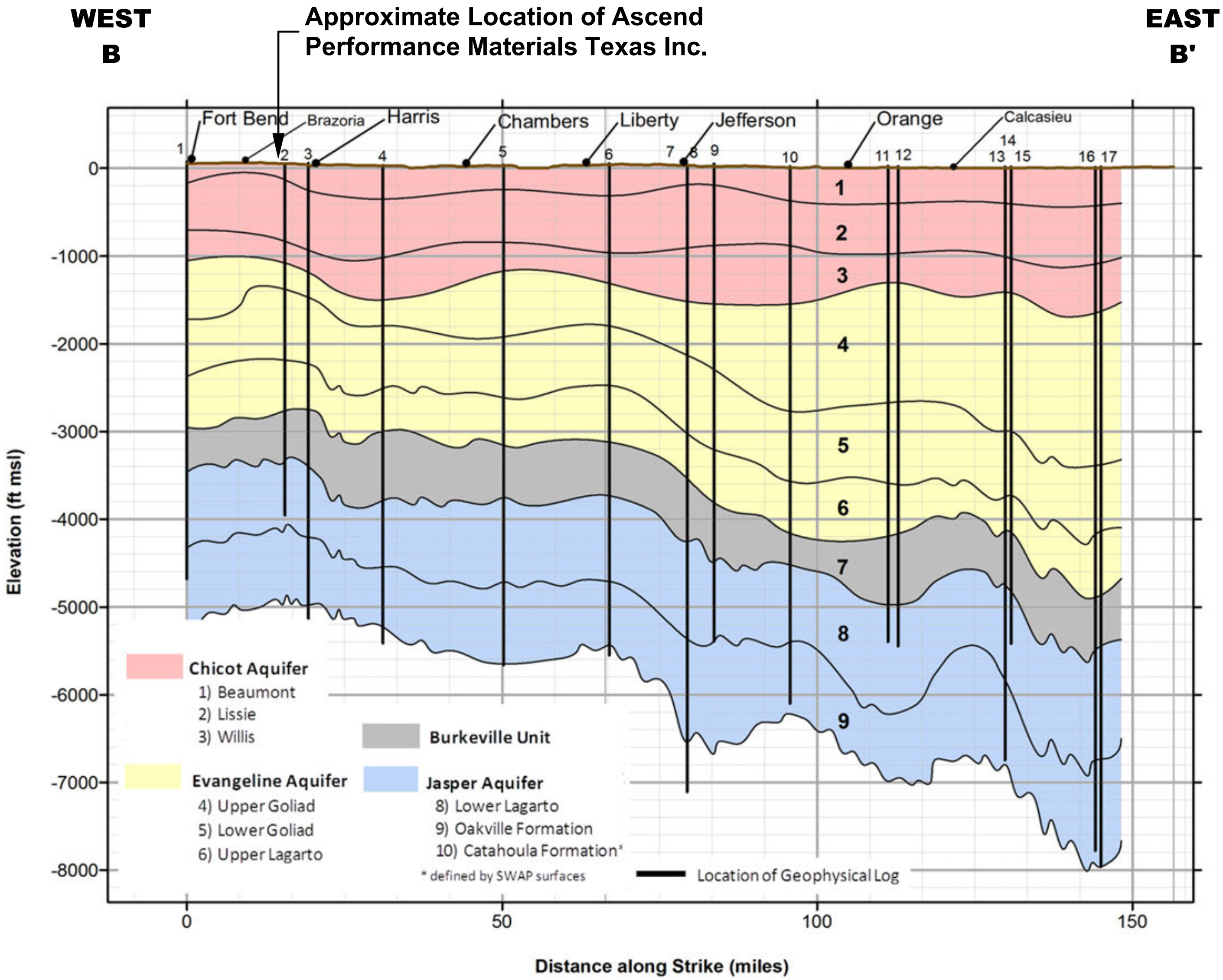
Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189

Ascend Performance Materials Texas Inc., Alvin, Texas



(modified from Young et al., 2012)



(modified from Young et al., 2012)

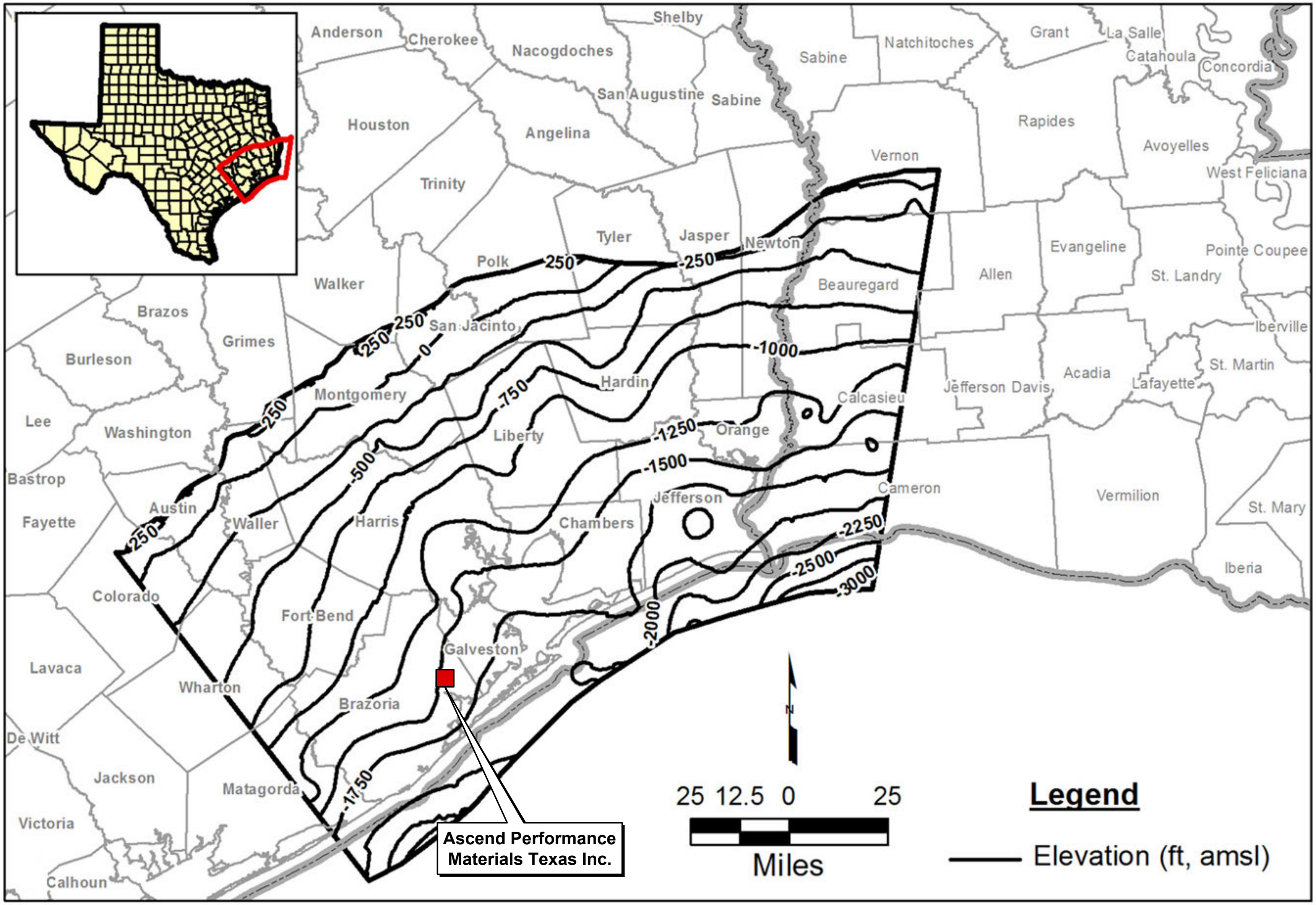
GSI ENVIRONMENTAL

Texas Geoscience Firm Registration Number: 50243

GSI Job No.	6932	Drawn By:	CDM
Map ID:	005_25	Chk'd By:	MW
Issued:	9-Aug-2024	Aprv'd By:	JMM
Scale:	As Shown		**Figure V.A.25**

HYDROGEOLOGIC STRIKE CROSS-SECTION: B-B'

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas



(modified from Young *et al.*, 2012

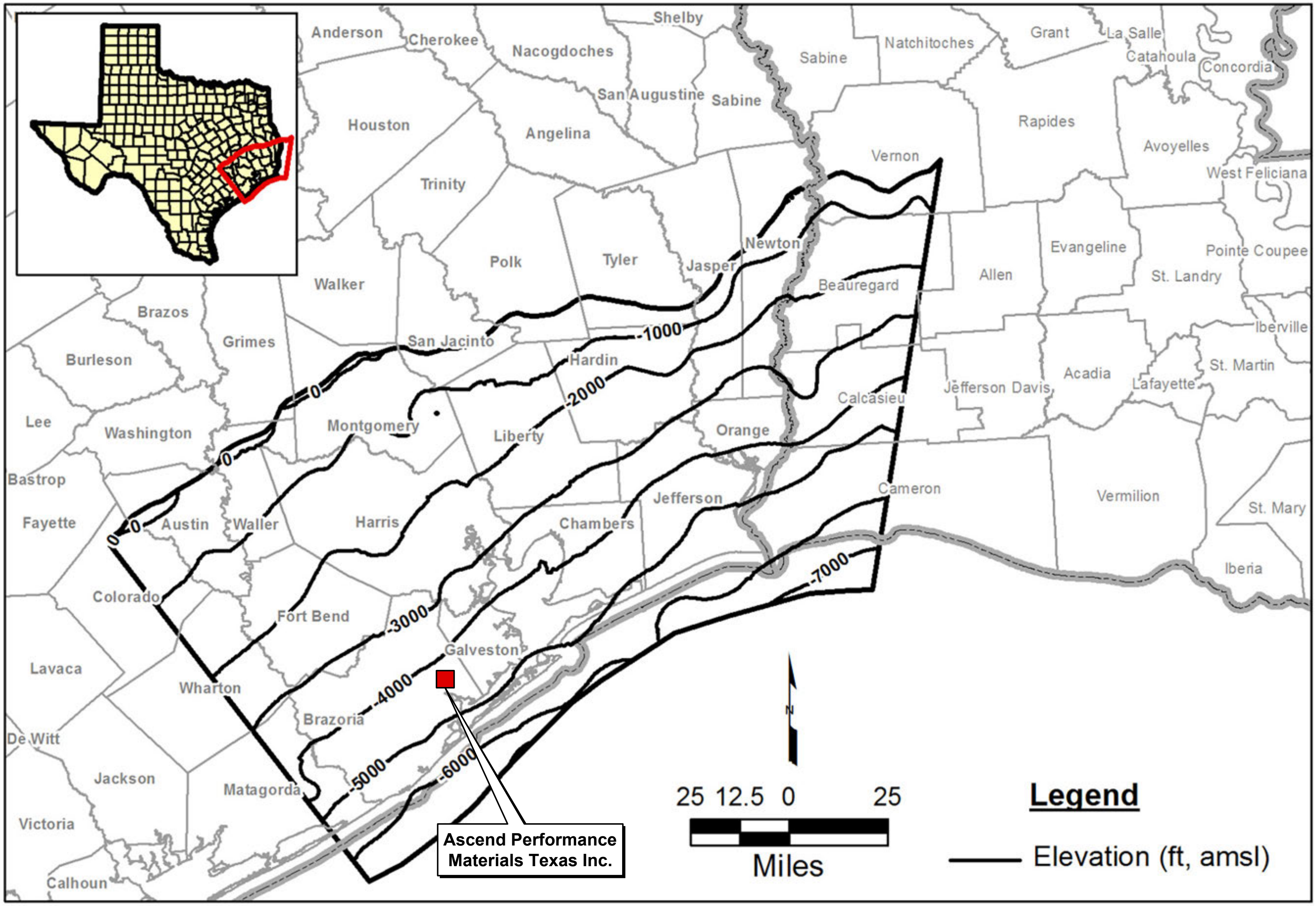
GSI Job No. 6932		Drawn By: CDM	
Map ID: 005_26		Chk'd By: MW	
Issued: 9-Aug-2024		Aprv'd By: JMM	
Scale: As Shown		**Figure V.A.26**	

GSI ENVIRONMENTAL

Texas Geoscience Firm Registration Number: 50243

STRUCTURE MAP, BASE OF THE CHICOT AQUIFER

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas



(modified from Young et al., 2012

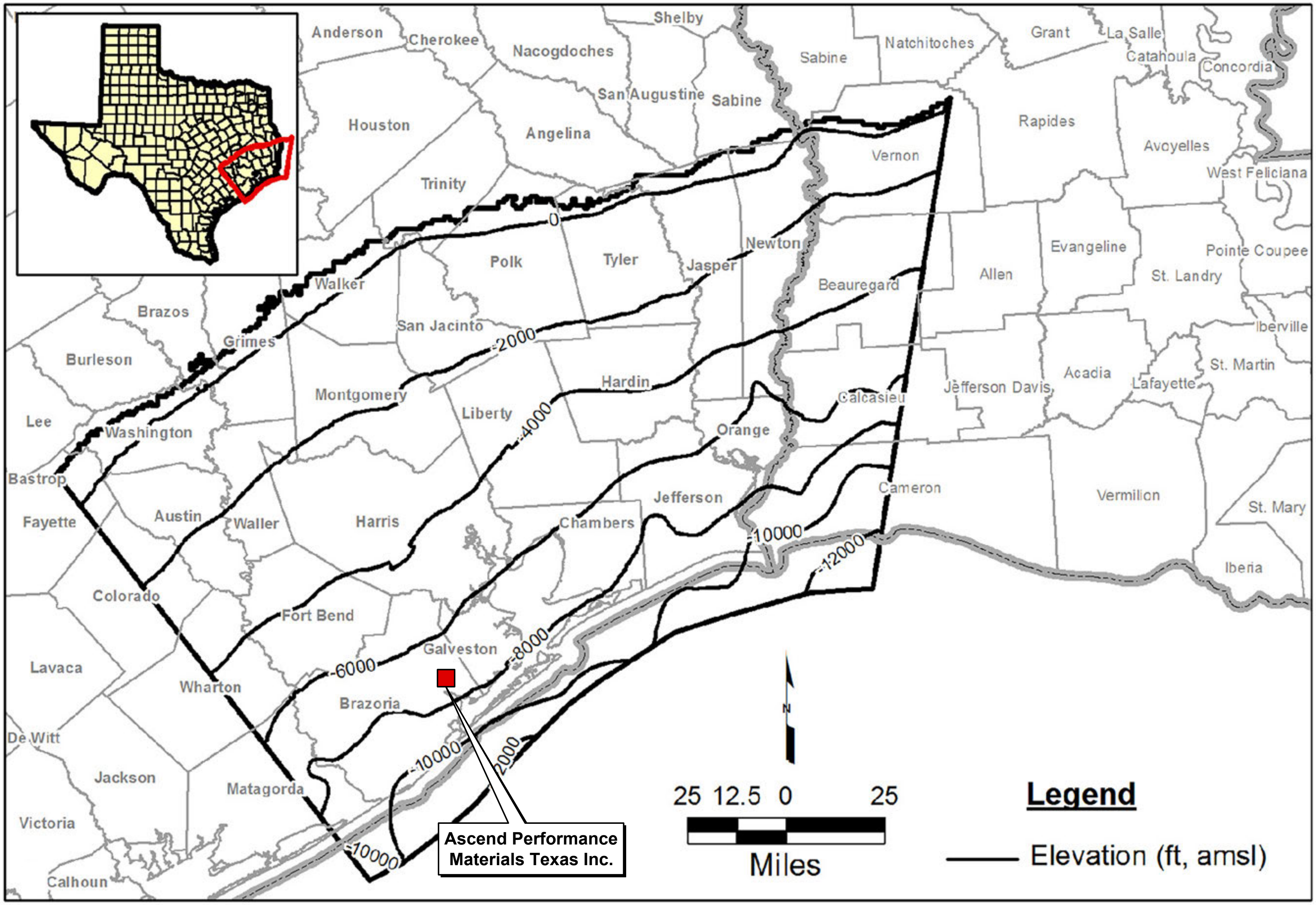
GSI ENVIRONMENTAL

Texas Geoscience Firm Registration Number: 50243

GSI Job No.	6932	Drawn By:	CDM
Map ID:	005_27	Chk'd By:	MW
Issued:	9-Aug-2024	Aprv'd By:	JMM
Scale:	As Shown		**Figure V.A.27**

STRUCTURE MAP, BASE OF THE EVANGELINE AQUIFER

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas



(modified from Young et al., 2012

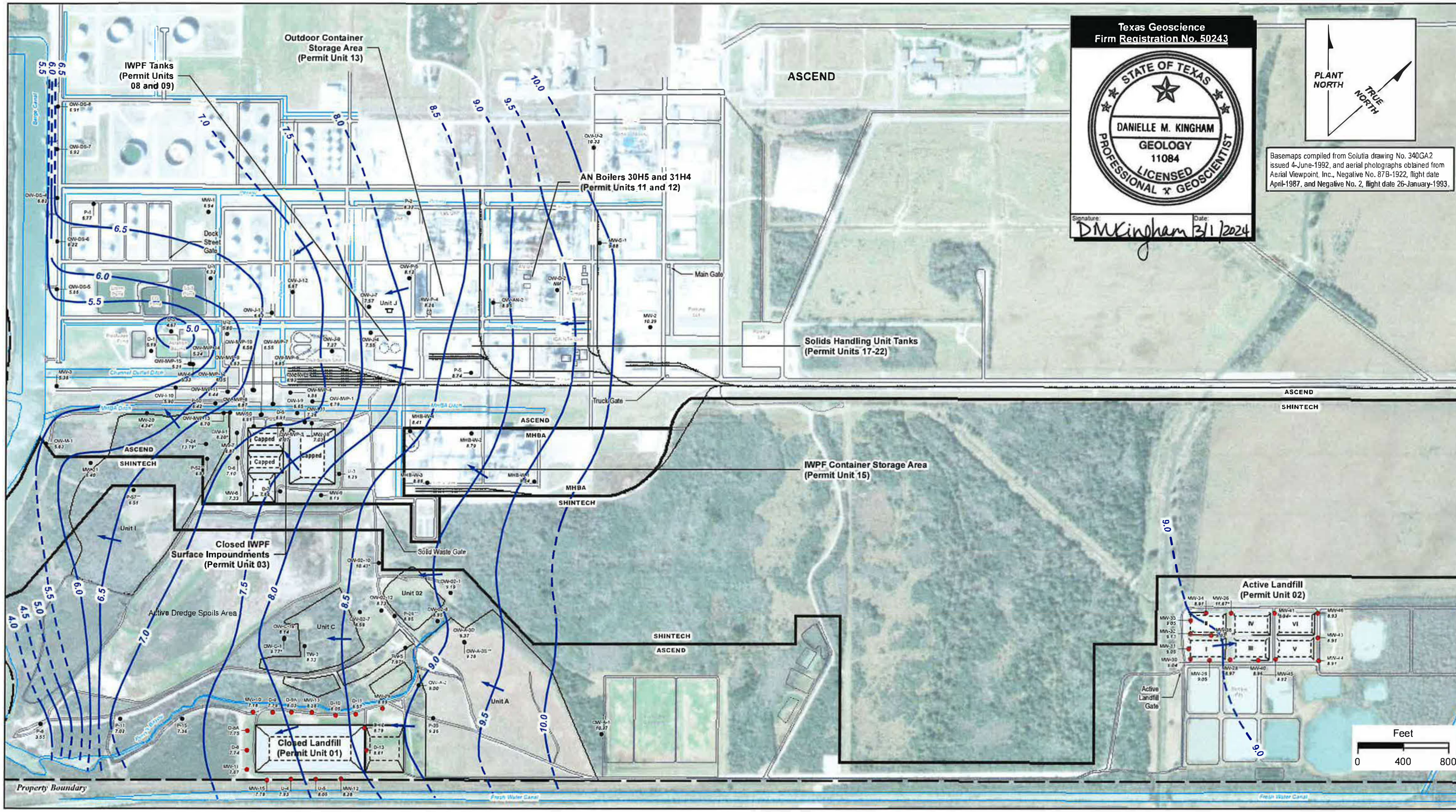
GSI ENVIRONMENTAL

Texas Geoscience Firm Registration Number: 50243

GSI Job No.	6932	Drawn By:	CDM
Map ID:	005_28	Chk'd By:	MW
Issued:	9-Aug-2024	Aprv'd By:	JMM
Scale:	As Shown	**Figure V.A.28**	

STRUCTURE CONTOUR OF THE BASE OF THE JASPER AQUIFER

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas



LEGEND

- RCRA monitoring well location
- Other monitoring well location
- **—6.0—** Potentiometric surface contour, ft MSL
- Boundary of permitted area
- **4.67** Static water level elevation, ft MSL, as measured on 9 January 2023
- **NM** Not measured
- * Value not used for contouring
- ** Well with non-aqueous phase liquid (NAPL)
- Representative groundwater flowpath

Notes:

1. Borrow pit boundaries approximated from Bing maps as of 2015.
2. MSL = Mean sea level; GWBU = Groundwater bearing unit.
3. Well OW-D-2 not found during survey.
4. Boundaries and roads from the 1992 basemap may not match the locations physically observed on the land surface, as roads and surfaces may have not been accurately surveyed in 1992 or those features may have changed over time.
5. PCS: NAD 1983, STP Texas South Central 4204 (ft).

GSI ENVIRONMENTAL

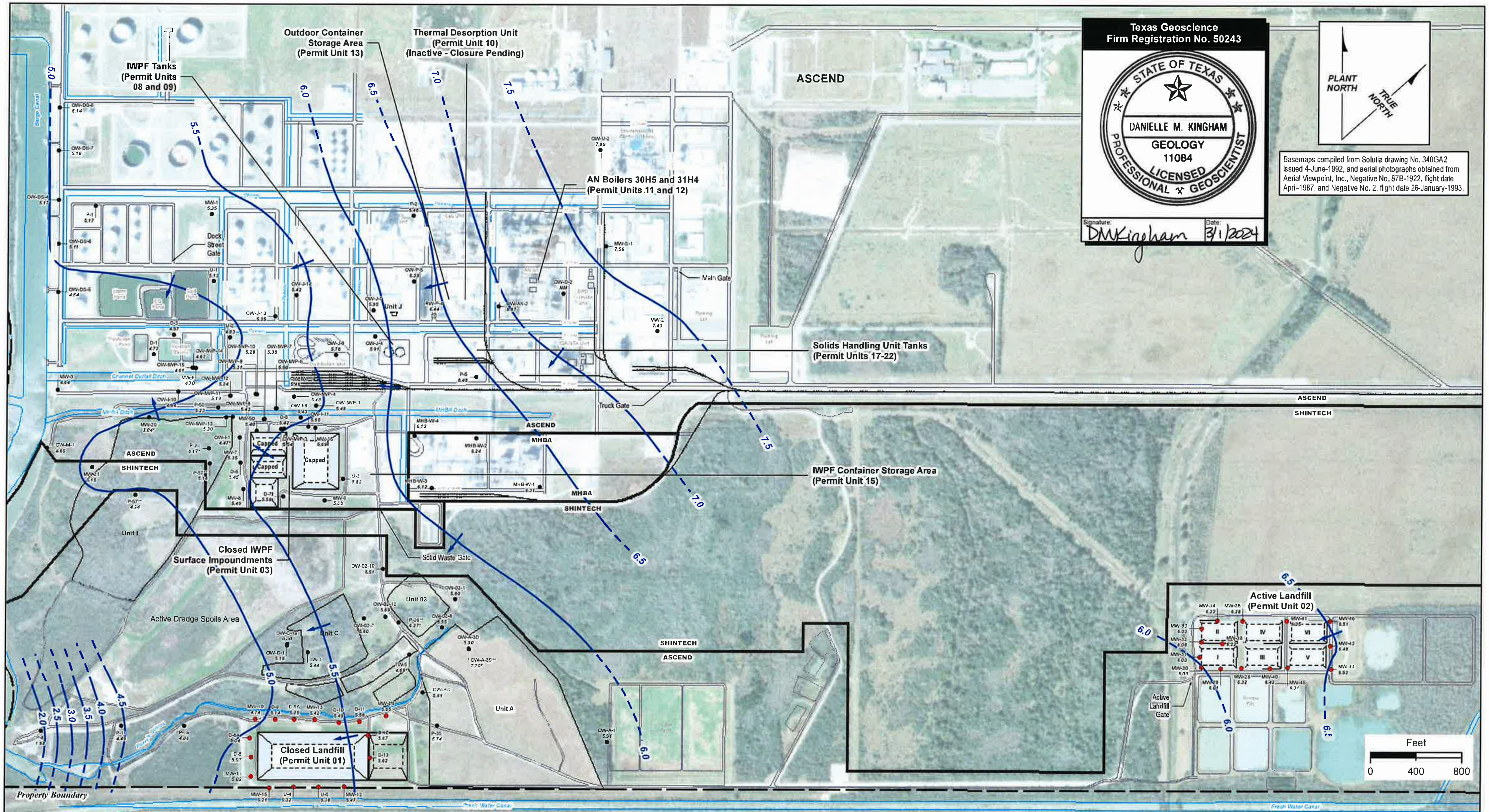
Texas Registration Number: F-1198

GSI Job No.	6476	Drawn By:	CDM
Issued:	1-Mar-2024	Chk'd By:	JSC
Map ID:	001_04	Appv'd By:	DBK
FIGURE 4			

POTENTIOMETRIC SURFACE CONTOUR MAP OF UPPER GWBU: 9 JANUARY 2023

Groundwater Detection Monitoring Program
Ascend Performance Materials Texas Inc.
Chocolate Bayou Plant, Alvin, Texas
Hazardous Waste Permit No. 50189

Figure V.A.29, previously submitted as Figure 4



LEGEND

- RCRA monitoring well location
- Other monitoring well location
- **6.0** Potentiometric surface contour, ft MSL
- Boundary of permitted area
- *4.88* Static water level elevation, ft MSL, as measured on 17 July 2023
- *NM* Not measured
- * Value not used for contouring
- ** Well with non-aqueous phase liquid (NAPL)
- Representative groundwater flowpath

Notes:

1. Borrow pit boundaries approximated from Bing maps as of 2015.
2. MSL = Mean sea level; GWBU = Groundwater bearing unit.
3. Well OW-D-2 not found during survey.
4. Boundaries and roads from the 1992 basemap may not match the locations physically observed on the land surface, as roads and surfaces may have not been accurately surveyed in 1992 or those features may have changed over time.
5. PCS: NAD 1983, STP Texas South Central 4204 (ft).

GSI ENVIRONMENTAL

Texas Registration Number: F-1198

GSI Job No. 6476	Drawn By: CDM
Issued: 1-Mar-2024	Chk'd By: EGK
Map ID: 001_05	Appv'd By: DBK
FIGURE 5	

POTENTIOMETRIC SURFACE CONTOUR MAP OF UPPER GWBU: 17 JULY 2023

Groundwater Detection Monitoring Program
Ascend Performance Materials Texas Inc.
Chocolate Bayou Plant, Alvin, Texas
Hazardous Waste Permit No. 50189

Figure V.A.30 previously submitted as Figure 5

Hazardous Waste Permit Renewal Application
Ascend Performance Materials Texas Inc., Alvin, Texas

Hazardous Waste Permit No. 50189

Part B, Section V: Appendix V.B.1 – Engineering Report for Outdoor Container Storage Area

Note: There were no changes to the Engineering Report for Outdoor Storage Container Storage Area, originally issued 31 December 2009 and updated on 21 February and 21 March 2013. Therefore, the 21 March 2013 Engineering Report and supporting documentation are submitted as is.

GSI Job No. 3742

ATTACHMENT V.2
ENGINEERING REPORT FOR
OUTDOOR CONTAINER STORAGE AREA (PERMIT UNIT 13)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No. 3742

ATTACHMENT V.2
ENGINEERING REPORT FOR
OUTDOOR CONTAINER STORAGE AREA (PERMIT UNIT 13)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas Inc., Alvin, Texas

TABLE OF CONTENTS

CERTIFICATION OF
ENGINEERING REPORT FOR
OUTDOOR CONTAINER STORAGE AREA (PERMIT UNIT 13)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas Inc., Alvin, Texas

I, Elaine A. Higgins, a registered professional engineer in the State of Texas, certify that the Engineering Report in the RCRA Permit Renewal Application issued 31 December 2009 and revised 21 February 2013 for the Outdoor Container Storage Area (Permit Unit 13) on the Ascend Performance Materials Texas Inc. Chocolate Bayou Plant in Alvin, Texas, has been prepared in accordance with the requirements of 40 CFR 264.170-.179.

Elaine A. Higgins 21 March 2013
Elaine A. Higgins, P.E.
State of Texas Registration No. 85482
GSI Environmental Inc.
Texas Firm Registration Number F-1198

1.0 DESCRIPTION OF OUTDOOR CONTAINER STORAGE AREA

The Outdoor Container Storage Area (Permit Unit 13) provides storage of containerized wastes retained for time periods greater than 90 days on the Ascend Chocolate Bayou facility. Design, construction, and operating specifications for this unit have been developed in accordance with requirements specified in 40 CFR 264.170-.179.

1.1 General Description

The Outdoor Container Storage Area is located in the central portion of the manufacturing area of the facility (see Attachment C.1). Design and operating information for the unit is summarized on Table V.B, and a plan view of the vicinity of the Outdoor Container Storage Area is provided on Figure V.2.1.

The area allocated for storage encompasses an approximate 206-ft by 178-ft area having a surface cover of crushed rock, shell, or similar material (see Figure V.2.1). The Outdoor Container Storage Area is permitted for a maximum capacity of approximately 1,500 tons of waste solids. The Outdoor Container Storage Area is used solely for the storage of containerized wastes containing no free liquids. Waste is managed in roll-off boxes, drums, overpacks, pails, or other suitable containers.

Container usage conforms to the requirements of 40 CFR 264.171-.173. In order to accommodate unrestricted movement of emergency equipment, a minimum aisle spacing of 30 inches is maintained. This minimum aisle spacing is also sufficient to provide access for placing, moving, and inspecting containers stored in the unit. No containers are stacked more than two units high.

1.2 Secondary Containment

The Outdoor Container Storage Area is used for storage of containerized wastes with no free liquids. Consequently, no secondary containment is required per 40 CFR 264.175(c)(1). The site is sloped to drain water away from the areas of container storage, thereby preventing stormwater accumulation in the unit.

2.0 HAZARDOUS WASTES MANAGED

2.1 Types of Wastes Managed

The Outdoor Container Storage Area is used only for storage of containerized radioactive mixed wastes and EPA hazardous waste (i.e., spent carbon, centrifuged process cake, and catalyst sludge). If necessary, prior to placement in the unit, solids and sludges are dewatered in order to pass the Paint Filter Liquids Test (i.e., EPA Method 9095). Section IV: Waste Analysis Plan provides additional details concerning the wastes generated at Ascend Chocolate Bayou.

2.2 Ignitable and/or Reactive Wastes

All waste streams managed in the unit are neither ignitable nor reactive; therefore, no potential exists for ignitability or reaction with other material or wastes.

2.3 Incompatible Wastes

The wastes to be stored in the Outdoor Container Storage Area (i.e., spent carbon, centrifuged process cake, and dewatered sludge) are not incompatible, as determined using the system presented in Section IV: Waste Analysis Plan.

3.0 CONTAINER STORAGE AREA OPERATING PROCEDURES

3.1 Container Design and Management Practices

Per requirements at 40 CFR 264.171-.172, hazardous wastes are stored only in containers that are in good condition and constructed of materials that are both compatible and non-reactive with the wastes being stored. Waste materials are promptly removed from any container found to exhibit severe rusting, visually apparent flaws, or leaks. If any such defect is observed, the waste is transferred to an acceptable container meeting the requirements of 40 CFR 264.171 and .172, or managed in another manner in accordance with applicable regulations (e.g., placed within an overpack drum).

In order to minimize the volume of disposed materials and maximize the use of resources, containers are re-used after reconditioning. The reconditioning process involves the following three-step process: i) removing waste from the container, ii) rinsing three times with a solution capable of dissolving the waste residue, and iii) inspecting to ensure that the reconditioned container remains adequate to contain the waste, as described above. Rinsate is collected for subsequent disposal in a permitted on-site injection well or off-site facility.

3.2 Waste Transfer Procedures

In accordance with practices outlined at 40 CFR 264.173, containers remain closed during storage except during the addition or removal of wastes. Wastes may be added to or removed from the container storage area by transferring closed drums, roll-off boxes, or other containers via truck, forklift, or other suitable vehicle. Alternatively, wastes held in another receptacle (e.g., a drum or smaller container) may be transferred by backhoe, shovel, trowel, or other suitable means to a container in the unit. At all times, containers are handled with sufficient care to prevent rupture or damage which could result in waste release.

3.3 Air Emissions

The Outdoor Container Storage Area is used only for the management of radioactive mixed waste (i.e., spent carbon, centrifuged process cake, and catalyst sludge) in accordance with all applicable regulations under the authority of the Atomic Energy Act and the Nuclear Waste Policy Act. Consequently, the unit is not subject to the requirements of air emissions standards for containers per 40 CFR 264.1080(b)(6). In addition, process knowledge and analysis of the non-radioactive portion of the waste in accordance with 40 CFR 264.1083(a)(1) indicate that the volatile organic component of the waste is less than 500 ppmw at the point of waste origination. Therefore, no additional air permitting is required.

3.4 Control of Run-On and Run-Off

As shown on Figure V.2.1, the pad on which containers are stored is constructed such that elevations range from 14.5 to 17 ft mean sea level (MSL). The ground surface of the unit slopes in a general west-southwest direction (plant datum) at a rate of 1 to 2%, and stormwater drains to a trench at the western boundary of the unit. No wastes containing free liquids are stored in this unit; therefore, no secondary containment is required.

3.5 Flood Protection

Per 30 TAC 335.204(a)(1), hazardous waste storage facilities located in the 100-yr floodplain must be designed, constructed, operated, and maintained to prevent physical transport of any hazardous waste by a 100-yr flood event. As discussed in Section II of this Application, the elevation of the 100-yr flood at the Outdoor Container Storage area is 16 ft MSL. Ground surface elevations in this unit range from 14.5 to 17 ft MSL (see Figures V.2.1 and V.2.2). Therefore, maximum standing water depths of approximately 1.5 could be expected during a 100-yr flood.

Areas of the 100-yr floodplain subject to a coastal flood with velocity hazard from wave action are designated as Zone VE on Figure II.1. Only a small area in the extreme southwest portion of the Ascend Chocolate Bayou Plant lies within the portion of the 100-yr floodplain subject to wave action during a flood, and no hazardous waste management units are located within this area. Therefore, no storm surge will be predicted for the Outdoor Container Storage Area in the event of a 100-yr flood event.

3.5.1 Planned Procedures

Protective measures will be taken at the Outdoor Container Storage Area to prevent transport of hazardous waste or damage to containers from floating debris. Such actions will be taken if National Weather Service predictions indicate that a hurricane has a greater than 50% probability of impacting the Chocolate Bayou Plant. Based upon the time allotted and the types of containers present in the unit at the time of the flood, one or more procedures will be implemented, as follows:

- *Empty Containers:* Waste will be removed and disposed in a permitted on-site or off-site hazardous waste disposal facility. After being cleaned as described in Section 3.1 above, empty containers will be retained on site.

- *Elevate Containers:* Containers will be raised to an elevation higher than the expected maximum flood stage by one of the following methods: i) by placing on a clean, empty, overturned roll-off bin, pallet, or other structure having sufficient strength to support the weight of the containers and included waste, or ii) by moving to the northeast portion of the unit having an elevation of greater than the predicted 100-yr flood (see Figure V.2.1).

- *Fill Containers:* Calculations indicate that roll-off bins filled with a minimal amount of dewatered sludge will be sufficiently heavy to resist floating during a 100-yr flood (see Appendix V.2.1). If a flood is predicted when roll-off bins containing dewatered sludge are stored in the unit, Ascend will verify that each roll-off box contains the minimum mass of sludge to prevent floating.

3.5.2 Resources

As an active chemical manufacturing facility, the Chocolate Bayou Facility maintains a varied roster of personnel available to move containers in the event of predicted flooding. Similarly, the facility maintains a large pool of vehicles suitable for moving containers, such as forklifts, truck-mounted cranes, drum-movers, etc.

3.5.3 Potential for Accidental Discharges

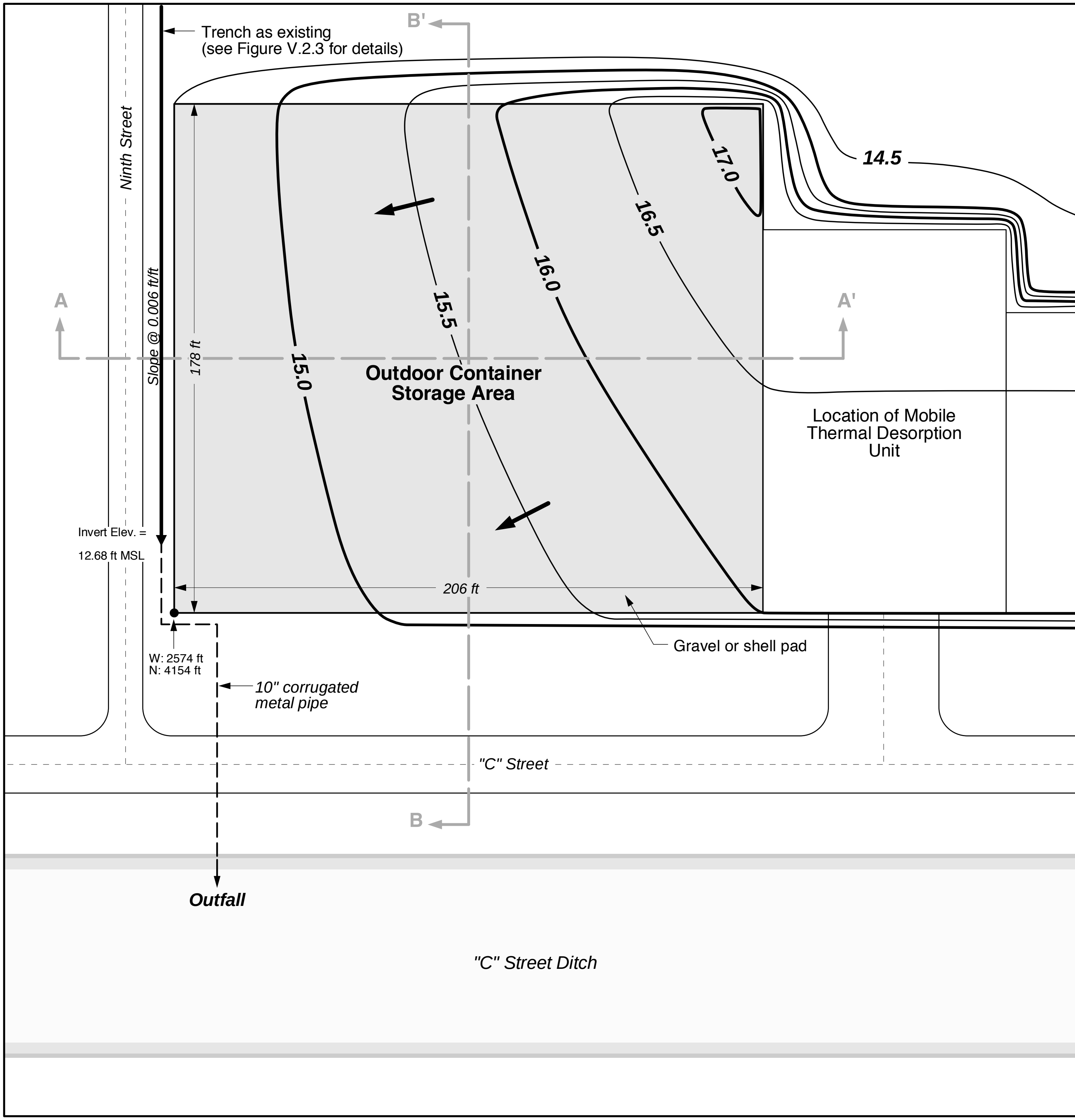
The potential for accidental discharges during movement of waste prior to flooding are negligible. Containers will be moved without opening the containers or removing the waste by means of equipment with sufficient strength and maneuverability to transfer the waste without mishap.

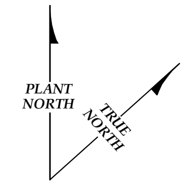
ATTACHMENT V.2
ENGINEERING REPORT FOR
OUTDOOR CONTAINER STORAGE AREA (PERMIT UNIT 13)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas Inc., Alvin, Texas

FIGURES





LEGEND

— 14.5 — Approximate proposed ground surface elevation contour, ft MSL

Direction of surface water drainage

Notes:

1) Coordinates referenced to plant datum
2) Elevations referenced to mean sea level (msl)
3) See Figure V.2.2 for cross-sections
4) Site plan information taken from the following Solutia drawings:
   a) Sewer and Underground Piping: No.2 Phenol Plant, D-75-PS-1, Rev 6, 11/12/74
   b) Process Area Paving and Drainage: No.2 Phenol Plant, D-75-GP-1, Rev 4, 2/20/78
   c) Plot Plan of Paving, Grading, and Underground Lines: Block 14, 340-GP-14, Rev 27, 10/83
   d) No. 2 Phenol Plant: Crane Pad West of 75-E5 Foundation Plan and Section, D-75-F0234, Rev 0, 5/9/77

SCALE (ft)

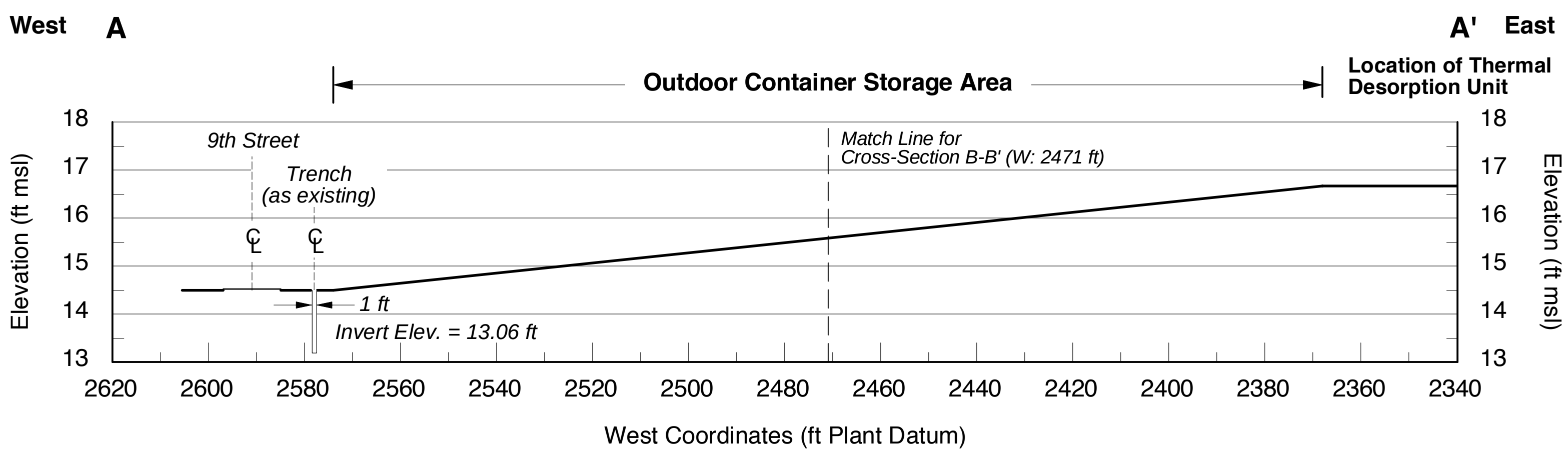
0 25 50

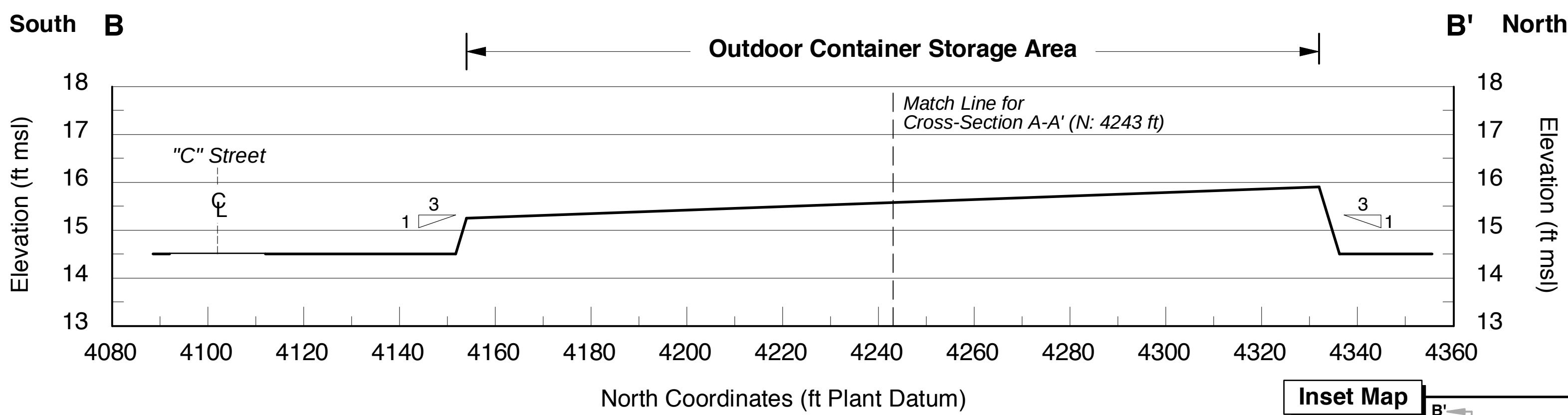
GSI ENVIRONMENTAL
Texas Registration Number: F-1198

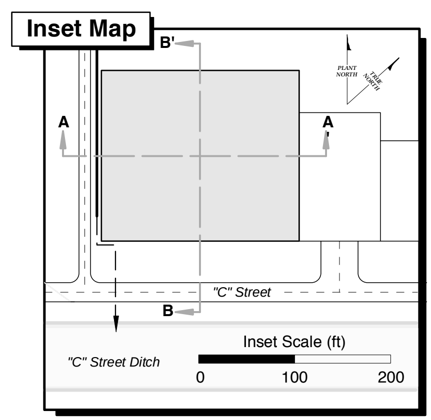
SITE PLAN:
OUTDOOR CONTAINER STORAGE AREA

RCRA Permit Renewal Application
RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

GSI Job No:	G-3379	Drawn By:	DLB
Issued:	31-Dec-09	Chk'd By:	EAH
Revised:	———	Appv'd By:	EAH
Scale:	As Shown		**FIGURE V.2.1**







Texas Registration Number: F-1198

Notes:

1) Coordinates referenced to plant datum
2) Elevations referenced to mean sea level (msl)
3) See Figure V.2.1 for plan view
4) See Figure V.2.3 for trench details

SCALE (ft)

0 20 40

Vertical Exaggeration 1:10

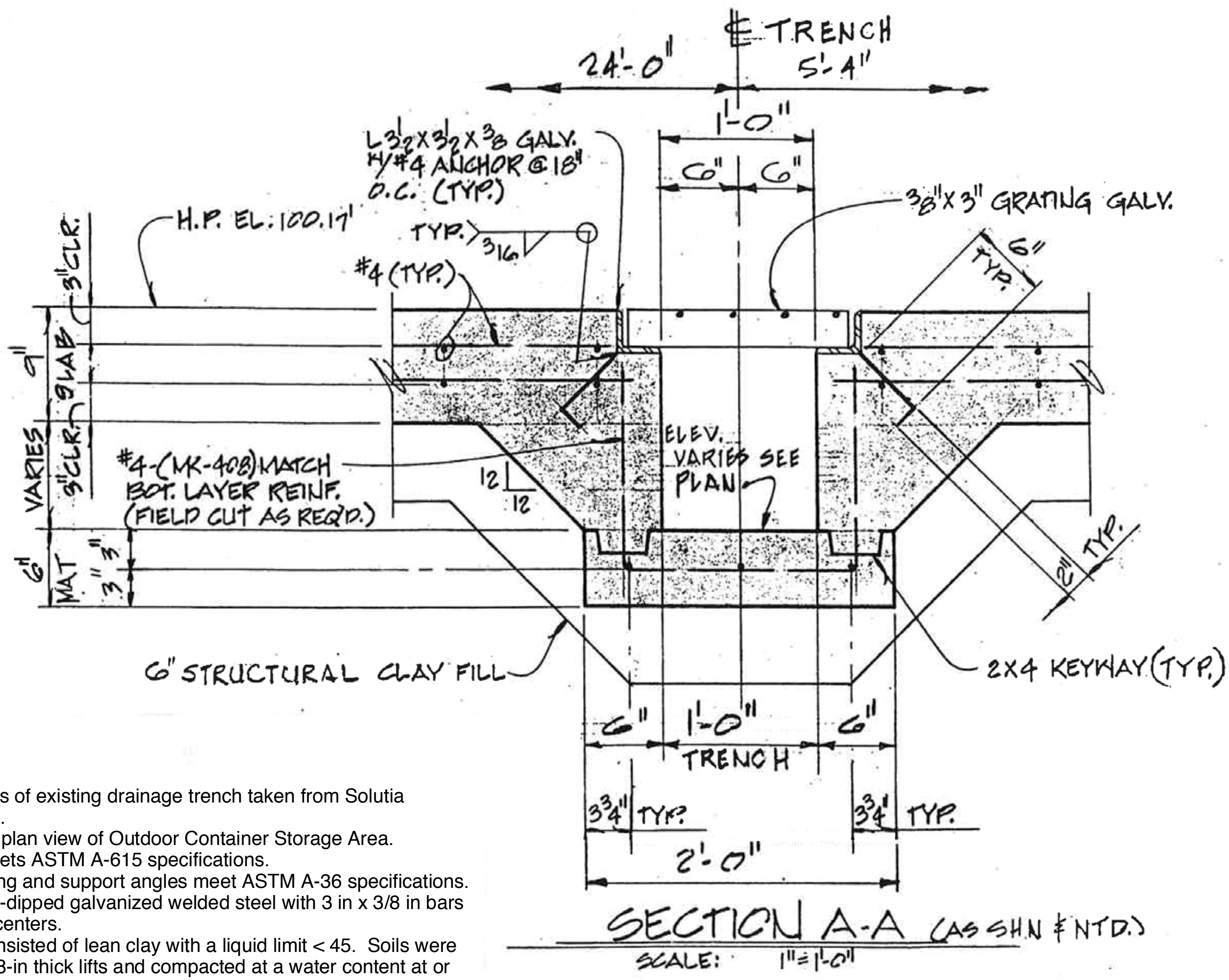
GSI ENVIRONMENTAL

Texas Registration Number: F-1198

GSI Job No.	G-3379	Drawn By:	DLB
Issued:	31-Dec-09	Chk'd By:	EAH
Revised:	________	Aprv'd By:	EAH
Scale:	As Shown	**FIGURE V.2.2**	

CROSS-SECTIONS:
OUTDOOR CONTAINER STORAGE AREA

RCRA Permit Renewal Application
RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas



Notes:

1. As-built specifications of existing drainage trench taken from Solutia drawing D-75-F0235.
2. See Figure V.2.1 for plan view of Outdoor Container Storage Area.
3. Reinforcing steel meets ASTM A-615 specifications.
4. Structural steel grating and support angles meet ASTM A-36 specifications.
5. Trench grating is hot-dipped galvanized welded steel with 3 in x 3/8 in bars spaced at 1-3/16 in centers.
6. Structural clay fill consisted of lean clay with a liquid limit < 45. Soils were placed in maximum 8-in thick lifts and compacted at a water content at or slightly above optimum water content; the compacted density was at least 95% of the maximum dry density per ASTM D698.

GSI ENVIRONMENTAL
Texas Registration Number: F-1198

GSI Job No.	G-3379	Drawn By:	DLB
Issued:	31-Dec-09	Chk'd By:	EAH
Revised:	________	Aprv'd By:	EAH
Scale:	Not to Scale	**FIGURE V.2.3**	

DRAINAGE TRENCH SPECIFICATIONS: OUTDOOR CONTAINER STORAGE AREA

RCRA Permit Renewal Application
RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

Figure V.2.4
RCRA Permit Renewal Application
Ascend Performance Materials Texas Inc.
Alvin, Texas
RCRA Permit No. HW-50189-000

Figure V.2.5
RCRA Permit Renewal Application
Ascend Performance Materials Texas Inc.
Alvin, Texas
RCRA Permit No. HW-50189-000

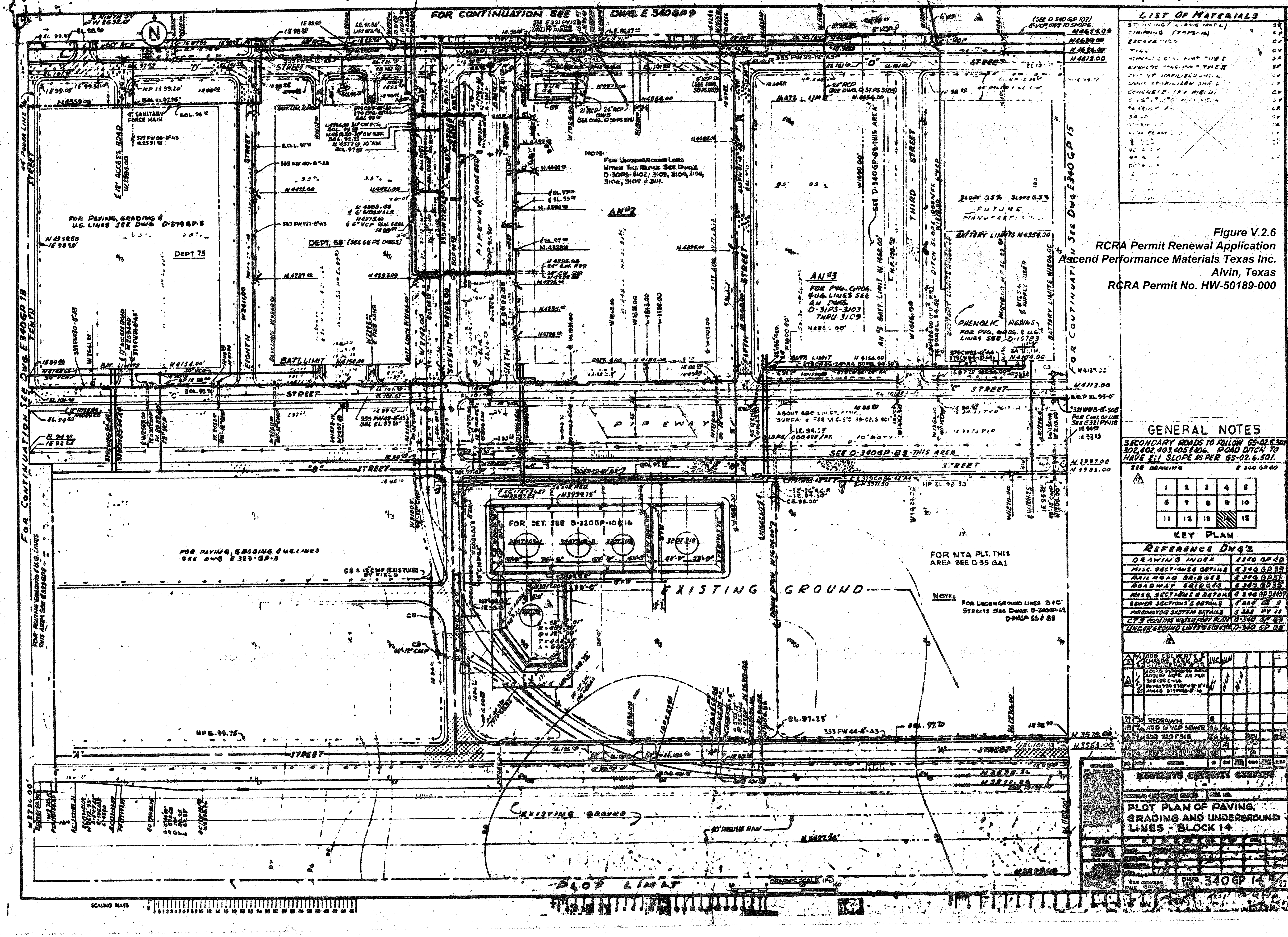
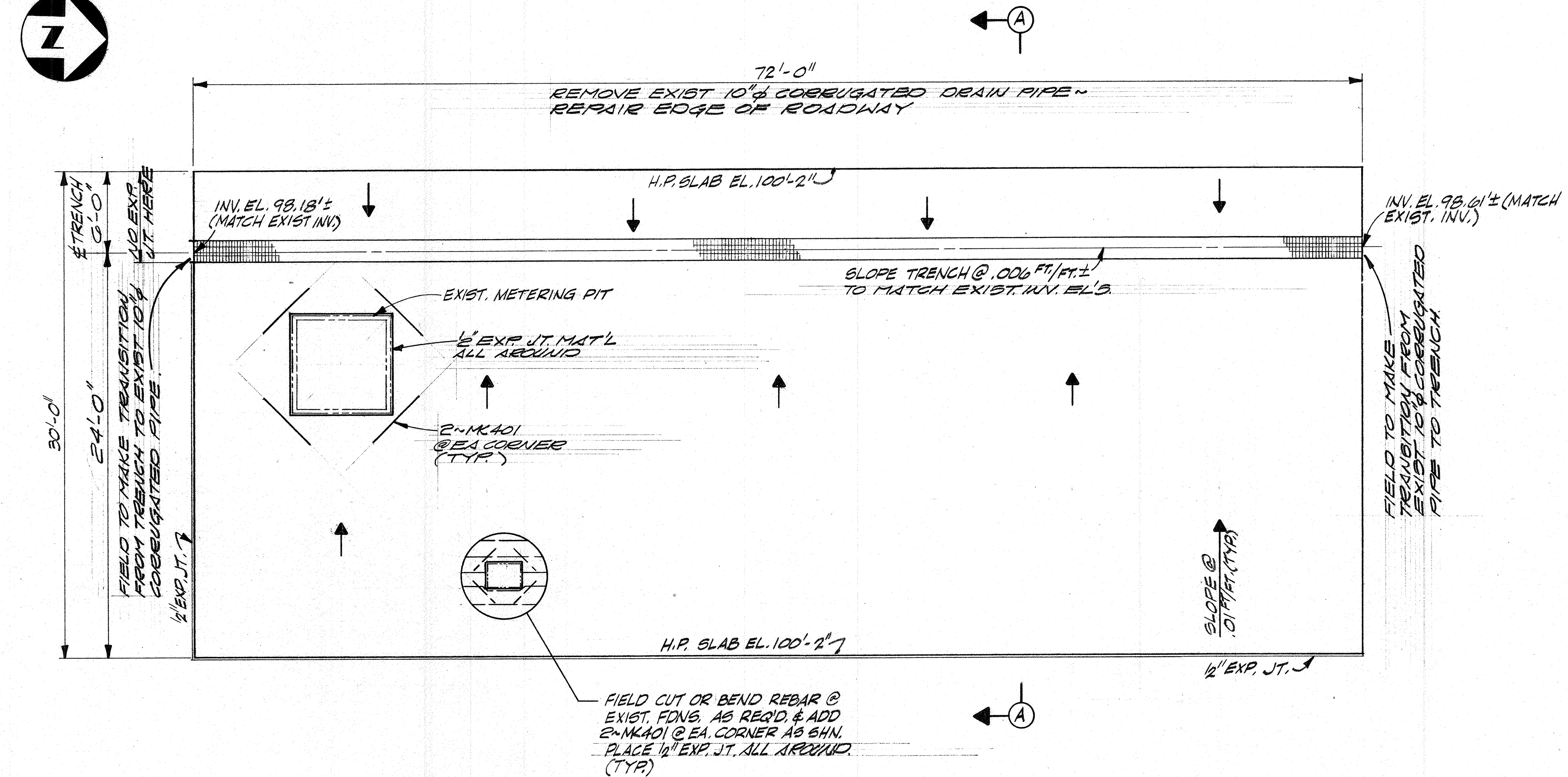
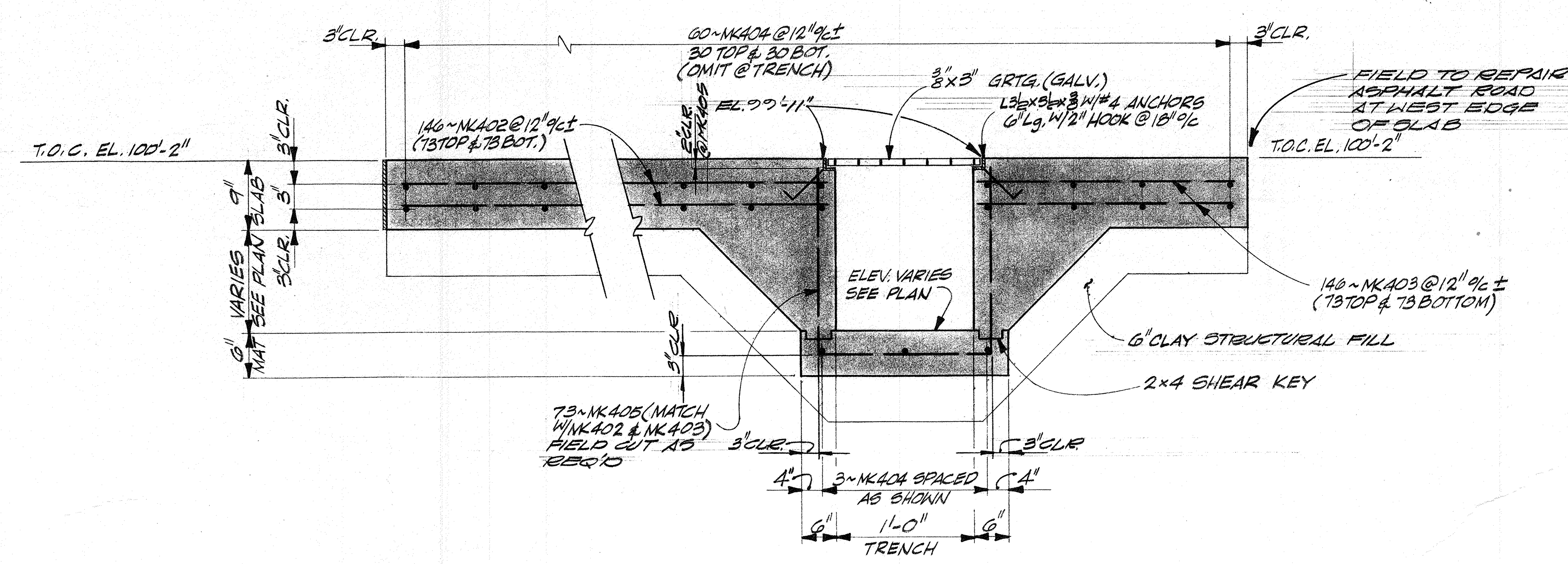


Figure V.2.6
RCRA Permit Renewal Application
Ascend Performance Materials Texas Inc.
Alvin, Texas
RCRA Permit No. HW-50189-000



PLAN

FOR LOCATION SEE DWG. D-75-GP1



SECTION A-A

THIS DWG. N.T.S.

REFERENCE DWGS.

D-75-GP-1 PROCESS AREA PAVING & DRAINAGE

REINFORCING SCHEDULE

REINFORCING TO BE DEFORMED BILLET-STEEL, CONFORMING TO A.S.T.M. A-615, GRADE 40

ALL HOOKS AND BENDS SHALL COMPLY WITH MINIMUM A.C.I. CODE UNLESS OTHERWISE SHOWN

ALL DIMENSIONS ARE OUT TO OUT OF BAR

DIMENSIONS OMITTED ARE ZERO

TYPE I TYPE II TYPE III TYPE IV

MARK	SIZE	TYPE	NO. REQ'D	LGTH. 1 BAR	TOTAL LGTH.	A	B	C	D	E
401	#4	I	24	2'-0"	48'	2'-0"				
402	#4	I	146	23'-0"	3358'	23'-0"				
403	#4	I	146	5'-0"	730'	5'-0"				
404	#4	I	63	71'-6"	4505'	71'-6"				
405	#4	III	73	5'-6"	402'	2'-0"	1'-6"	2'-0"		

Figure V.2.7
RCRA Permit Renewal Application
Ascend Performance Materials Texas Inc.
Alvin, Texas
RCRA Permit No. HW-50189-000

GENERAL NOTES FOR CRANE-SUPPORT PAD

1. All concrete shall have a minimum compressive stress of 3000 psi at 28 days.
2. All reinforcing steel shall meet ASTM A-615 Grade 40 specifications.
3. Structural steel grating and support angles shall meet ASTM A-36 specifications.
4. Trench grating shall be hot dipped galvanized welded steel with 3"x3/8" bars spaced at 1 3/16" centers.
5. Existing slab within the area shown shall be demolished and disposed of in a local area as directed by Monsanto representative.
6. New concrete shall be placed against solid, undisturbed soil or structural fill.
7. Structural fill should consist of lean clay with a liquid limit less than 45. Soils should be placed in lifts of 8" max. loose thickness & compacted at a water content at or slightly above optimum water content; the compacted density should be at least 95% of the maximum dry density as determined by a standard proctor compaction test, ASTM D-698-70.

VOID BECAUSE OF DEMOLITION DATE 6/6/84 CK'D PCS

NO.	W.O. NO.	REVISION	DR.	CK'D.	DRAFT. SUPV.	ENG'R.	APPR.	DATE

Monsanto COMPANY — PLANT ENGINEERING, Chocolate Bayou, ALVIN, TEXAS

P.A.F.E. 17024

DEPT.

AREA

No. 2 PHENOL PLANT

CRANE PAD WEST OF 75-E5
FOUNDATION PLAN & SECTION

	BY	DATE		BY	DATE
DRAWN	R. Montgomery	5.5.77	ENG'R.	[illegible]	5/9/77
CHECKED	J. SPEICH	5-10-77	PROCESS		
DRAFT. SUPV.			PROD.	[illegible]	

SCALE 3/16"=1'-0" U.O.N. DWG. NO. D-75-F0234 R/0

ATTACHMENT V.2
ENGINEERING REPORT FOR
OUTDOOR CONTAINER STORAGE AREA (PERMIT UNIT 13)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDICES

GSI Job No. 3742
Issued: 31 December 2009
Revised: 21 February 2013 Rev. 1

GSI
ENVIRONMENTAL

APPENDIX V.2.1
CALCULATION OF MINIMUM WEIGHT TO PREVENT CONTAINERS FROM FLOATING DURING 100-YR FLOOD

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas Inc., Alvin, Texas

STATE OF TEXAS
ELAINE A. HIGGINS
85482
LICENSED
PROFESSIONAL ENGINEER

21 March 2013
Texas Firm Reg No.
F-1198

I. PURPOSE:

- Determine weights required to prevent roll-off boxes used for storage of containerized wastes in the Outdoor Container Storage Area from floating in the event of a 100-yr flood.

II. METHOD:

- Determine the buoyant force produced by the maximum expected flood depth in the unit and compare to the weight of standard roll-off boxes expected to be used. Roll-off box and contents will not float when combined weight is greater than weight of water displaced. Use minimum site elevation and maximum flood elevation for conservative estimate.

III. ASSUMPTIONS:

- Roll-off boxes have standard dimensions and weights (i.e., 22 ft long and 8 ft wide with weights ranging from 4,617 to 5,856 lb, see below, per BFI, personal communication to Ascend).
- Roll-off box wheels support box 10 inches above the ground surface.
- Minimum site elevation = 14.5 ft MSL (see Figure II.1).
- Maximum flood elevation = 16 ft MSL (see Figure V.2.5).
- Unit weight of water = 62.4 lb/ft^3.
- Specific gravity of sludge = 1.06, corresponding to unit weight of 66.1 lb/ft^3 (per process knowledge).
- Roll-off boxes are sealed against water infiltration.

IV. RESULTS:

- Maximum Height of Water Around Box = 16 ft - 14.5 ft - (10 in/12 in/ft) = 0.67 ft
- Corresponding Weight of Water Displaced = 22 ft x 8 ft x 0.67 ft x 62.4 lb/ft^3 = 7,358 lb
- Therefore, weight of box alone insufficient to keep from floating. Roll-off box must be filled with the following amounts of sludge to keep from floating:

Roll-off Box Dimensions				Weight of Displaced Water	Required Weight of Sludge	Sludge Required to Prevent Floating		
Length	Width	Height	Weight			Volume	Thickness	
(ft)	(ft)	(ft)	(lb)	(lb)	(lb)	(yd^3)	(ft)	(in)
22	8	3.5	4,617	7,358	2,741	1.5	0.24	3
22	8	5.5	5,072	7,358	2,286	1.3	0.2	2.5
22	8	8	5,856	7,358	1,502	0.8	0.13	1.5

GSI ENVIRONMENTAL

- Example Calculations:
  Volume of Sludge Required = Required Weight of Sludge/sludge unit wt
  Volume of Sludge Required = 2741 lb / (66.1 lb/ft^3 x 27 ft^3/yd^3) = 1.6 yd^3

  Thickness of Sludge Required = Required Weight of Sludge/(length x width x sludge unit wt)
  Thickness of Sludge Required = 2741 lb / (8 ft x 22 ft x 66.1 lb/ft^3) = 0.24 ft = 3 in

GSI Job No. 6932

Hazardous Waste Permit Renewal Application
Ascend Performance Materials Texas Inc., Alvin, Texas

Hazardous Waste Permit No. 50189

Part B, Section V: Appendix V.B.2 – Engineering Report for Outdoor Container Storage Area 2

APPENDIX V.B.2
ENGINEERING REPORT FOR
OUTDOOR CONTAINER STORAGE AREA 2 (PERMIT UNIT 23)

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas, Inc., Alvin, Texas

APPENDIX V.B.2
ENGINEERING REPORT FOR
OUTDOOR CONTAINER STORAGE AREA 2 (PERMIT UNIT 23)

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

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GSI Job No. 6932

CERTIFICATION OF ENGINEERING REPORT FOR OUTDOOR CONTAINER STORAGE AREA 2 (PERMIT UNIT 23)

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas, Inc., Alvin, Texas

I, James M. McDade, a registered professional engineer in the State of Texas, certify that the Engineering Report in the Hazardous Waste Permit Renewal Application issued 9 August 2024 for the Outdoor Container Storage Area 2 (Permit Unit 23) on the Ascend Performance Materials Texas Inc., Chocolate Bayou Plant in Alvin, Texas, has been prepared in accordance with the requirements of 40 CFR 264.170-.179.

STATE OF TEXAS
JAMES M. McDADE
115868
LICENSED
PROFESSIONAL ENGINEER

8/9/24

James M. McDade, P.E.
State of Texas Registration No. 115868
GSI Environmental Inc.
Texas Registration No. F-1198

APPENDIX V.B.2
ENGINEERING REPORT FOR
OUTDOOR CONTAINER STORAGE AREA 2 (PERMIT UNIT 23)

Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas, Inc., Alvin, Texas

1.0 DESCRIPTION OF CONTAINER STORAGE AREA

The Outdoor Container Storage Area 2 (Permit Unit 23) will provide storage of containerized wastes retained for time periods greater than 90 days on the Ascend Chocolate Bayou facility. Currently, the unit is a less than 90-day container storage area listed on the facility's Notice of Registration (NOR) as NOR Unit 114. Design, construction, and operating specifications for this unit have been developed in accordance with requirements specified in 40 CFR 264.170-.179.

1.1 General Description

The Outdoor Container Storage Area 2 is located in the southern portion of the manufacturing area of the facility (see Figure V.A.6). Design and operating information for the unit is summarized on Table V.B, and a plan view of the vicinity of the Outdoor Container Storage Area 2 is provided on Figure V.B.2.1.

The area allocated for storage encompasses an approximate 323-ft by 182-ft area having a surface cover of crushed rock, shell, or similar material (see Figure V.B.2.1). The Outdoor Container Storage Area 2 is permitted for a maximum capacity of approximately 370 tons of waste solids. The Outdoor Container Storage Area 2 is and will be used solely for the storage of containerized wastes containing no free liquids. Waste is managed in roll-off boxes, but can also include totes, drums, or other suitable containers.

Container usage conforms to the requirements of 40 CFR 264.171-.173. In order to accommodate unrestricted movement of emergency equipment, a minimum aisle spacing of 30 inches between containers is maintained. This minimum aisle spacing is also sufficient to provide access for placing, moving, and inspecting containers stored in the unit. No containers are stacked more than two units high.

1.2 Secondary Containment (264.175)

The Outdoor Container Storage Area 2 is used for storage of containerized wastes with no free liquids. Consequently, no secondary containment is required per 40 CFR 264.175(c)(1). The site is sloped to drain water away from the areas of container storage, thereby preventing stormwater accumulation in the unit.

2.0 HAZARDOUS WASTES MANAGED

2.1 Types of Wastes Managed

The Outdoor Container Storage Area 2 is used only for storage of containerized radioactive mixed wastes and EPA hazardous waste (i.e., spent carbon, centrifuged process cake, and catalyst sludge). If necessary, prior to placement in the unit, solids and sludges are dewatered in order to pass the Paint Filter Liquids Test (i.e., EPA Method 9095). The Waste Analysis Plan in Part B, Section IV of this permit application provides additional details concerning the wastes generated at Ascend Chocolate Bayou.

2.2 Ignitable and/or Reactive Wastes (264.176)

Waste streams managed in the unit are neither ignitable nor reactive; therefore, no potential exists for ignitability or reaction with other material or wastes.

2.3 Incompatible Wastes (264.177)

The wastes to be stored in the Outdoor Container Storage Area 2 (i.e., spent carbon, centrifuged process cake, and dewatered sludge) are not incompatible, as determined using the system presented in Waste Analysis Plan in Part B, Section IV of this permit application.

3.0 CONTAINER STORAGE AREA OPERATING PROCEDURES

3.1 Container Design and Management Practices (264.171 and 264.172)

Per requirements at 40 CFR 264.171-.172, hazardous wastes are stored only in containers that are in good condition and constructed of materials that are both compatible and non-reactive with the wastes being stored. Waste materials are promptly removed from any container found to exhibit severe rusting, visually apparent flaws, or leaks. If any such defect is observed, the waste is transferred to an acceptable container meeting the requirements of 40 CFR 264.171 and 264.172 or managed in another manner in accordance with applicable regulations (e.g., placed within an overpack drum).

In order to minimize the volume of disposed materials and maximize the use of resources, containers are re-used after reconditioning. The reconditioning process involves the following three-step process: i) removing waste from the container, ii) rinsing three times with a solution capable of dissolving the waste residue, and iii) inspecting to ensure that the reconditioned container remains adequate to contain the waste, as described above. Rinsate is collected for subsequent disposal in a permitted on-site injection well or off-site facility.

3.2 Waste Transfer Procedures (264.173)

In accordance with practices outlined at 40 CFR 264.173, containers remain closed during storage except during the addition or removal of wastes. Wastes may be added to or removed from the container storage area by transferring closed drums, roll-off boxes, or other containers via truck, forklift, or other suitable vehicle. Alternatively, wastes held in another receptacle (e.g., a drum or smaller container) may be transferred by backhoe, shovel, trowel, or other suitable means to a container in the unit. At all times, containers are handled with sufficient care to prevent rupture or damage which could result in waste release.

3.3 Air Emissions

The Outdoor Container Storage Area 2 is used only for the management of radioactive mixed waste (i.e., spent carbon, centrifuged process cake, and catalyst sludge) in accordance with all applicable regulations under the authority of the Atomic Energy Act and the Nuclear Waste Policy Act. Consequently, the unit is not subject to the requirements of air emissions standards for containers per 40 CFR 264.1080(b)(6). In addition, process knowledge and analysis of the non-radioactive portion of the waste in accordance with 40 CFR 264.1083(a)(1) indicate that the volatile organic component of the waste is less than 500 ppmw at the point of waste origination. Therefore, no additional air permitting is required.

3.4 Control of Run-On and Run-Off

As shown on Figure V.B.2.1, the pad on which containers are stored is constructed such that elevations are approximately 14 ft mean sea level (MSL). The ground surface of the unit slopes in a general plant west to east direction at a rate of approximately 1 to 2%, and stormwater drains to a ditch along the eastern boundary of the unit. No wastes containing free liquids are stored in this unit; therefore, no secondary containment is required.

3.5 Flood Protection

Per 30 TAC 335.204(a)(1), hazardous waste storage facilities located in the 100-yr floodplain must be designed, constructed, operated, and maintained to prevent physical transport of any hazardous waste by a 100-yr flood event. As discussed in Part B, Section II of this permit renewal application, the elevation of the 100-yr flood at the Outdoor Container Storage Area 2 is approximately 13 ft MSL. Ground surface elevations in this unit are approximately 14 ft MSL. Therefore, it is estimated that Outdoor Container Storage Area 2 is above the 100-yr flood plain. As discussed in Section 3.5.1, additional precautions will be taken to prevent transport of hazardous waste or damage to containers from floating debris, if a significant weather event and potential flooding are imminent.

Areas of the 100-yr floodplain subject to a coastal flood with velocity hazard from wave action are designated as Zone VE on Figure V.A.2. No portion of Outdoor Container Storage Area 2 is located in Zone VE, and therefore, no storm surge will be predicted in the event of a 100-yr flood event.

3.5.1 Planned Procedures

Protective measures will be taken at the Outdoor Container Storage Area 2 to prevent transport of hazardous waste or damage to containers from floating debris. Such actions will be taken if National Weather Service predictions indicate that a hurricane has a greater than 50% probability of impacting the Ascend Chocolate Bayou Plant. Based upon the time allotted and the types of containers present in the unit at the time of the flood, one or more procedures will be implemented, as follows:

- *Empty Containers*: Waste will be removed and disposed in a permitted on-site or off-site hazardous waste disposal facility. After being cleaned as described in Section 3.1 above, empty containers will be retained on site.
- *Elevate Containers*: Containers will be raised to an elevation higher than the expected maximum flood stage by placing on a clean, empty, overturned roll-off bin, pallet, or other structure having sufficient strength to support the weight of the containers and included waste.

3.5.2 Resources

As an active chemical manufacturing facility, the Chocolate Bayou Facility maintains a varied roster of personnel available to move containers in the event of predicted flooding. Similarly, the facility maintains a large pool of vehicles suitable for moving containers, such as forklifts, truck-mounted cranes, drum-movers, etc.

3.5.3 Potential for Accidental Discharges

The potential for accidental discharges during movement of waste prior to flooding are negligible. Containers will be moved without opening the containers or removing the waste by means of equipment with sufficient strength and maneuverability to transfer the waste without mishap.

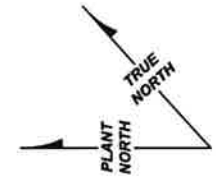
3.6 Inspections (264.174)

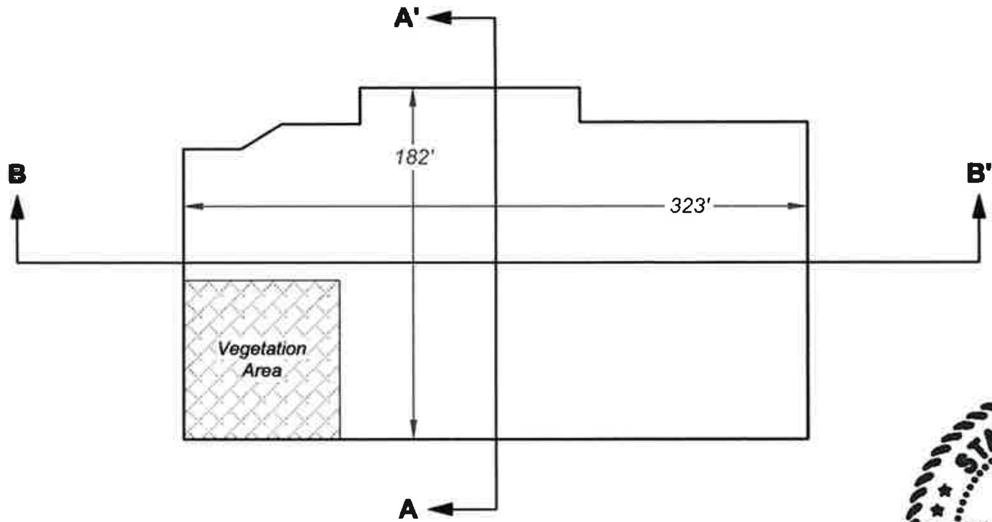
Ascend will inspect the Outdoor Container Storage Area 2 in accordance with the schedule listed in Table III.D (see Section III of Part B application). Ascend will look for leaking containers and for deterioration of containers and the containment system caused by corrosion or other factors.

APPENDIX V.B.2
ENGINEERING REPORT FOR
OUTDOOR CONTAINER STORAGE AREA 2 (PERMIT UNIT 23)

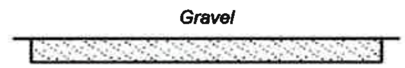
Hazardous Waste Permit Renewal Application
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

FIGURES





PLAN VIEW

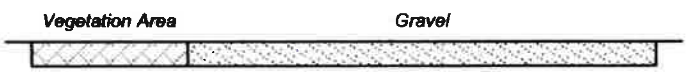


CROSS SECTION A-A'

(Vertical Exaggeration: 25x)

STATE OF TEXAS
JAMES M. McDADE
115868
LICENSED PROFESSIONAL ENGINEER

8/9/24

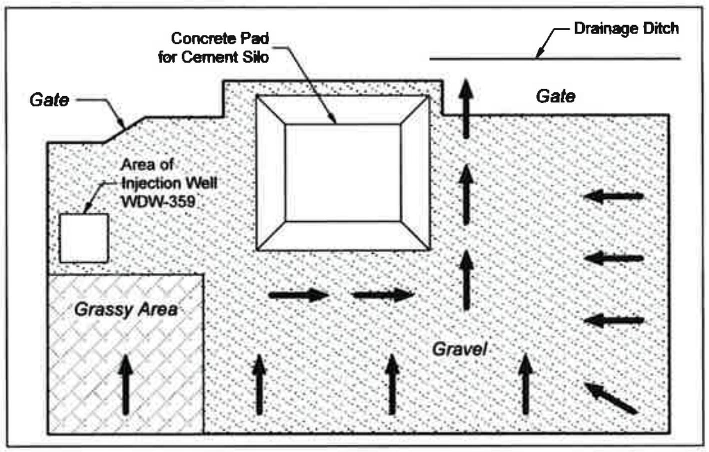


CROSS SECTION B-B'

(Vertical Exaggeration: 25x)

Detailed Plan View

(Certain areas are not to scale)



SCALE (ft.)

0 50 100

LEGEND

Gravel

Surface water flow direction

Notes:

1. Wastes will only be managed in the gravel areas of the unit.
2. Wastes will not be managed in the area with vegetation.
3. Wastes will not be managed in the area of WDW-359, which is separated by a fence.

GSI ENVIRONMENTAL

Texas Registration Number: F-1198

GSI Job No.	6932	Drawn By:	CDM
Map ID:	005_31	Chk'd By:	MW
Issued:	9-Aug-2024	Aprv'd By:	JMM
Scale:	As Shown	FIGURE V.B.2.1	

PROPOSED OUTDOOR CONTAINER STORAGE AREA 2, PERMIT UNIT NO. 23

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189

Ascend Performance Materials Texas Inc., Alvin, Texas

Hazardous Waste Permit Renewal Application
Ascend Performance Materials Texas Inc., Alvin, Texas

Hazardous Waste Permit No. 50189

Part B, Section V: Appendix V.C.1 – Engineering Report for IWPF Tanks

Note: There were no changes to the Engineering Report for IWPF Tanks, originally issued 31 December 2009 and last modified with a Class 1 Permit Modification on 7 April 2023. Therefore, the 7 April 2023 Engineering Report and supporting documentation are submitted as is.

GSI Job No. 6193

ATTACHMENT V.4
ENGINEERING REPORT FOR
IWPF TANKS (PERMIT UNITS 08 AND 09)

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

ATTACHMENT V.4
ENGINEERING REPORT FOR
IWPF TANKS (PERMIT UNITS 08 AND 09)

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

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Section **Page No.**

GSI Job No. 6193

GSI ENVIRONMENTAL

CERTIFICATION OF
ENGINEERING REPORT FOR
IWPF TANKS PERMIT UNITS 08 AND 09:

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

I, James M. McDade, a registered professional engineer in the State of Texas, certify that the Engineering Report in the Hazardous Permit Renewal Application issued 31 December 2009, revised 6 February 2012, revised 19 September 2019, revised 30 July 2020, and revised 7 April 2023 for the IWPF Tanks (Permit Units 08 and 09) on the Ascend Chocolate Bayou Plant in Alvin, Texas, has been prepared in accordance with the requirements of 40 CFR 264.190-.200.

STATE OF TEXAS
JAMES M. McDADE
115868
LICENSED
PROFESSIONAL ENGINEER

7 April 2023

James M. McDade, P.E.
State of Texas Registration No. 115868
GSI Environmental Inc.
Registered Engineering Firm No. F-01198

1.0 DESCRIPTION OF IWPF TANKS (PERMIT UNITS 08 AND 09)

Injection Well Pretreatment Facility (IWPF) Tanks (Permit Units 08 and 09) are located in the south central portion of the manufacturing area of the Ascend Chocolate Bayou facility (see Attachment C.6 and Figure V.4.1).

The tanks and ancillary equipment are designed to provide processing for wastewater and solids which accumulate in the tanks. Wastewater processing is conducted on an on-going basis and may include one or more of the following: pH adjustment, dissolved oxygen reduction, solids removal, oil separation, and flow surge equalization prior to disposal via permitted injection well. Treatment of sludge and solids which accumulate in the tanks is conducted on an as-needed basis at an approximate frequency of 8 to 12 years. Solids are then removed and further treated to meet Land Disposal Restrictions under 40 CFR 268 prior to disposal.

The tank system consists of two carbon steel, floating-roof tanks and appurtenances, designed for collection and pretreatment of process wastewater and storm water prior to disposal in the on-site permitted injection well system (see Figure V.4.2). Each of the two tanks measures approximately 82 ft in diameter and has an approximate 34-ft high straight-sided shell, corresponding to a total liquid height of 30 ft. Both tanks are located within a single concrete secondary containment area having an approximate 4-ft high, reinforced concrete, secondary containment perimeter dike. Both tanks were designed and field-constructed with external floating roofs, internal and external cathodic protection, internal coating, integral flexible membrane liners for leak detection, reinforced concrete ringwall foundations, and level alarms.

Fluids pretreated in the IWPF tanks are disposed in the on-site injection well network. Successful operation of the injection well system has included monitoring for oil, solids, pH, temperature, total suspended solids, and specific gravity to ensure that properties of disposed fluids are within permit specified limits.

2.0 HAZARDOUS WASTES MANAGED IN THE IWPF TANK SYSTEM

2.1 Wastes Managed

Wastes managed in the IWPF Tanks are shown on Table V.C. The IWPF Tanks are used for management and storage of organic and inorganic liquids such as process wastewaters, storm water, recovered groundwater, and landfill leachate prior to disposal via permitted injection well. The IWPF Tanks are also used for the storage and processing of hazardous waste sludge. In this application, Section IV: Waste Analysis Plan provides additional details concerning the wastes generated at Ascend Chocolate Bayou.

2.2 Ignitable and/or Reactive Wastes

Process wastewaters are treated in Elementary Neutralization Units (ENUs), Totally Enclosed Treatment Facilities (TETFs), or other similar treatment units prior to entering the IWPF tank system. Further wastewater processing upon entering the IWPF system involves oil/water separation, pH adjustment, and/or solids separation. This additional processing is conducted to meet the operating requirements for the injection wells. Thus, liquids managed in the tanks do not meet the definition of ignitable or reactive wastes as defined in 40 CFR 261.21 or .23, respectively.

2.3 Incompatible Wastes

Determination of waste compatibility is based upon the procedure presented in Section IV - Waste Analysis Plan. In order to prevent potential adverse reactions or releases, unit operating procedures require that all newly generated wastes are evaluated to determine compatibility with existing wastes. If a new waste is determined to be incompatible with existing wastes managed in the unit, the waste will not be managed in the IWPF Tank system.

3.0 CONSTRUCTION DETAILS OF THE IWPF TANK SYSTEM

In accordance with requirements of 40 CFR 264.192, design of the IWPF Tanks was completed and certified by an independent registered professional engineer (Pilko, 1993a; 1993b). Tanks and ancillary equipment were installed in accordance with standard engineering practices for quality control and testing. The tank collection and discharge piping system are supported by structural steel and/or reinforced concrete supports located at appropriate intervals per code specifications.

Ancillary piping is steel with welded, flanged connections and tie-downs designed to accommodate possible expansion and contraction. The IWPF Tanks are equipped with a two part corrosion protection system consisting of the following: i) application of a vaporized corrosion inhibitor, and ii) on-going electrical resistance monitoring. The design specifications and installation details for the system are described in Attachment V.4.1 - Corrosion Protection System for IWPF Tanks 332T1-1 and 332T1-2.

The construction and installation of IWPF Tanks 332T1-1 and 332T1-2 was monitored by a qualified independent registered engineer, and certified in accordance with the specifications of 40 CFR 264.192(b)-(g), as adopted by the TNRCC per 30 TAC 335.152(a)(8). The certification submitted on 23 August 1994, is included as Appendix V.4.1. An integrity assessment was completed for each of the tanks in early 2009 in order to verify the suitability of the tanks for storage of hazardous waste sludge (See Appendix V.4.5).

Ascend proposes to change the primary seal for the floating roof of IWPF Tank 332T1-1 (Permit Unit 08), which was originally designed and constructed with a log seal. As detailed in Appendix V.4.9, the new proposed seal is a mechanical seal designed in accordance with API Standard 650. Replacement of the log seal with a mechanical seal represents an equal or better modification to the tank. As documented in Appendix V.4.9, replacement of the seal will be completed in general accordance with API Standard 653, and the tank will remain in-service during replacement. Procedures for seal replacement, including personal protective equipment (PPE) requirements, are included in Appendix

V.4.9. During seal replacement, Ascend will continue to inspect the tank and conduct routine operation and maintenance in accordance with Table III-D of this Part B application. Upon replacement of the seal, a report certifying the modification will be sealed by a registered Professional Engineer licensed in the State of Texas, and the report will be submitted to TCEQ.

4.0 OPERATING PROCEDURES FOR THE IWPF TANK SYSTEM

4.1 Waste Flow Description

Operation of the IWPF tank system conforms to requirements referenced in 40 CFR 264.194. An engineering flow diagram for the IWPF tank system is provided on Figure V.4.3. Wastewater is pumped to IWPF Tanks 332T1-1 and 332T1-2 by means of a network of pressure piping connected to ancillary tanks and process units. Prior to receipt, wastewater received by the IWPF system is pretreated to remove solids and reduce organic concentrations. The IWPF Tanks provide composition and flow equalization for the various waste streams received prior to disposal in the on-site permitted injection well. Before entering the IWPF Tanks, the waste streams undergo pH adjustment, oxygen concentration reduction, addition of corrosion inhibitors, and solids removal.

4.2 Solids Handling

Wastewater streams entering the tank system are subject to primary solids removal steps to minimize the rate of solids accumulation in the IWPF Tanks. Solids may be removed, stored, or treated within either of the tanks. However, over time solids may accumulate in the tanks; therefore, treatment of sludge and solids which accumulate in the tanks is conducted on an as-needed basis at an approximate frequency of 8 to 12 years. Sludge and solids processing involves i) addition of caustic to remove cyanide and ii) addition of coagulant to promote solid-liquid separation. Solids are then removed and further treated to meet Land Disposal Restrictions specified in 40 CFR 268 prior to disposal in a permitted off-site or on-site hazardous waste disposal unit.

4.3 Prevention of Releases

In order to prevent corrosion, rupture, leak, or other failure of the IWPF Tanks and ancillary equipment, materials of construction have been selected to be compatible with the hazardous wastewaters managed. A hazard operability analysis (HAZOP) was conducted prior to placing the tanks in service to review safety aspects of the system design and operation.

Overflows are prevented by normal operation of the tanks with sufficient freeboard above the fluid level in the tanks. The normal operating capacity of each tank is approximately 16%. Levels are monitored electronically via the plant Distribution Control System (DCS). Two inlet valves maintained in the open position direct flow to the IWPF Tanks. A gauge on the side of each tank provides a local means of reading the level.

Two tank outlet nozzles feed a common header for each tank before reaching the remote-operated shut off valves. The valves may be shutoff locally at the secondary containment dike wall or via DCS. Closing the two solenoid valves isolates the associated tank from the rest of the system.

Owing to the importance of level control to tank operation, three alarms are continuously monitored via DCS, as follows: high-high level, high level, and low level. Overtopping of the tanks is prevented by means of level alarms installed in each tank. Controls and practices to prevent overfilling of the IWPF Tanks include a high-level alarm at the 85% full level (approximately 25 ft elevation), a second alarm at the 90% full level (approximately 26 ft elevation), and a backup alarm at the 90% full level. Redundant local level indicators serve as a backup. Liquid level is displayed locally at the tank and remotely in the control room and alarms are audible and visual. The tanks are monitored routinely by operators at least once a day per 40 CFR 264.195.

4.4 Containment and Detection of Releases

All ancillary equipment (i.e., piping, pumps, valves, etc.) associated with the tank system is either located within the secondary containment area described above or meets the requirements of 40 CFR 264.193(f).

In order to prevent the release of hazardous waste or hazardous constituents to the environment, secondary containment for the IWPF tank system was constructed in accordance with the requirements of 40 CFR 264.193. Available information for the secondary containment and leak detection systems is provided in Appendices V.4.3 and V.4.4. The secondary containment consists of an approximate 4-ft high concrete wall on a concrete base. The secondary containment was placed on a foundation/base capable of preventing failure due to settlement, compression, or uplift resistance to pressure gradients above and below the system.

The capacity of the secondary containment is sufficient to contain the complete volume of one tank plus the precipitation from a 25-year, 24-hour storm event (i.e., a 10 inch rainfall at this geographical location). See Appendix V.4.4 for a calculation of secondary containment capacity. The secondary containment walls and concrete base are lined with a waterproof coating compatible with all wastes expected to be handled in the tanks per 40 CFR 264.193(c)(1).

The leak-detection system has been designed and is operated to detect the failure of the primary containment structure or the presence of any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours per 40 CFR 264.193(c)(3). Each IWPF tank has been constructed on a leak detection system having the following components: i) a base of compacted backfill, ii) a synthetic liner, and iii) a layer of permeable fill containing perforated pipes connected to the secondary containment area. Should a leak occur in the base of a tank, fluids would drain through the permeable fill layer to the perforated pipes, through the concrete ringwall foundation, and into the secondary containment area.

Fluids from releases or precipitation drain to a sump in the unit for collection and removal. In the event of a release or leak from the system, fluids are pumped back into the tanks after the leak or cause of release has been corrected. Alternatively, fluids may be managed by vacuum truck or similar means of conveyance to a permitted on-site or off-site treatment or disposal facility.

4.5 Spill Response

Provisions of 40 CFR 264.196 specify response activities to be conducted in the event of a release from a tank system. Upon identifying a release from the tank system to the secondary containment, Ascend will implement response actions, which may include the following, as appropriate:

- *Flow Cessation:* The flow of hazardous waste into the tanks or secondary containment area will be stopped immediately upon noticing the release.

- *Waste Removal:* Waste will be removed to prevent further release to the environment and to facilitate inspection and repair of the tank system. Spilled or leaked waste and accumulated precipitation will be removed from the secondary containment system within 24 hours per 40 CFR 264.193(c)(4). If necessary, Ascend will document site conditions or other factors that preclude immediate waste removal and then complete waste removal within the earliest practicable time. Wastewater collected within the secondary containment area will also be removed to prevent adverse impacts to human health or environmental resources. A visual inspection will be conducted to identify affected soils. Ascend will take actions as necessary to prevent further migration of the release to soils and will remove and properly dispose any affected soils.

- *Notifications:* Specific actions to be taken for reporting releases from tank systems will be conducted in accordance with 40 CFR 264.196(d).

- *Return to Service:* If the integrity of the system has not been damaged, the tank system will be returned to service after wastes are removed and repairs completed per 40 CFR 264.196(e). If major repairs are required, the tank system will be certified per 40 CFR 264.196(f) prior to returning the unit to service.

4.6 Air Emissions from the IWPF Tank System

The IWPF Tanks are equipped with external floating roofs that comply with air emission standards referenced in 40 CFR 264 Subpart CC. Openings in the roof (e.g., sample wells, cathodic protection nozzles, and access hatches) are closed when not in use. The external roof floats on the wastewater contained within the tank. Monitoring and inspection of equipment installed to control air emissions is conducted in accordance to requirements of 40 CFR 264.1088. Additional information regarding air emissions is provided in Section X of this application.

4.7 Emergency Shutdown of Electrical Systems

Emergency shutdown of the electrically operated pumps, instrumentation, and equipment associated with the IWPF Tanks is conducted as follows:

- *Shutdown:* Electrically operated equipment is designed to shut down in a fail-safe mode. Thus, in the event of a power failure, all processes shut down in a manner that isolates potentially hazardous materials from personnel and the environment. In addition, automatic control valves on the inlet and outlet of each IWPF Tank can be automatically closed either i) remotely from the Control Room by the Board Processor via the DCS or ii) locally in the field. The outlet pumps connected to the IWPF Tanks (i.e., 332P1-1 and 332P1-2) have field mounted start-stop switches that can be activated in the event of an emergency.

- *Restart:* The reason for emergency shutdown is thoroughly investigated prior to restarting electrically powered equipment. Any necessary repairs or replacements are completed before placing the equipment back in service. Corrective action may include service, repair, or replacement of instruments and equipment, as required. Valves and pumps can be restarted either remotely via the DCS in the Control Room or locally in the field.

ATTACHMENT V.4
ENGINEERING REPORT FOR
IWPF TANKS (PERMIT UNITS 08 AND 09)

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDICES

GSI Job No. G-3379
Issued: 31 December 2009

ATTACHMENT V.4
ENGINEERING REPORT FOR
IWPF TANKS (PERMIT UNITS 08 AND 09)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.4.1

Appendix V.4.1 Certification of RCRA Tank Installation

Groundwater Services, Inc.
...r, Suite ...
Houston, Texas 77...
Tel.: (713) 663-6600
Fax: (713) 663-6546

August 23, 1994
GSI Job No.G-1527

Mr. Bill Kibikas
Monsanto Company
P.O. Box 711
Alvin, Texas 77512

Re: Certification of RCRA Tank Installation, Tanks 332TI-1 and 332T1-2, Injection Well Pretreatment Facility, Monsanto Company, Alvin, Texas.

Dear Mr. Kibikas:

As requested by Monsanto, Groundwater Services, Inc. (GSI), has monitored the installation of Tanks 332T1-1 and 332T1-2 for the Injection Well Pretreatment Facility (IWPF) on the Monsanto Chocolate Bayou Plant in Alvin, Texas. Management of hazardous wastes within the IWPF tank system is authorized under a modification to RCRA Permit No. HW-50189-001 issued by the Texas Natural Resource Conservation Commission (TNRCC) in August 1993. As required under this RCRA permit, proper design and installation of the tank system must be certified in accordance with the specifications of 40 CFR 264.192(b)-(g), as adopted by the TNRCC per 30 TAC 335.152(a)(8). This letter reviews relevant design and installation procedures and provides certification of compliance with RCRA standards.

TANK SYSTEM DESCRIPTION

IWPF Tanks 332T1-1 and 332T1-2 were constructed and commissioned during the period of November 1993 to September 1994 as a partial replacement for the IWPF surface impoundment system. The tank system consists of two nominal one-million gallon, carbon steel, floating-roof tanks and appurtenances, designed for collection and pretreatment of process wastewater and stormwater prior to disposal in on-site permitted injection wells (see Figure 1).

The tanks measure approximately 82 ft in diameter with a 34 ft straight-side shell height, and are located within a concrete secondary containment area with a 4 ft high perimeter dike. Both tanks were designed and field-constructed with external double-deck floating pontoon roofs, internal and external cathodic protection, internal vinyl ester coating, integral HDPE leak detection liners and reinforced concrete ringwall foundations, and electronic overflow/spill alarms. The tanks and ancillary equipment are designed to provide pH adjustment, oxygen removal, solids removal, and flow surge equalization for a maximum 1200 gpm influent wastewater and stormwater stream prior to deepwell injection.

Tank design and construction specifications were based upon applicable standards issued by the American Petroleum Institute (API), American Society of Mechanical Engineers (ASME), American Concrete Institute (ACI), and the Monsanto Company, as identified on Table 1. Detailed design information is provided in project design documents listed on Table 2. Conformance of the tank system design with the requirements of 40 CFR 264.192(a) was certified by an independent registered professional engineer as part of the RCRA permit application documentation submitted to the Texas Water Commission in July 1993. Tank system construction procedures and certification of compliance with the installation requirements of 40 CFR 264.192(b)-(f) are addressed below.

TANK INSTALLATION AND TESTING PROCEDURES

Design and installation requirements for new tank systems subject to RCRA facility standards are outlined under 40 CFR 264.192(a)-(g). Under these rules, specific guidelines are provided regarding: i) tank structure handling and fabrication, ii) foundation material design and installation, iii) tank tightness testing, iv) ancillary equipment protection, and v) corrosion protection. Relevant procedures employed for the installation of IWPF Tanks 332T1-1 and 332T1-2 are addressed in turn below. Quality control documentation compiled during the tank construction project and presently on file at the Monsanto plant is itemized on Table 2.

Tank Structure Fabrication

As specified under 40 CFR 264.192(b), proper handling procedures are to be implemented so as to prevent structural damage to the tank system during installation. All structural damage or other inadequate construction/installation conditions are to be remedied prior to use of the tank system. Quality control and inspection procedures implemented for this purpose during construction of IWPF Tanks 332T1-1 and 332T1-2 are as follows:

- *Weld Breaks, Punctures, or Cracks:* The tank structures were subject to both visual inspections and non-destructive testing to ensure absence of structural deficiencies in accordance with applicable API, ASME, and Monsanto standards (see Table 1). All welding personnel were required to provide evidence of proper welding operator qualifications per Section IX of the ASME Code. On both tanks, shell welds were spot radiographed, and dye penetrant tests were conducted to ensure adequate shell to bottom welds.

August 23, 1994

Field inspection reports and test results documenting conformance with applicable standards are identified on Table 2.

- *Protective Coating:* The internal surfaces of the tanks were double-coated with a spray-applied, vinyl ester coating with a minimum 35-mil total thickness. External shell and roof surfaces were painted per Monsanto K1.3 Standard C3 and K3.2 Standard 2. Adequacy of tank protective coatings was confirmed by the contractor on the basis of holiday testing conducted in accordance with the Steel Structures Painting Council (SSPC) Paint Specification No. 2 (see Table 2).

- *Corrosion Protection:* All tank system components were visually inspected for absence of corrosion prior to installation per Monsanto D2.2 Standard 3. The tank cathodic protection system was designed and tested by a qualified corrosion expert. Relevant quality control documentation is identified on Table 2. Additional discussion of the corrosion protection system installed for this tank system is provided below.

Tank Foundation Installation

As required by 40 CFR 264.192(c), tank backfill soils and foundations must be designed and installed so as to provide full and uniform support to the tank and associated piping. The foundations of IWPF Tanks 332T1-1 and 332T1-2 were designed and constructed to support the full operating load of the tank structures with adequate margin of safety against bearing capacity failure or excessive settlement. Relevant geotechnical design specifications are provided in engineering design reports issued by Groundwater Services, Inc. (GSI), and Fugro-McClelland, Inc., in June 1993 (see Table 2). Civil/structural specifications for the reinforced concrete ringwall foundations and secondary containment pad area are detailed in the Monsanto bid package issued September 30, 1993.

Field records of site proof-rolling inspections, backfill soil characteristic testing, and soil compaction tests conducted to confirm proper placement of tank foundation soils are listed on Table 2. Conformance with applicable ACI and ASTM standards for the ringwall foundations and secondary containment pad has been documented on the basis of field inspection reports, aggregate test results, concrete delivery tickets and pour cards, and concrete compression test reports compiled during the construction program (see Table 2).

Pre-Service Tank Testing

As required under 40 CFR 264.192(d), tanks and ancillary equipment are to be tested for tightness and all leaks repaired prior to placing the tank system in service. For this purpose, hydrostatic pressure tests were conducted on both IWPF

Tanks 332T1-1 and 332T1-2, in accordance with Monsanto D2.5 Standard 12 (see Table 1). Test procedures involved filling of the tanks to design capacity with clean water and visually inspecting the vessels for evidence of leakage. During each hydrotest, the double-deck floating roofs and associated seals were also inspected for proper flotation and leak prevention. In addition, a vacuum box leak tests were conducted on each tank bottom in accordance with Monsanto D2.5 Standard 23. Proper materials of construction, seam welding, and performance of the HDPE leak detection liner were confirmed on the basis of site inspections conducted by qualified contractor personnel. In addition to the vessel tests, all tank system piping was subjected to hydrostatic pressure tests at 150% of the design pressure, and all leaking joints or connections were repaired as needed. Field records documenting proper tightness results for all tank system components are identified on Table 2.

Ancillary Equipment Installation

Per 40 CFR 264.192(e), ancillary equipment, including collection and discharge piping and related pumps, instrumentation, etc., must be supported and protected against physical damage or excessive stress due to settlement, vibration, expansion, or contraction. Accordingly, all ancillary piping and equipment has been designed and installed in accordance with ASME Standard B31.3, the Chemical Plant and Petroleum Refinery Piping Code. The full length of the tank collection and discharge piping system is supported by structural steel and/or reinforced concrete supports located at appropriate intervals per code specifications. All piping is carbon steel with welded, flanged connections and tie-downs designed to accommodate possible expansion and contraction. Metallic piping installation and inspection specifications employed in this project are detailed in CEA 4247 Specifications 21A-2 and 21A-3 in the civil/structural bid request document (see Table 2). Mechanical equipment anchoring specifications conform with Monsanto A2.3 Standard 11 (see Table 1.)

Corrosion Protection System

Under 40 CFR 264.192(f), the owner or operator of a RCRA tank system is required to provide the type and degree of corrosion protection recommended by an independent corrosion expert. In addition, installation of the corrosion protection system must be supervised by an independent qualified expert. For the purpose of corrosion protection, IWPF Tanks 332T1-1 and 332T1-2 are equipped with a cathodic protection system consisting of: i) six internally suspended sacrificial silicon anodes to protect the tank interior surfaces, ii) external sacrificial magnesium anode ribbon connected to the tank bottom, and iii) electrical isolation of all tank nozzles and flanges. Both the internal and external cathodic protection systems are equipped with appropriate wiring and access nozzles to facilitate periodic testing with reference electrodes.

Groundwater Services, Inc.

August 23, 1994

The cathodic protection system was designed by John Atwood & Associates, a firm specializing in corrosion protection specifications per NACE standards, and installed by Global Cathodic Protection, Inc. Proper installation and testing of the sacrificial anode systems was certified by Mr. J. H. Isbell, a qualified inspector in the employ of Global Cathodic Protection. Relevant installation records are identified on Table 2.

CERTIFICATION OF TANK SYSTEM INSTALLATION

Technical Basis for Certification

Groundwater Services, Inc. (GSI), has monitored all phases of the IWPF tank installation project to confirm compliance with applicable provisions of 40 CFR 264.192(b)-(f). Evaluation of the tank system design and installation has been based upon information derived from the following sources: i) tank system design and bid request documents, ii) field inspection reports and test records produced by tank installation contractors, iii) periodic construction site inspections by GSI staff, and iv) interviews with Monsanto quality control and construction management personnel. A summary of the tank design and construction documentation relied upon by GSI is provided on Table 2.

Certification Statement

On the basis of the information reviewed above, I, John A. Connor, a registered professional engineer in the State of Texas, certify that IWPF Tanks 332T1-1 and 332T1-2 and related ancillary equipment have been designed and installed on the Monsanto Chocolate Bayou Plant in Alvin, Texas, in accordance with the requirements of the Resource Conservation and Recovery Act (RCRA), as specified under 40 CFR 264.192(b)-(f).

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

Groundwater Services, Inc.

August 23, 1994

Should you have any questions regarding the information provided in this certification report, please contact me at (713) 663-6600.

Sincerely,

John A. Connor, P.E.
State of Texas
Registration No. 62707

STATE OF TEXAS
JOHN A. CONNOR
62707
REGISTERED PROFESSIONAL ENGINEER

SEAL

SUBSCRIBED AND SWORN BEFORE ME on the 23rd day of August, 1994, to certify which witness my hand and official seal.

Martha S. Lott

Notary Public in and for
Harris County, Texas

MARTHA S. LOTT
NOTARY PUBLIC
State of Texas
Comm. Exp. 07-19-96

NOTARY PUBLIC
STATE OF TEXAS

NOTARY SEAL

My Commission Expires:
7-19-96

cc: Mr. Tony Pacifico
Mr. José Boix

Appendix V.6.1
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

GSI Job No. G-1527
Issued: 8/23/94
Page 1 of 1

TABLE 1
PARTIAL LIST OF APPLICABLE DESIGN AND CONSTRUCTION STANDARDS FOR IWPF TANK SYSTEM

Injection Well Pretreatment Facility
Monsanto Company, Alvin, Texas

American Petroleum Institute (API)

- API 650: Welded Steel Tanks for Oil Storage
- API 620: Rules for Design and Construction of Large, Welded, Low-Pressure Storage Tanks

American Society of Mechanical Engineers (ASME)

- ASME B31.3: Chemical Plant and Petroleum Refinery Piping

American Concrete Institute (ACI)

- ACI 304: Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete
- ACI 311: Recommended Practice for Concrete Inspection
- ACI 315: Manual for Standard Practice for Detailing Reinforced Concrete Structures
- ACI 318: Building Code Requirements for Reinforced Concrete
- ACI 347: Recommended Practice for Concrete Formwork

Monsanto Standards

- Monsanto A2.3 Standard 11: "Anchor Bolts, Recommended Practice," issue 4, September 1983, 5p.
- Monsanto A3.1 Standard 5: "Hollow Load-Bearing Concrete Masonry Units, Material Specifications," issue 4, June 1974, 1p.
- Monsanto A3.1 Standard 15: "Mortar, Material Specification," issue 3, June 1974, 1p.
- Monsanto A4.1 Standard 11: "Fabrication for Hot-Dip Galvanizing, Recommended Practice," issue 5, November 1982, 1p.
- Monsanto A6.3 Standard 15: "Duct Openings in Masonry Wall, Recommended Practice," issue 2, June 1970, 2p.
- Monsanto D2.2 Standard 3: "Carbon Steel Equipment, Class II and III," issue 4, September 1983, 3p.
- Monsanto D2.3 Standard 1: "Field Erected Storage Tanks," issue 1, July 1978, 2p.
- Monsanto D2.5 Standard 12: "Hydrostatic Pressure Test for Metallic Equipment," issue 1, December 1979, 2p.
- Monsanto D2.5 Standard 23: "Vacuum Box Leak Test," issue 1, December 1979, 1p.
- Monsanto D2.5 Standard 32: "Dye Penetrant Examination, CED Master Specification," issue 1, October 1979, 4p.
- Monsanto D3.2 Standard 37: "Fabricator's Design Guide for Tanks," issue 2, September 1980, 3p.
- Monsanto K1.3 Standard A9: "Three Coat Heavy-Duty System for Piping and Equipment, Coal Tar Epoxy," issue 1, October 1985, 1p.
- Monsanto K1.3 Standard C1: "One Coat Protection for Carbon Steel, Inorganic Zinc," issue 6, October 1989, 1p.
- Monsanto K1.3 Standard C3: "Two Coat Normal Thickness System for Non-Primed Steel, Inorganic Zinc - Catalyzed Epoxy," issue 5, October 1985, 1p.
- Monsanto K1.3 Standard U1: "Coating and Wrapping for Underground Pipe, Reinforced Hot Bitumin-Felt Wrapping," issue 7, October 1989, 1p.
- Monsanto K3.2 Standard 2: "Liquid Applied Linings, Application Specification," issue 4, October 1985, 4p.
- Monsanto K4.2 Standard 2: "Hot-Dip Galvanizing, Construction Specification," issue 3, October 1985, 1p.

TABLE 2

SUMMARY OF TANK SYSTEM DESIGN AND CONSTRUCTION DOCUMENTATION: IWPF TANKS 332T1-1 AND 332T1-2

**Injection Well Pretreatment Facility
Monsanto Company, Alvin, Texas**

DOCUMENTATION	CONTRACTOR	SUBCONTRACTOR	DATE	SIGNED BY	NOTES
Tank System Design Documents					
Application for Class 2 RCRA Permit Modification, IWPF Hazardous Waste Storage Tanks, Monsanto Company, Chocolate Bayou Plant, Alvin, Texas, TWC Permit No. HW-50189-001.	Pilko & Assoc., Inc.	—	2/12/93	—	RCRA Permit Application, submitted to TNRCC.
Notice of Deficiency Response, Application for Class 2 RCRA Permit Modification, IWPF Hazardous Waste Storage Tanks, Monsanto Company, Chocolate Bayou Plant, Alvin, Texas, TWC Permit No. HS-50189-001, Rev. 1.	Pilko & Assoc., Inc.	—	6/21/93	—	Supplemental permit application document submitted to TNRCC.
Geotechnical/Environmental Site Assessment, New Injection Well Pretreatment Facility Tanks, Monsanto Company, Alvin, Texas, GSI Job No. G-1446.	Groundwater Services, Inc.	Fugro-McClelland, Inc.	6/16/93	—	Preliminary geotechnical soil sampling and testing.
Monsanto Tank Mechanical Data Specifications, CEA 4247, 336-T1-1 and 336-T1-2, Rev C.	Stubbs	—	8/31/93	E. Morganegg	General mechanical standards by engineer.
Monsanto Chemical Group, Bid Package for Civil-Structural and Architectural Construction, Injection Well Pretreatment Facility Replacement Project, CEA 4247, Chocolate Bayou Plant, Alvin, Texas, Rev. 0.	Stubbs	—	9/30/93	—	Detailed civil/structural specifications by enginer.

Notes:

All reports, test results, and communications referenced above relate to design and construction of IWPF Tanks 332T1-1 and 332T1-2, installed on the Monsanto Chocolate Bayou Plant in Alvin, Texas, during the period of November 1993 - September 1994. All documents are on file at the Monsanto plant.

Alamo = Alamo Iron Works
Atwood = John Atwood and Associates
Cajun = Cajun Contractors
CCI = CCI Inspection Services, Inc.
Control = Control Specialities, Inc.
Dashiell = Dashiell Corp
Global = Global Cathodic Protection, Inc.
H&G = H&G Inspection Company, Inc.
IND = IND Chem Constructors, Inc.
Law = Law Engineering, Inc.
MBI = Master Builders, Inc.
PSI = Professional Services Industries, Inc.
SLT = Soil Liner Technologies
Southern Materials = Division of Houston Shell and Concrete
Stubbs = CDI - Stubbs Overbeck
TIPCO = Texas Industrial Painting Company, Inc.
US = US Contractors
Westinghouse = Westinghouse/Elliott Valve
Wyatt = Wyatt Field Services

TABLE 2

**SUMMARY OF TANK SYSTEM
DESIGN AND CONSTRUCTION DOCUMENTATION:
IWPF TANKS 332T1-1 AND 332T1-2**

**Injection Well Pretreatment Facility
Monsanto Company, Alvin, Texas**

DOCUMENTATION	CONTRACTOR	SUBCONTRACTOR	DATE	SIGNED BY	NOTES
Tank System Design Documents *(continued)*					
Tank Data Sheets and Calculations, CEA 4247, 336-T1-1 and 336-T1-2.	Wyatt	—	10/25/93	M. J. Kopecky	Detailed mechanical design by contractor.
Tank and Floating Roof Data Sheets, per API Standard 650, 9th ed. and Monsanto Specification CEA 4247, 336-T1-1 and 336-T1-2.	Wyatt	—	12/8/93	B.J. Brady	Detailed mechanical design by contractor.
Tank Structure Fabrication Records					
Welding Procedure Specifications	Wyatt	—	10/26/93		Reviewed by Stubbs. Approved by D. Arnold, Monsanto.
Tank Erection Sequence Plan	Wyatt	—	12/8/93	B.J. Brady	Reviewed for construction by Stubbs.
Welding Procedure for Injection Well Corrosion Spool	—	—	—	—	Welding of modified corrosion spool (A516 carbon steel flanges to API-5A grade P-110 well casing).
Recommended welding procedure for welding flanges to Corrosion Loop Test Tubing Sections	Monsanto MTS	—	4/81	R.L. Marx	—
Welding Procedure Qualification Record	Wyatt	—	10/26/93	—	Reviewed by Stubbs. Approved by D. Arnold, Monsanto.
Welder Qualifications	US	—	4/7/94	J.P. Kelly	Welder Log - name and stencil.
Procedure Qualification Record	US	—	5/12/94	T.R. Easley	Joint design, position, base metal, heat treatment, gas, filler metal, electrical, technique, tensile test, guided bend test, toughness test, hardness test.

Notes:

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SLT = Soil Liner Technologies
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TABLE 2

SUMMARY OF TANK SYSTEM
DESIGN AND CONSTRUCTION DOCUMENTATION:
IWPF TANKS 332T1-1 AND 332T1-2

Injection Well Pretreatment Facility
Monsanto Company, Alvin, Texas

DOCUMENTATION	CONTRACTOR	SUBCONTRACTOR	DATE	SIGNED BY	NOTES
Tank Structure Fabrication Records *(continued)*					
Welding Procedure Specification	US	—	5/12/94	T.R. Easley	Gas, filler metal, electrical, technique, joint, base metal, preheat joint, heat treatment.
Weld Test Results	US	Metallon Metallurgical Testing Laboratories	5/11/94	D. R. McGehee	ASTM A370: Size, area, yield strength, tensile strength, percent longation.
Weld Test Results	US	Metallon Metallurgical Testing Laboratories	5/10/94	D. R. McGehee	ASME Section IX: Size, area, ultimate load, tensile strength, fracture location.
Various Manufacturers' Records of Welder or Welding Operator Qualifications Tests	US	—	—	—	—
Visual Inspections of grinding welds	Wyatt	—	—	—	NACE detail. Reviewed by Stubbs.
Report of Liquid Dye Penetrant Examinations	Wyatt	H&G	—	—	ASME V and Monsanto D2.5 Std 32.
Standard specs for steel substrates to receive monolithic linings	Wyatt	MBI	—	—	—
Coating Procedure written by MBI	Wyatt	TIPCO	—	—	—
Roof Coating Warranty, MCC Bldg. # P-1265	Cajun	Bondcote	1/18/94		—
Coating Inspection Plan	Wyatt	CCI	4/13/94	S. Ramey	—

otes:

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Global = Global Cathodic Protection, Inc.

H&G = H&G Inspection Company, Inc.
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PSI = Professional Services Industries, Inc.
SLT = Soil Liner Technologies

Southern Materials = Division of Houston Shell and Concrete
Stubbs = CDI - Stubbs Overbeck
TIPCO = Texas Industrial Painting Company, Inc.
US = US Contractors
Westinghouse = Westinghouse/Elliott Valve
Wyatt = Wyatt Field Services

Appendix V.6.1
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

TABLE 2

**SUMMARY OF TANK SYSTEM
DESIGN AND CONSTRUCTION DOCUMENTATION:
IWPF TANKS 332T1-1 AND 332T1-2**

**Injection Well Pretreatment Facility
Monsanto Company, Alvin, Texas**

DOCUMENTATION	CONTRACTOR	SUBCONTRACTOR	DATE	SIGNED BY	NOTES
Tank Structure Fabrication Records *(continued)*					
Daily Inspection Report - Surface Preparation	Wyatt	TIPCO	—	W. Harris	—
Coating Inspection Daily Reports	Wyatt	CCI	—	W. Strong	Inspections in accordance with Steel Structures Painting Council Paint Specification Application No. 2, "Measurement of Dry Paint Thickness with Magnetic Gages" SSPC-PA2, specs by Master Builders, 1/21/94, Peter Isto.
Tank Foundation Installation Records					
Soil Compaction Results under T1-1 Ringwall	Cajun	PSI	12/9/93	—	—
Moisture Density Relationship of Soil	Cajun	PSI	—	—	AASHTO T-180 Visual soil classification, source results, max dry density , optimal moisture content.
Field Compression Tests	Cajun	PSI	—	—	AASHTO T-180; ASTM D-1557, Method A: Max Dry Density; Water content; In-place dry density; percent compression; location; type of soil.
Test Results for Fill Materials	Cajun	—	11/30/93	M. Moran	—
Backfill and Proofrolling Inspection Field Notes	Stubbs	—	12/17/93	R. Carter	—
Report of Proofrolling Inspection	Stubbs	—	12/20/93	R. Carter	—
Elevation Certificate, FEMA National Flood Insurance Program	Stroud	—	2/14/94	R.L. Stroud	—

Notes:

All reports, test results, and communications referenced above relate to design and construction of IWPF Tanks 332T1-1 and 332T1-2, installed on the Monsanto Chocolate Bayou Plant in Alvin, Texas, during the period of November 1993 - September 1994. All documents are on file at the Monsanto plant.

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IWPF TANKS 332T1-1 AND 332T1-2**

**Injection Well Pretreatment Facility
Monsanto Company, Alvin, Texas**

DOCUMENTATION	CONTRACTOR	SUBCONTRACTOR	DATE	SIGNED BY	NOTES
Tank Foundation Installation Records ***(continued)***					
Rebar Shop Drawings for Ring Walls, MCC Bldg and Pads	Cajun	Alamo	11/30/93	R. Carter	Reviewed by Stubbs.
Concrete Mix Design Review	Stubbs	—	11/30/93	—	Replace Rheobuild 1000 with Daracem 100.
Concrete Delivery Tickets	Cajun	Southern Materials	—	—	Quantity; cumulative quantity ordered; product code; description: 4000-F 1.5G SP/R yard Plasticizer (oz.).
Concrete Pour Cards	Cajun	Southern Materials	3/31/94	—	—
Concrete Compression Test Reports	Cajun	PSI	1/94 - 3/94	B. Rogers, J. B. Coombs, R. Salas	Test cylinders made by contractor's rep and picked up by subcontractors rep: nominal size: 6" X 12"; Field compressive strength: 3 days; Lab compressive strength: 7 days; Lab compressive strength: 28 days; 4000 psi with 1.5" gravel and superplastic.
Daily Field Reports	Cajun	PSI	1/94 - 3/94	J.B. Coombs, R. Salas	—
Report of Field Inspection of Concrete	Cajun	PSI	1/94 - 4/94	B. Rogers, J.B. Coombs, R. Salas, R. Byrd	Set number of cylinders, concrete ticket, time load and unload, yards of concrete , slump, air 90, concrete temperature, location of placement.

otes:

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SUMMARY OF TANK SYSTEM
DESIGN AND CONSTRUCTION DOCUMENTATION:
IWPF TANKS 332T1-1 AND 332T1-2

Injection Well Pretreatment Facility
Monsanto Company, Alvin, Texas

DOCUMENTATION	CONTRACTOR	SUBCONTRACTOR	DATE	SIGNED BY	NOTES
Tank Foundation Installation Records *(continued)*					
Concrete Mix Design Data	Stubbs	—	4/19/94	H.C. Nichols	Approval of 4000 psi concrete design from Pioneer Concrete of Texas, Inc. Superplasticizer = Rheobuild 1000; from MBI; Air entrained admixture = Darex II by WA Grace.
Aggregate Testing for Vulcan/ICA	Cajun	Law	—	S.L. Kaiser	Distributing Co. Report of TXDOT Item 249 Tests for limestone base.
Tank Settlement Inspection	Stubbs	—	3/28 - 4/13/94	R. Carter	—
Pre-Service Tank Testing Records					
Roll Test Data for HDPE Liner	Cajun	SLT	10 to 11/93	—	—
Letter from SLT to Cajun regarding pipe penetration through polylock and liner	Cajun	SLT	11/29/93	—	Pipe seal completion specs.
Liner Certification	Cajun	SLT	12/17/93	R.K. Zimmerman	NSF Standard 54.
Liner Material Warranty	Cajun	SLT	12/17/93	J.L. Bohrer	—
Surface Acceptance for HDPE Liner	Cajun	SLT	12/18/93	—	Applies to acceptability of surface conditions for installation of geosynthetic products (Tank 332T1-1, west ringwall).
Liner Welding Resin Certification	Cajun	SLT	12/20/93	—	—

otes:

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IWPF TANKS 332T1-1 AND 332T1-2**

**Injection Well Pretreatment Facility
Monsanto Company, Alvin, Texas**

DOCUMENTATION	CONTRACTOR	SUBCONTRACTOR	DATE	SIGNED BY	NOTES
Pre-Service Tank Testing Records *(continued)*					
Resumes of Liner Installation Personnel	Cajun	SLT	12/20/93	C. Piper, M. Gomez, G. Telez, N. Cain	—
Surface Acceptance for HDPE Liner	Cajun	SLT	12/23/93	C.G. Pate	Acceptability of surface conditions for installation of geosynthetic products (Tank 332T1-2, east ringwall).
Geosynthetic Material and Installation Acceptance.	Cajun	SLT	12/23/93	C.G. Pate	Install 80 mil HDPE liner in 2 ringwalls, vacuum test, spark test, and ground leak detection pipes.
Certification for Tank and Floating Roof Data Sheets	Stubbs	Wyatt	12/8/93	B.J. Brady	In compliance with API Standard 650, 9th ed, & Monsanto Spec CEA 4247-T1/T2.
Hydrostatic Testing of Tank Foundation Settlement conducted 3/28 - 4/14/94	Monsanto	—	4/20/94	T. Pacifico	Monsanto D2.5 Standard 12.
PSV Calibration Report Test Report - Direct acting spring valves	Control	—	—	—	—
Valve Certified Inspection and Test Report	Stubbs	Westinghouse	—	—	—
Repad Pneumatic Leak Tests	Stubbs	Wyatt	—	—	API 650 Specifications.
Vacuum Box Leak Tests for Tank Base	Stubbs	Wyatt	—	—	API 650, Monsanto D2.5 Standard 23.
Floating Roof Seal Inspection.	Wyatt	IND	6/13/94	K. McKee	Visual inspection of double-deck floating roof with foam leg with secondary wiper seal, Tank 332T1-1.

otes:

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Appendix V.6.1
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

TABLE 2

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IWPF TANKS 332T1-1 AND 332T1-2**

**Injection Well Pretreatment Facility
Monsanto Company, Alvin, Texas**

DOCUMENTATION	CONTRACTOR	SUBCONTRACTOR	DATE	SIGNED BY	NOTES
Pre-Service Tank Testing Records *(continued)*					
Floating Roof Seal Inspection.	Wyatt	IND	6/23/94	K. McKee	Visual inspection of double-deck floating roof with foam leg with secondary wiper seal, Tank 332T1-2.
Corrosion Protection System Installation					
Letter regarding routing anode connection cables to one side of the tank and as built	Cajun	Global	2/22/94	J. Davis	Discussion of spec modification.
Letter regarding routing of sealed anode connection	Cajun	Global	4/14/94	J. Davis	Discussion of spec modification.
Facsimile regarding 2 current drain points (spec) vs. 1 (built): no adverse consequences	Atwood	—	—	J. Atwood	Approval of spec modification by engineer.
Measured potentials before and after cathodic protection installation. As-built of cathodic protection system.	Cajun	Global	6/29/94	J.H. Isbell	—
Sacrificial Anode System Certification	Cajun	Global	—	J.H. Isbell	Accepted by D. Arnold, Monsanto.
Sacrificial Anode System Certification	Cajun	Global	—	J.H. Isbell	Accepted by D. Arnold, Monsanto.

otes:

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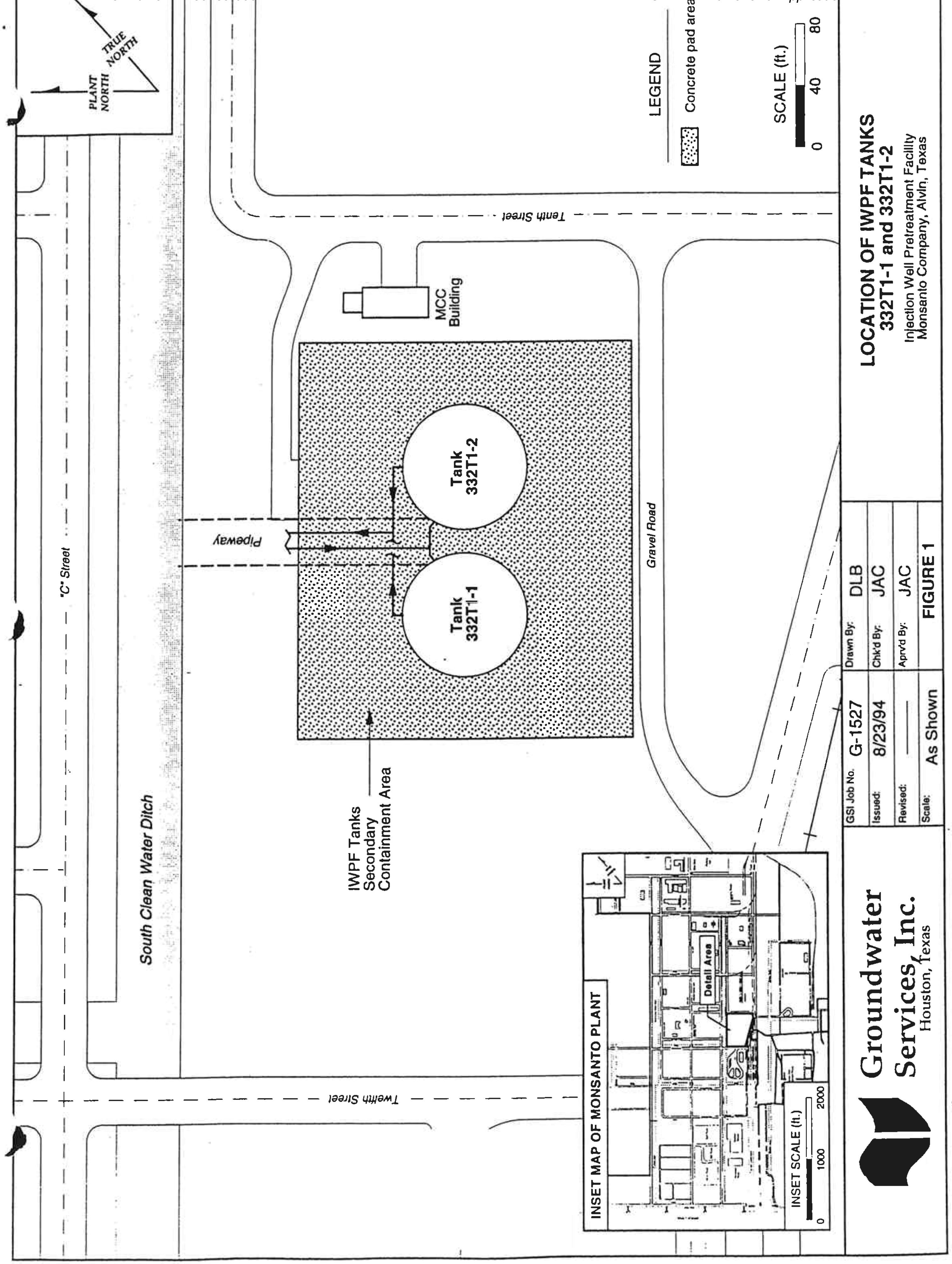

PLANT NORTH
TRUE NORTH
LEGEND
Concrete pad area
SCALE (ft.)
0
40
80
Tenth Street
MCC Building
Tank 332T1-2
Tank 332T1-1
Pipeway
Gravel Road
"C" Street
South Clean Water Ditch
IWPF Tanks Secondary Containment Area
Twelfth Street
INSET MAP OF MONSANTO PLANT
Detail Area
INSET SCALE (ft.)
0
1000
2000
Groundwater Services, Inc.
Houston, Texas
GSI Job No. G-1527
Issued: 8/23/94
Revised:
Scale: As Shown
Drawn By: DLB
Chk'd By: JAC
Aprv'd By: JAC
FIGURE 1
LOCATION OF IWPF TANKS 332T1-1 and 332T1-2
Injection Well Pretreatment Facility
Monsanto Company, Alvin, Texas

GSI Job No. G-3379
Issued: 31 December 2009

ATTACHMENT V.4
ENGINEERING REPORT FOR
IWPF TANKS (PERMIT UNITS 08 AND 09)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.4.2

Appendix V.4.2 Certification of Floating Roof Tanks

Monsanto Project CEA4247

Waste Water Storage Tanks

(2) 82'ϕ x 34' Double Deck Floating Roof Tanks

Chocolate Bayou Plant

Alvin, Texas

As a Professional Engineer registered in the State of Texas and experienced in the design of tanks and vessels, I do hereby certify that the attached tank and floating roof data sheets are in compliance with the requirements of API Standard 650, 8th Edition and Monsanto's Mechanical Specification 4247-EP-T1/T2 (IWPF) dated 1/5/93 and amended by CBI letter dated February 4, 1993.

STATE OF TEXAS
JAMES G. SOULES
54841
REGISTERED PROFESSIONAL ENGINEER

/17/93

James G. Soules
Registered Professional Engineer
State of Texas
License No. 54841

TABLE OF CONTENTS

STATE OF TEXAS
JAMES G. SOULES
54841
REGISTERED
PROFESSIONAL ENGINEER

/93

SUBJECT	CBI	OFFICE DHE	REVISION		REFERENCE NO.
(2) 82' DIA. X 34' DDFRT MONSANTO ALVIN, TEXAS	MADE BY JGS	CHKD BY	MADE BY	CHKD BY	SHT TC-1 OF
	DATE 6/17/93	DATE	DATE	DATE	

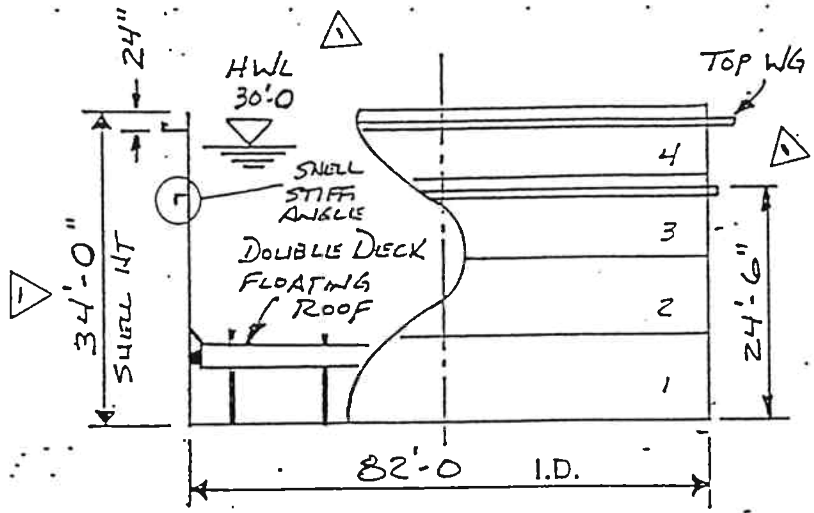
CBI

Sht 1 of 2

Date 1.19.93
Made by PWL
Chkd by
Rev. NO. 1 2/4/93

TANK DATA AND SPECIFICATION SHEET

Est. Job No.	Customer	MILS 301	MONSANTO CHEMICAL	Location	ALVIN TX
Tank No.	Service	T1/T2	WASTE WATER	No. Req'd.	2



Design Codes	API 650 & MONSANTO SPEC IWPF

Nozzles & Flanges

Mark	Size & Rating	Qnt'y.	Application
A			
B	PER NOZZLE		
C	SCHEDULE		
D	PG 5 OF		
E	SPEC IWPF		

Design Conditions

Content	WASTE H_2O
Spec. Gravity	1.0
Design Pressure	ATMOS
Design Temperature	+30°F DMT
Capacity	Nom. 1.179 MMG
Corr. Allowance	Shell 1/8 Roof 1/8 Bot. 1/8
Joint Eff. SD = 25.3 KSI	85%
X-Ray (PER API)	SPOT
Seismic Factor	ZONE 0
Wind Velocity	125 MPH
Snow Load	~
Rain Fall	10"/24 HR MAX
Filling Rate	1200 GPM
Pumpout Rate	1500 GPM

Construction Details

Tank Size (Dia. Hgt.) 82'-0 / 34'-0

		Mat'l	PL Width/Thick	Joint	Heat Treatment
Bottom		516-70	/ .375"	BUTT	~
Annular			/		
SHELL	1	516-70	102.0" / .3694"	BUTT	~
	2		/ .2978"		
	3		/ .2500"		
	4	do	do / .2500"	do	
	~~5~~		/		
	~~6~~		/		
	~~7~~		/		
	~~8~~		/		
Top ~~Angle~~ WG		A36	14.25" x 6" x 1/4" PL		
Roof		(SEE SHT 2 FOR DETAIL)			
~~Framing~~ STIFF ANGLE		A36	5x5		

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2/4/93

Appurtenances

Stairway	SPIRAL	Platform w/Handrail	TOP & INTMDE
Roof Manway		Water Draw off w/ Sump	N/A
Shell Manway w/ DAVIT	(4) 24"	ROOF DRAIN	(1) 6"
Heating Coil	N/A	ROOF EMERG. DRAIN	(1) 6"
Tank Gauge	N/A		
Gage Hatch	N/A		

Remarks

REFER TO SHT 2 OF 2 FOR FLOATING ROOF DETAILS

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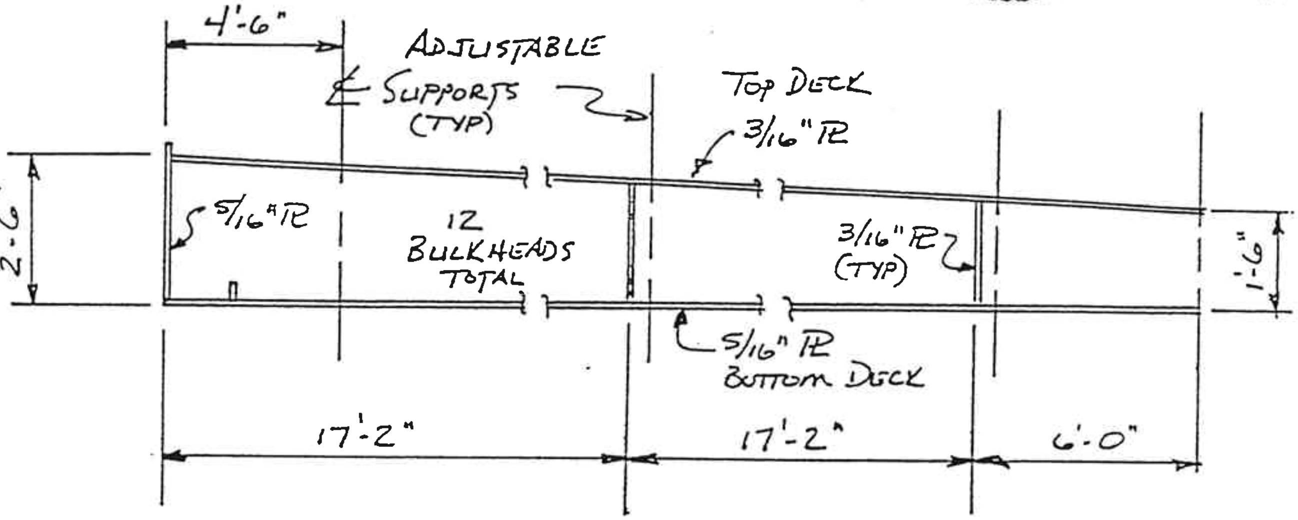
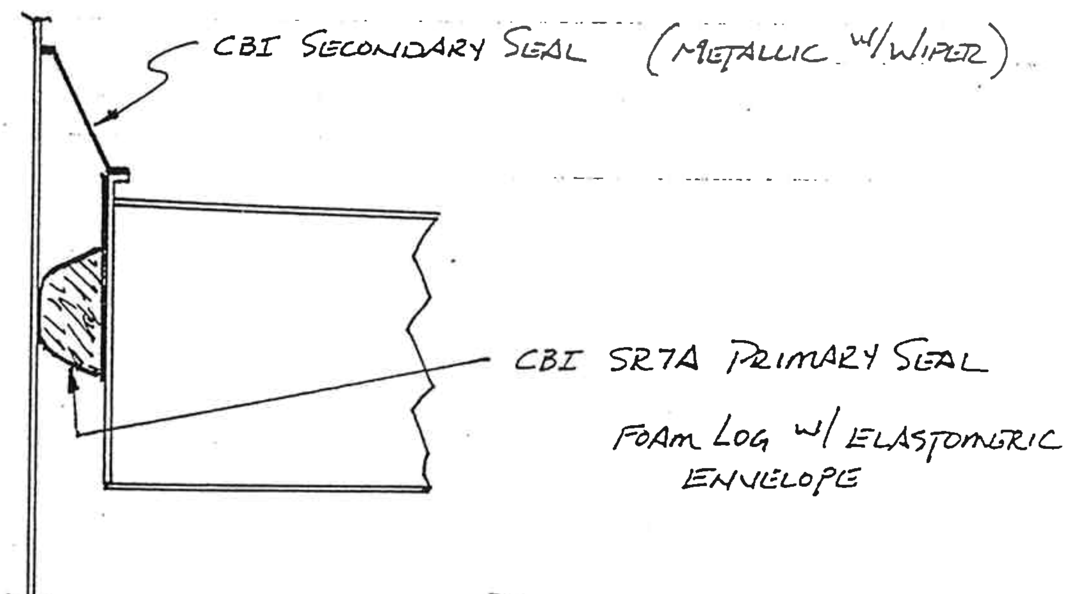
93



SECTION THRU DOUBLE DECK ROOF



SEAL DETAILS

SUBJECT	CBI OFFICE	REVISION 0		REFERENCE NO. MILLS 301
DOUBLE DECK ROOF FOR 82'φ WASTE H_2O TANK MONSANTO CHEMICAL	MADE BY PL	CHKD BY	MADE BY	CHKD BY	SHT 2 OF 2
	DATE 1-20-93	DATE	DATE	DATE	

Printed In USA

GO 84 REV SEP 84

Sheet 2

STATE OF TEXAS
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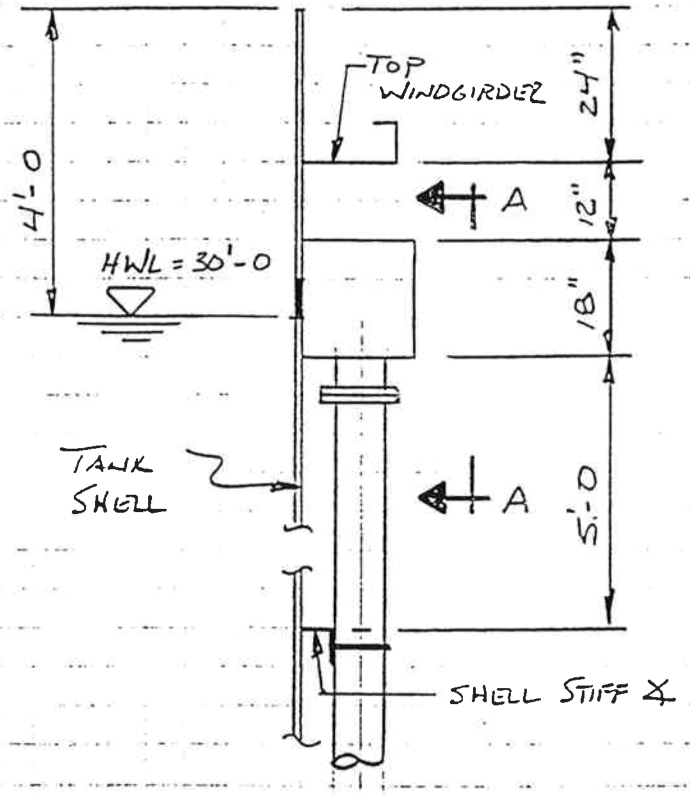
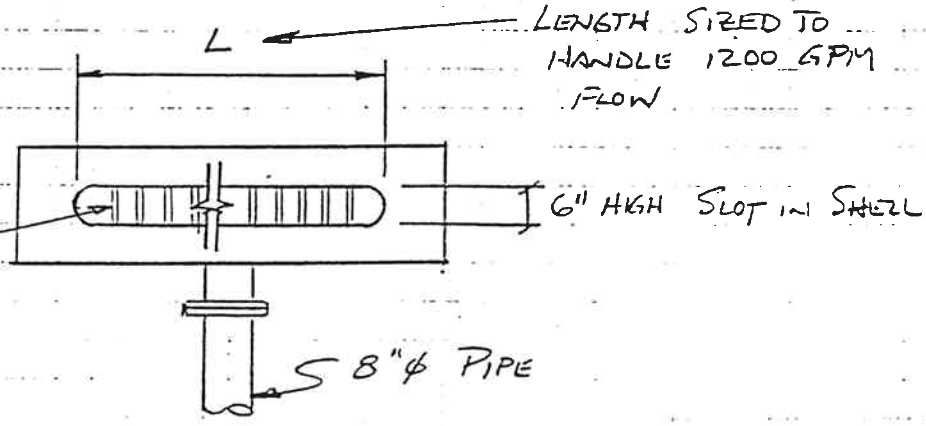
54841
REGISTERED PROFESSIONAL ENGINEER
[signature] /17/93



OVERFLOW BOX WILL BE SIZED TO ACCOMODATE 1200 GPM MAX FLOW

BOX WILL BE CONSTRUCTED OF 1/4" PLATE

OVERFLOW DETAIL

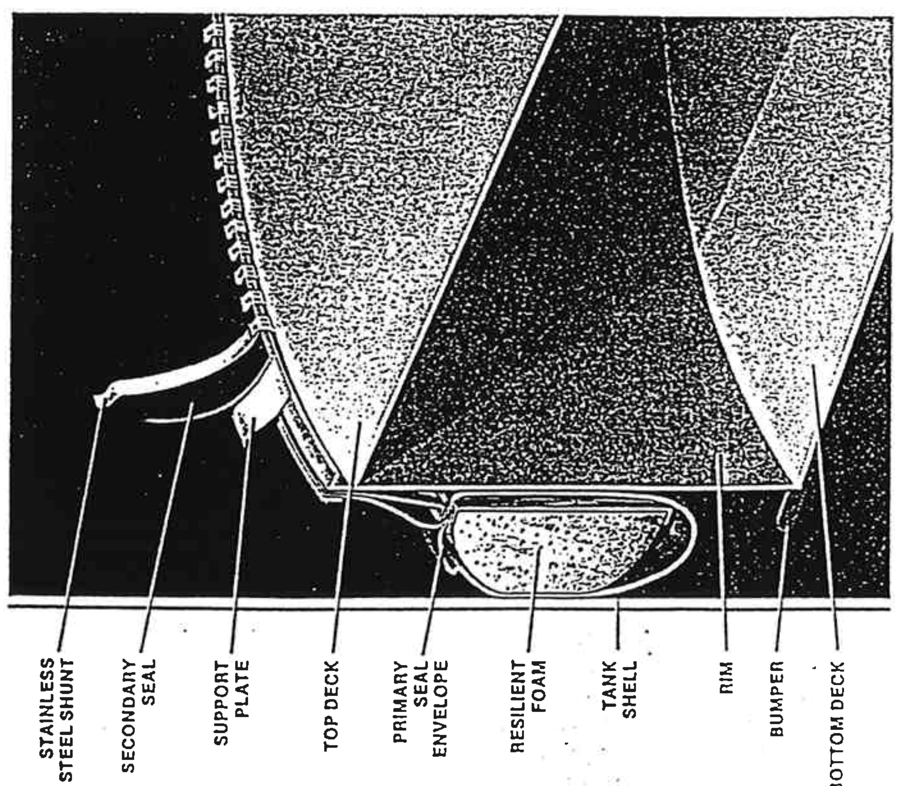


PREVENTS SEAL FROM DAMAGE IN 6" SLOT

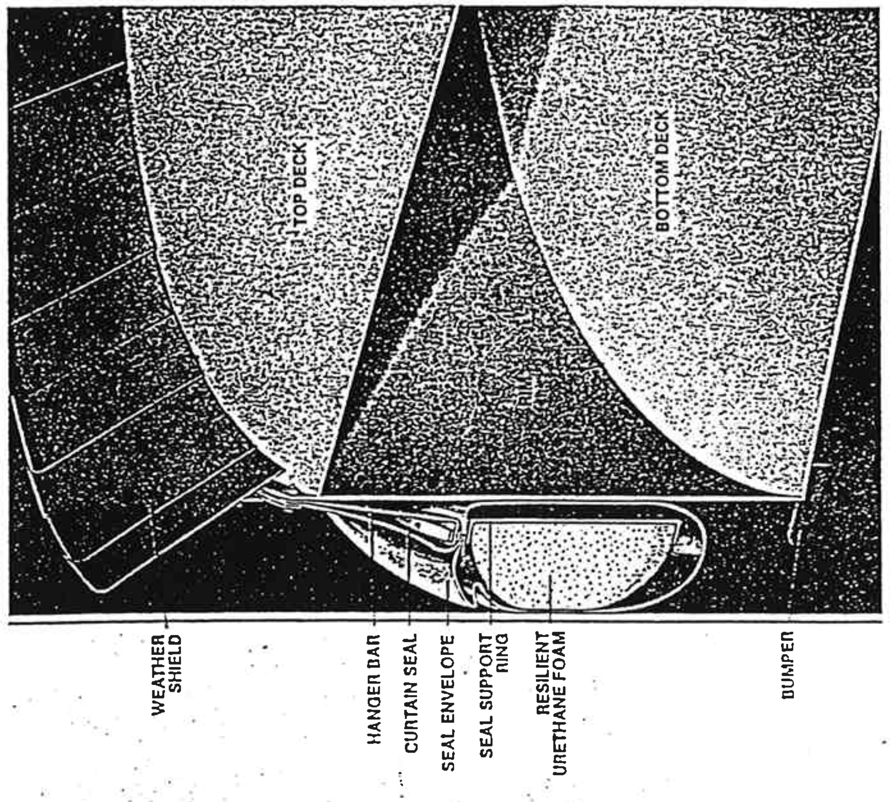
SECTION A-A

SUBJECT	OFFICE	REVISION 0		REFERENCE NO.
8"ϕ OVERFLOW DETAIL 82'ϕ WASTEWATER TANKS MONSANTO - ALVIN, TX	CBI			MILLS 301
	MADE BY PW	CHKD BY	MADE BY	CHKD BY	SHT 1 OF 1
	DATE 2/4/93	DATE	DATE	DATE	SK A

SR-7A seal with CBI Vapormaster® secondary seal.



SR-7A resilient (non-metallic) filled seal for tanks with welded shells.



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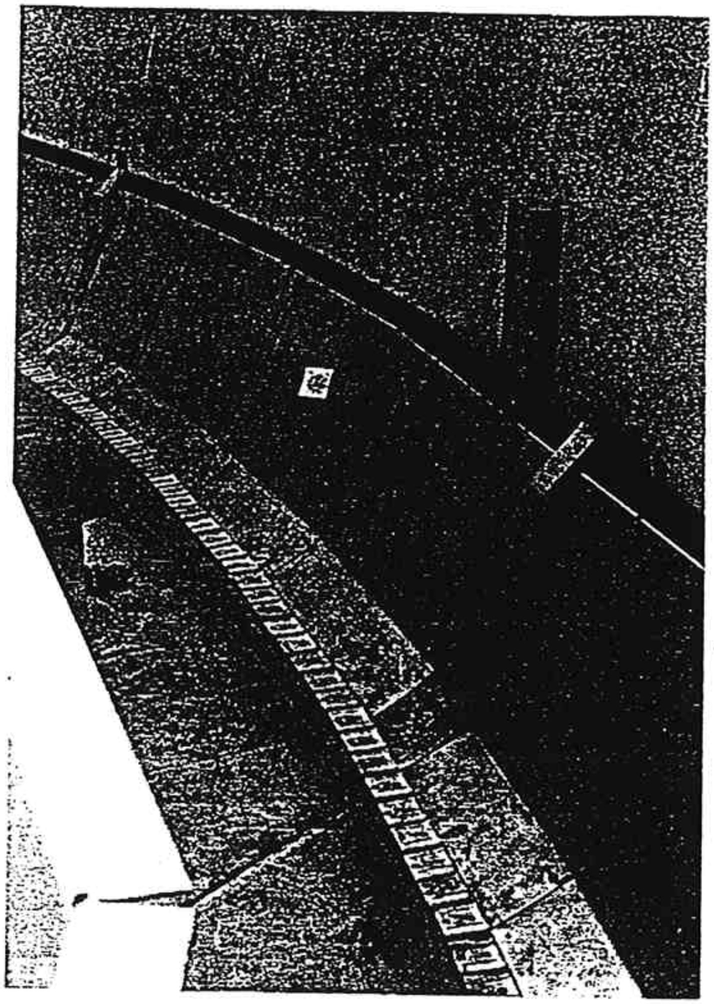
Rev 0
Sheet 4

SECONDARY SEAL

The seal is an improved, alternate method for a secondary seal on floating roof tanks. It consists of a bent plate attached to the outer deck and an elastomeric tip at the shell. The tip is held firmly against the tank shell by the compressive force in the plate.



Key features include:

- o **Meets EPA Requirements**
- o **Excellent resistance to the environment.**

  Stainless steel and Butadiene rubber construction.
- o **Enhanced tip design.**

  Improved taper
- o **Ease of installation.**

  Minimal number of components.

STATE OF TEXAS
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54841
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PROFESSIONAL ENGINEER

/17/93

Rev 0
Sheet 5

CBI

SPECIFICATION

IDENTIFICATION REV. NO.	0 08/02/89
CONTRACT	
TITLE	SHEET METAL COMPRESSION PLATE
PRODUCT	SECONDARY SEAL
PAGE NO.	1 OF 1

1.0 SCOPE

The scope of work is the supply of stainless steel sheet metal sections. The sections are composed of three sheet metal components spot welded together.

The information contained in this specification is to be used only in connection with performance of work for CBI. Any other use is expressly forbidden. The seal described in this specification is proprietary and covered by United States and foreign patents.

2.0 DETAILED DESCRIPTION FOR QUOTATION
(Reference Drawing 2 Compression Plate Assembly and Detail)

2.1 Material

All components are to be composed of A246 Type 304 stainless steel. The sheet sections must have a minimum yield stress of 50 ksi. No painting or special surface finish is required. Vendor is encouraged to quote an alternate stainless steel material if quality, weldability, and formability are equivalent.

2.2 Welding

The components shall be attached with 3/16" diameter spot welds located as shown on the drawing.

3.0 INFORMATION REQUIRED WITH QUOTATION

3.1 Vendors shall provide separate prices per section for the sections shown on the referenced drawing. Prices shall be F.O.B. manufacturing location. The pricing shall include packaging to prevent damage during transport to each job site.

3.2 Vendors shall provide the separate prices for initial set-up, die costs, and any other one time charges which would not apply to subsequent orders.

3.3 Vendor shall provide a description of the method of fabrication of individual pieces and the final assembly. The plant location and equipment to be used shall be provided.

3.4 Vendor shall provide an experience list and information showing the vendor's ability to fabricate these components.

3.5 Vendor shall provide a schedule from date of detailed order to the ship date.

STATE OF TEXAS
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54847
REGISTERED
PROFESSIONAL ENGINEER

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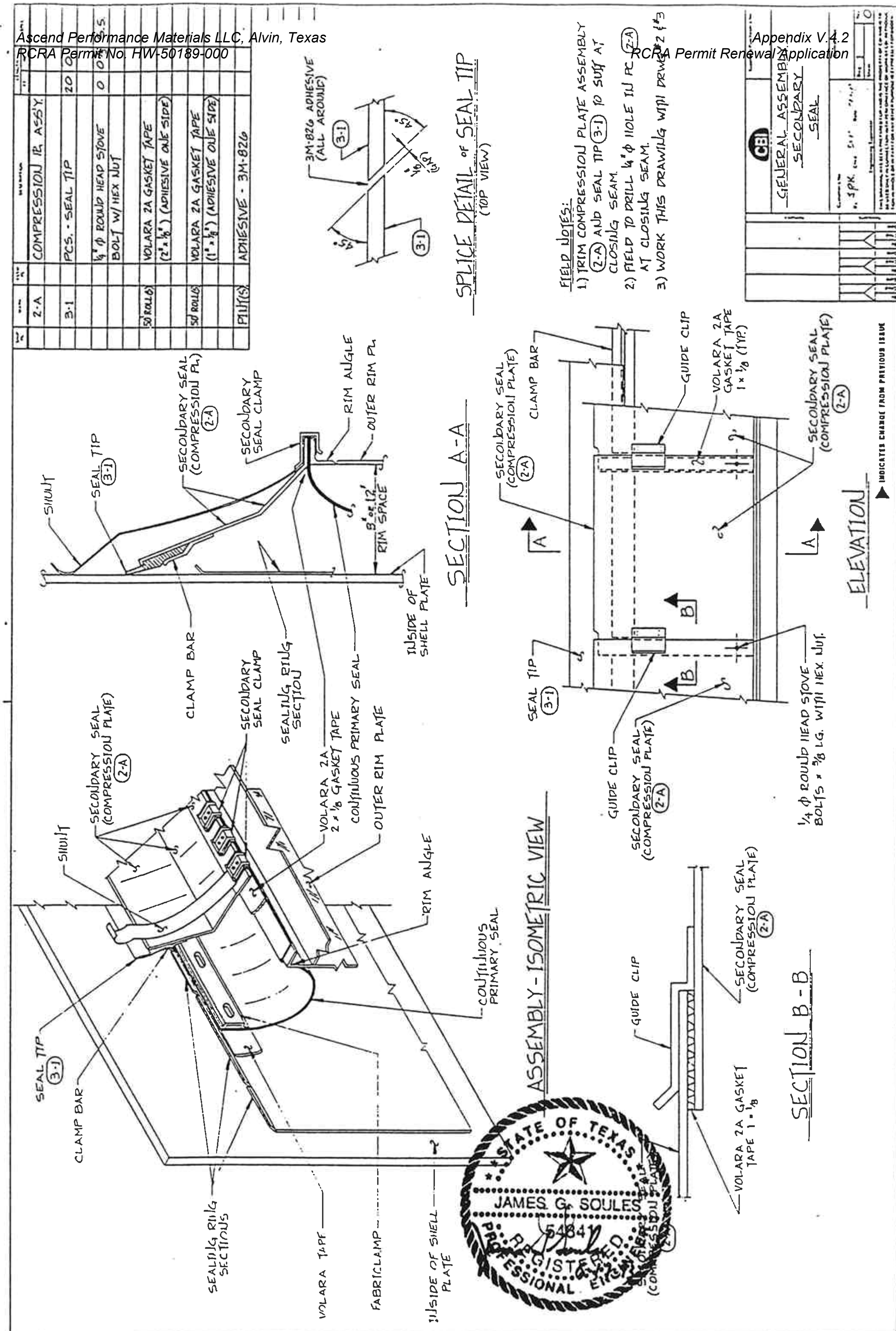
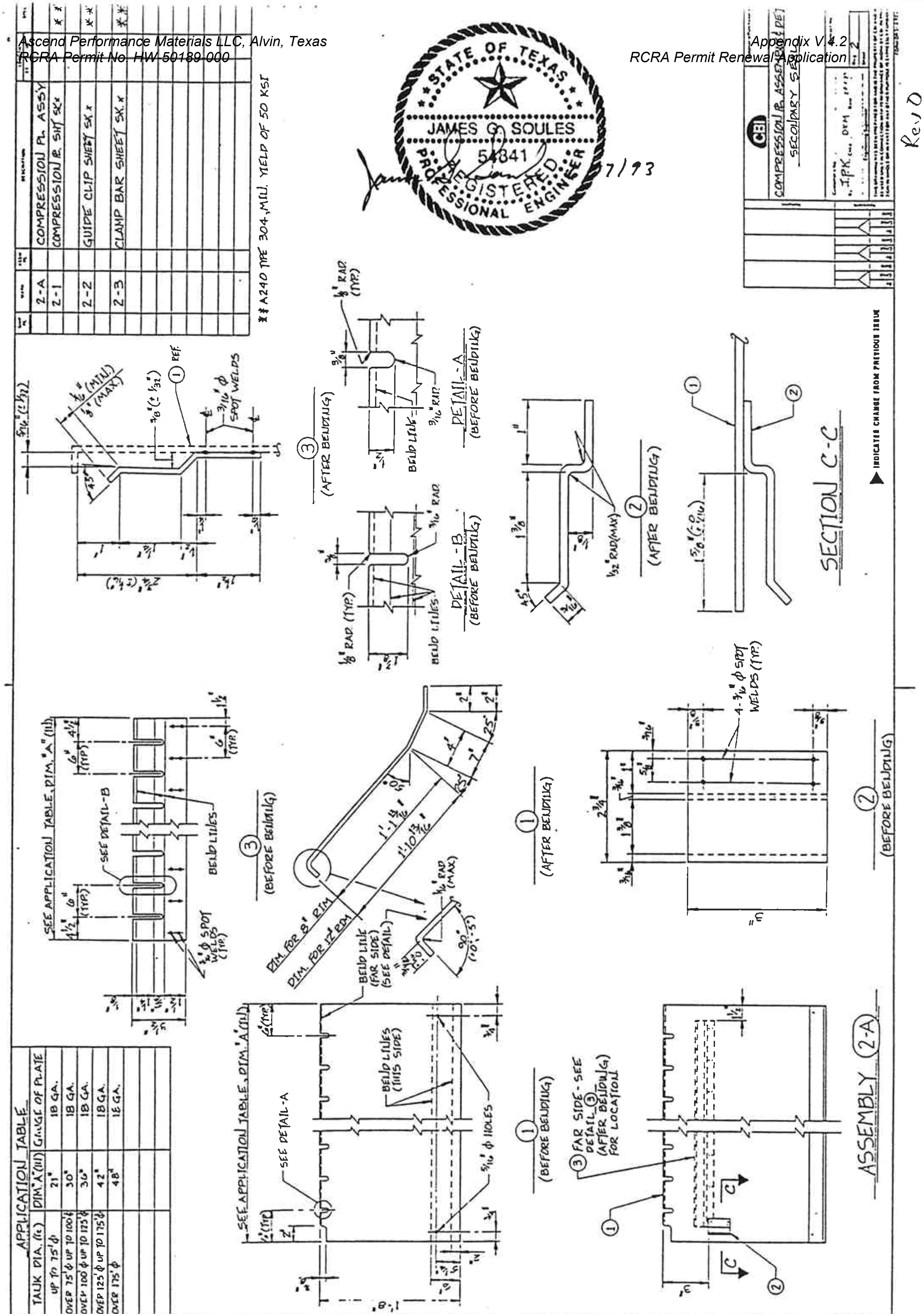
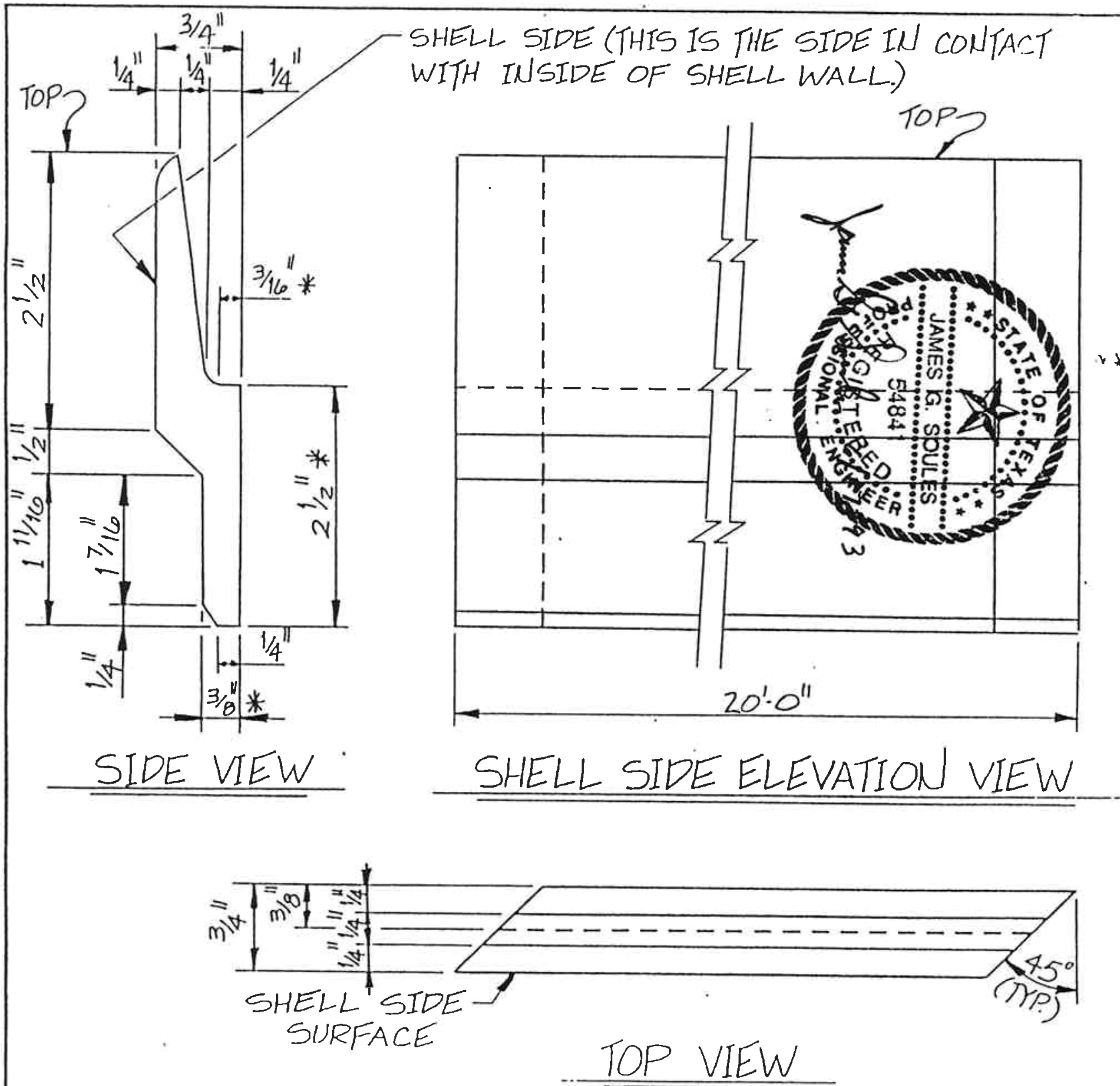
Sheet 6


2-A COMPRESSION PL ASS'Y
3-1 PCS. - SEAL TIP
1/4" φ ROUND HEAD STOVE BOLT W/ HEX NUT
50 ROLLS VOLARA 2A GASKET TAPE (2" x 1/8") (ADHESIVE ONE SIDE)
50 ROLLS VOLARA 2A GASKET TAPE (1" x 1/8") (ADHESIVE ONE SIDE)
PINT(S) ADHESIVE - 3M-826
3M-826 ADHESIVE (ALL AROUND)
SPLICE DETAIL of SEAL TIP
(TOP VIEW)
FIELD NOTES:
1) TRIM COMPRESSION PLATE ASSEMBLY (2-A) AND SEAL TIP (3-1) TO SUIT AT CLOSING SEAM.
2) FIELD TO DRILL 1/4"φ HOLE IN PC (2-A) AT CLOSING SEAM.
3) WORK THIS DRAWING WITH DRWG 2 & 3
GENERAL ASSEMBLY SECONDARY SEAL
SHUNT
SEAL TIP
SECONDARY SEAL (COMPRESSION PL)
SECONDARY SEAL CLAMP
RIM ANGLE
OUTER RIM PL
8" or 12" RIM SPACE
INSIDE OF SHELL PLATE
CLAMP BAR
SEALING RING SECTION
CONTINUOUS PRIMARY SEAL
SECTION A-A
GUIDE CLIP
VOLARA 2A GASKET TAPE 1 x 1/8 (TYP.)
SECONDARY SEAL (COMPRESSION PLATE)
1/4 φ ROUND HEAD STOVE BOLTS x 3/8 LG. WITH HEX. NUT.
ELEVATION
INDICATES CHANGE FROM PREVIOUS ISSUE
VOLARA 2A 2 x 1/8 GASKET TAPE
OUTER RIM PLATE
SEALING RING SECTIONS
VOLARA TAPE
FABRICLAMP
INSIDE OF SHELL PLATE
ASSEMBLY-ISOMETRIC VIEW
VOLARA 2A GASKET TAPE 1 x 1/8
SECTION B-B
STATE OF TEXAS
JAMES G. SOULES
54641
REGISTERED
PROFESSIONAL ENGINEER


STATE OF TEXAS
JAMES G. SOULES
54341
REGISTERED
PROFESSIONAL ENGINEER
7/93
Rev D
COMPRESSION PL. ASSEMBLY DET.
SECONDARY SEAL
2-A COMPRESSION PL. ASSY
2-1 COMPRESSION PL. SHT SK.
2-2 GUIDE CLIP SHEET SK.
2-3 CLAMP BAR SHEET SK.
** A240 TYPE 304, MIN. YIELD OF 50 KSI
APPLICATION TABLE
TANK DIA. (ft.) | DIM. "A" (in) | GAUGE OF PLATE
UP TO 75'φ | 21" | 18 GA.
OVER 75'φ UP TO 100'φ | 30" | 18 GA.
OVER 100'φ UP TO 125'φ | 36" | 18 GA.
OVER 125'φ UP TO 175'φ | 42" | 18 GA.
OVER 175'φ | 48" | 16 GA.
ASSEMBLY 2-A
SECTION C-C
DETAIL-A (BEFORE BENDING)
DETAIL-B (BEFORE BENDING)
1 (BEFORE BENDING)
1 (AFTER BENDING)
2 (BEFORE BENDING)
2 (AFTER BENDING)
3 (BEFORE BENDING)
3 (AFTER BENDING)
SEE APPLICATION TABLE, DIM. "A" (IN)
SEE DETAIL-A
SEE DETAIL-B
BEND LINES
BEND LINES (THIS SIDE)
BEND LINE (FAR SIDE) (SEE DETAIL)
5/16" φ HOLES
DIM. FOR 8' RIM
DIM. FOR 12' RIM
FAR SIDE - SEE DETAIL 3 (AFTER BENDING) FOR LOCATION
INDICATES CHANGE FROM PREVIOUS ISSUE

Sheet 8



Ship Pc	Mark	Assm Pc	Description	Length Ft.	Length In	Spec
	3-1		SEAL TIP SECTION	20	0	* *

* MATERIAL SPECIFICATIONS

The intent of the material specification is to insure a compatible and functional wiper. The material must be sufficiently hard to easily slide against the shell without appreciable abrasion. The material must retain its characteristics in the presence of aromatic products and swell as little as possible. Please supply test values on the intended compound for the items listed below and any additional relevant information. Exception may be taken to the items listed below and should be noted. However, the wiper must be constructed of nitrile butadiene rubber.

Compound:	Nitrile - Butadiene Rubber NBR
Durometer:	80 to 85 Shore A
Modulus of Elasticity:	2000 psi
Ultimate Tensile Strength:	1500 psi
Minimum Elongation:	250%
Abrasion Resistance:	ASTM D2228 or Taber Abrasion Test with a H-22 Wheel
Effects of Liquids:	ASTM D471 Fuel B or Similar
Resistance to Heat Aging:	ASTM D573 185° for 7 Days

Please provide the constituents of the compound in percentages with the quotation.

*) RMA CLASS 2 TOLERANCES REQ'D.

NOTE:
WORK THIS DRAWING WITH DRWG.'S #1 & #2

By	Chkd	Date	By	Chkd	Date	Revisions / Remarks

CBI

ELASTOMERIC SEAL TIP
SECONDARY SEAL

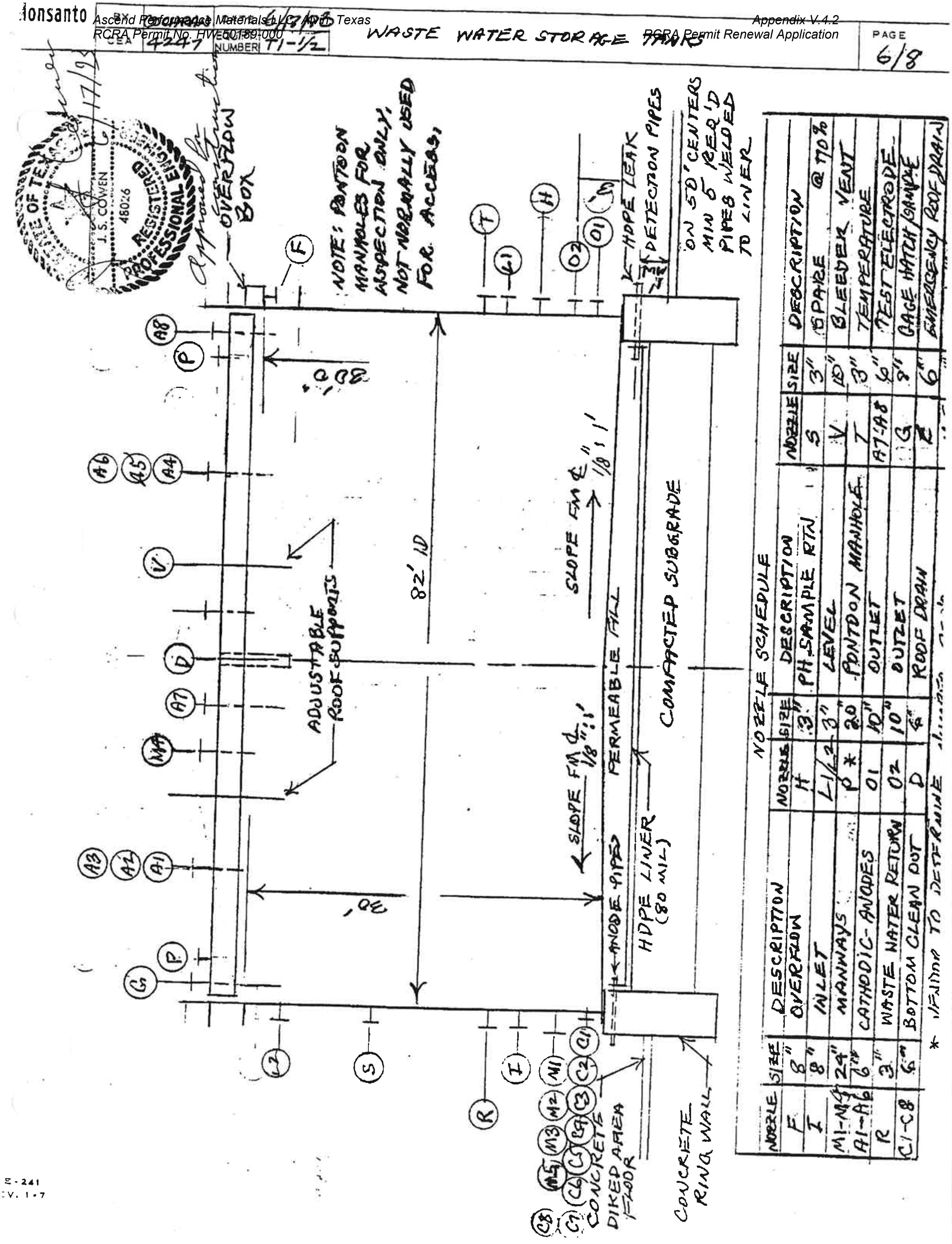
Supplier's/Purchaser's No
Customer's No
Contract No
By J.F.K. Chkd ___ Date ___
Engineering Supervisor
Dwg 3
Sheet
Rev C

► Indicates change from previous issue

FORM DR 33 JAN

CBI DRAFTING AIDS

Sheet 9



NOZZLE	SIZE	DESCRIPTION	NOZZLE	SIZE	DESCRIPTION	NOZZLE	SIZE	DESCRIPTION
F	8"	OVERFLOW	H	3"	PH SAMPLE RTN	S	3"	SPARE @ 170%
I	8"	INLET	L1/2	3"	LEVEL	V	10"	BLEEDER VENT
M1-M5	24"	MANWAYS	P *	20"	PONTOON MANHOLE	T	3"	TEMPERATURE
A1-A6	6"	CATHODIC-ANODES	O1	10"	OUTLET	A7-A8	6"	TEST ELECTRODE
R	3"	WASTE WATER RETURN	O2	10"	OUTLET	G	8"	GAGE HATCH/SAMPLE
C1-C8	6"	BOTTOM CLEAN OUT	D	4"	ROOF DRAIN	E	6"	EMERGENCY ROOF DRAIN

* VENDOR TO DETERMINE ...

E-241
REV. 1-7

ATTACHMENT V.4
ENGINEERING REPORT FOR
IWPF TANKS (PERMIT UNITS 08 AND 09)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.4.3

Appendix V.4.3 Additional Design Drawings for IWPF Tanks

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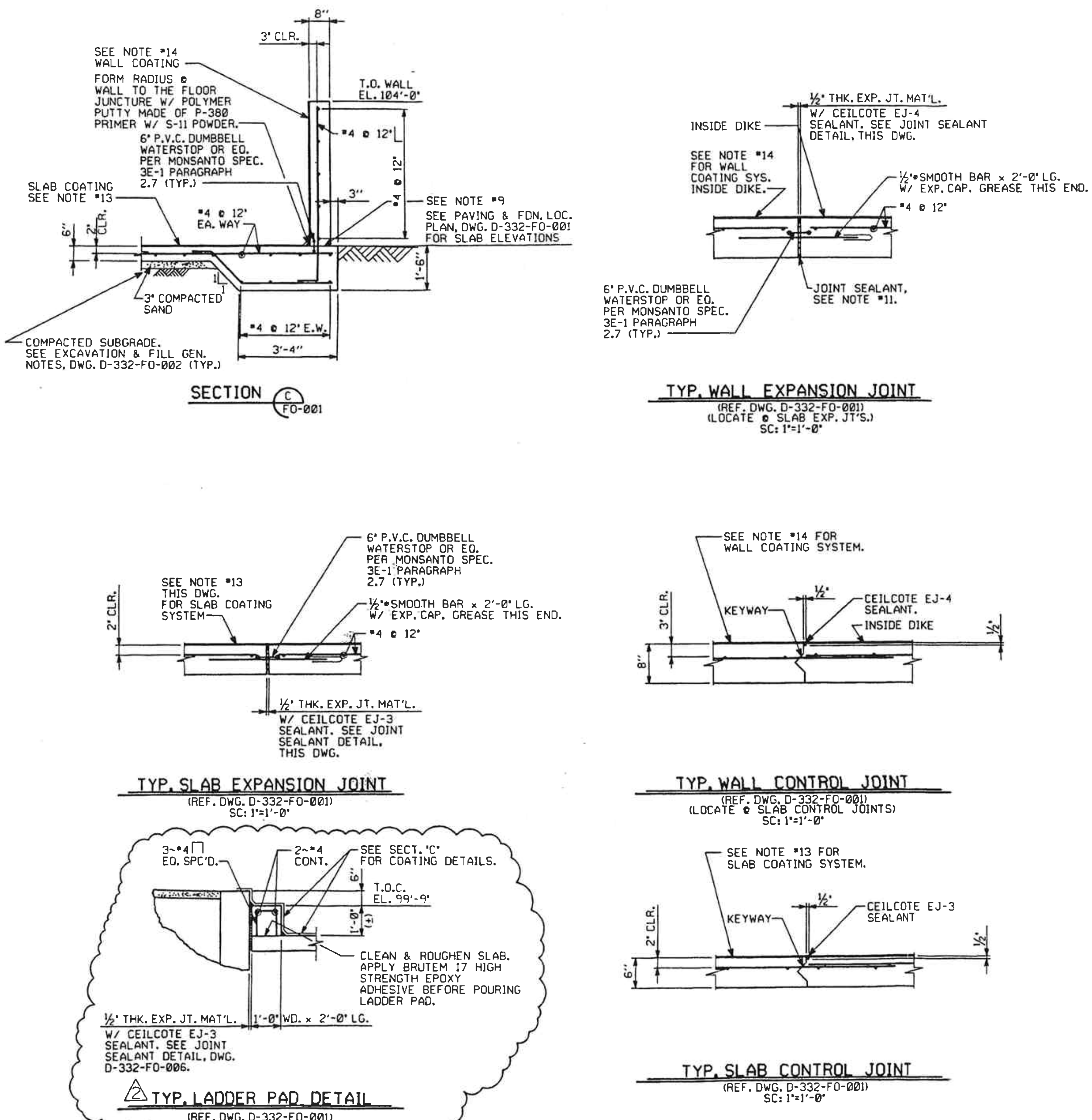
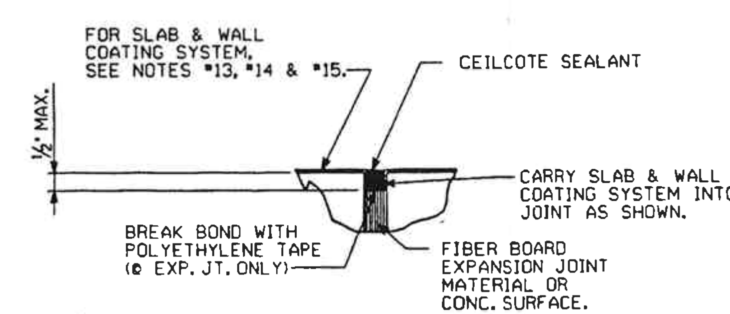
DATE: 27-Jan-94 14:42

"WORK SAFELY"





JOINT SEALANT DETAIL
(N.T.S.)

CONCRETE GENERAL NOTES

1. ALL CONCRETE WORK SHALL CONFORM TO THE JOB SPECIFICATION 3E-1, ACI-301 AND ACI-318 LATEST EDITIONS.
2. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT 28 DAYS, U.N.O.
3. ALL REINFORCING BARS SHALL BE NEW, CLEAN, BILLET-STEEL AS PER ASTM DESIGNATION A-615, GRADE 60.
4. ALL REINFORCING BARS SHALL BE DETAILED AND PLACED AS PER ACI MANUALS 315 AND 318 LATEST EDITIONS.
5. ALL WELDED WIRE FABRIC SHALL CONFORM TO ASTM A-185 AND BE PLACED WITH A MINIMUM OF 2 MESH LAPS AT ALL SPLICES.
6. ALL ANCHOR BOLTS SHALL CONFORM TO ASTM DESIGNATION A-36 U.N. AND SHALL BE GALVANIZED AS PER ASTM A-153.
7. ALL EXPOSED CONCRETE AND GROUT CORNERS AND EDGES SHALL BE CHAMFERED 3/4" UNLESS NOTED OTHERWISE.
8. ALL EXPOSED CONCRETE SHALL BE FINISHED IN ACCORDANCE W/ACI-301.
9. CONSTRUCTION JOINTS BETWEEN NEW AND HARDENED CONCRETE SHALL BE CLEAN, FREE OF LAITANCE AND INTENTIONALLY ROUGHENED TO A FULL AMPLITUDE OF 1/4" & COATED W/ NEAT CEMENT OR CONC. ADHESIVE.
10. SAW CUT 1" DEEP MIN. & BREAK OUT EXISTING CONCRETE SLAB AS REQUIRED. RE-USE OR MATCH EXISTING REINFORCING WHEN RE-POURING.
11. JOINT SEALANT, BRUTEM 92 U.N.O. INSTALL PER MANUF. SPECIFICATIONS, MASTER BUILDER TECHNOLOGIES, HOUSTON, TEXAS OR EQUAL. COMPRESSIBLE BACKER ROD TO BE 50% LARGER THAN WIDTH OF JOINT.
12. TEMPORARY BENCH MARK (T.B.M.) SHOWN ON DWG. D-332-FO-001.
13. SLAB COATING SYSTEM: PRIME CONCRETE W/ CEILCOTE P-380 CONC. PRIMER, THEN APPLY 20-25 MIL. THK. VINYL ESTER COATING, CEILCOTE FLAKELINE 242, AS PER MANUFACTURER'S INSTRUCTIONS. COATING SHALL HAVE A NON-SKID FINISH BY ADDING SAND TO THE FIRST COAT. ALLOW TO CURE, REMOVE EXCESS SAND & THEN ROLLER APPLY FLAKELINE 242 (GRAY) TOPCOAT. NOMINAL THICKNESS = 1/8".
    JOINT SEALANT: CEILCOTE EJ-3, INSTALLED AS PER MANUFACTURER'S INSTRUCTIONS.
    ALL MATERIALS ARE MANUFACTURED BY MASTER BUILDERS TECHNOLOGIES.
14. WALL COATING SYSTEM: SAME AS SLAB COATING SYSTEM, EXCEPT NON-SKID SURFACE IS NOT REQUIRED.
    JOINT SEALANT: CEILCOTE EJ-4.
15. REFER TO THE SPECIFICATION 3E-1 FOR ADDITIONAL CONCRETE COATING SYSTEM DETAILS.
16. (1) GROUT FOR PIPE SUPPORTS, PIPE SLEEPERS & CABLE TRAY SUPPORTS TO BE NON-SHRINK NONMETALLIC GROUT PER SPEC. 3H-5.

REFERENCE DRAWINGS

D-332-FO-001	PAVING & FDN. LOC. PLAN
D-332-FO-002	CIVIL SECT'S. & DETAILS

REV	CEA	BY / DATE	DESCRIPTION	CHKD / APPD
2	4247	M. CLARK 1/28/94	ADDED LADDER PAD DETAIL	J.J. COPELA / W.A.K
1	4247	M. CLARK 1/7/93	ADDED NOTE #16	J.J. COPELA / GRUNDMA
0	4247	M. CLARK 1/7/93	ISSUE FOR CONST.	J.J. COPELA / GRUNDMA
A	4247	M. CLARK 7/17/93	ISSUE FOR APPROVAL	J.J. COPELA / GRUNDMA

Monsanto THE CHEMICAL GROUP ENGINEERING DEPT. ST. LOUIS, MISSOURI

COMPANY CHEMICAL PLANT CHOC. BAYOU

DIKE WALL AND SLAB
CONC. SECTIONS & DETAILS
IWPF REPLACEMENT

	BY	DATE
DRAWN	M. CLARK	7/13/93
CHECKED	J.J. COPELAND	8/22/93
DESIGNED	J.T. HULL	9/14/93

SCALE 1/2" = 1'-0"

C.E.A. NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	R
4247	46	D	332.00	S	003	2

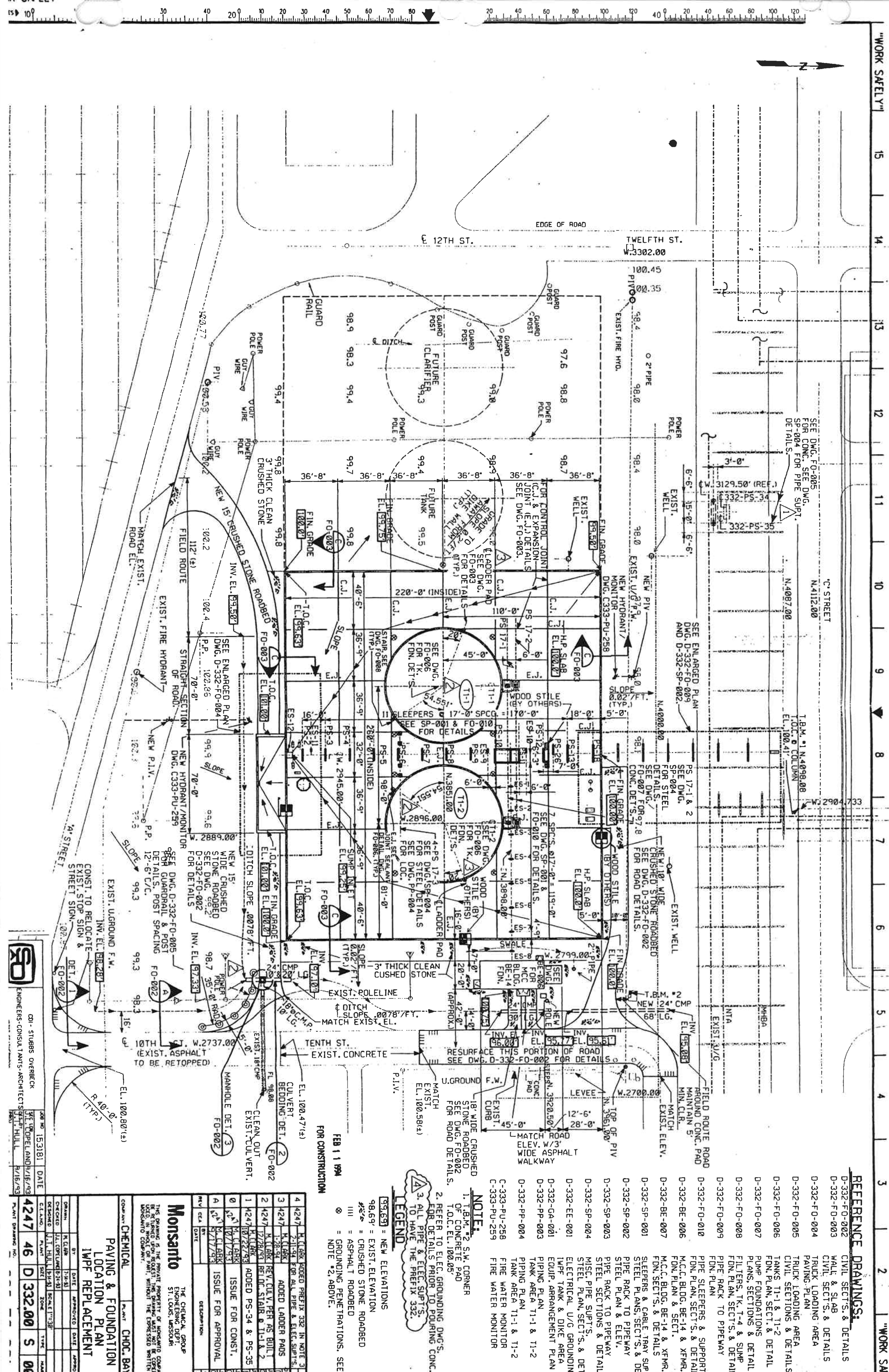
PLANT DRAWING NO. D-332-FO-003

CDI - STUBBS OVERBECK
ENGINEERS-CONSULTANTS-ARCHITECTS
12727 FEATHERWOOD HOUSTON, TEXAS 77034 (713)484-7622
A CDI COMPANY

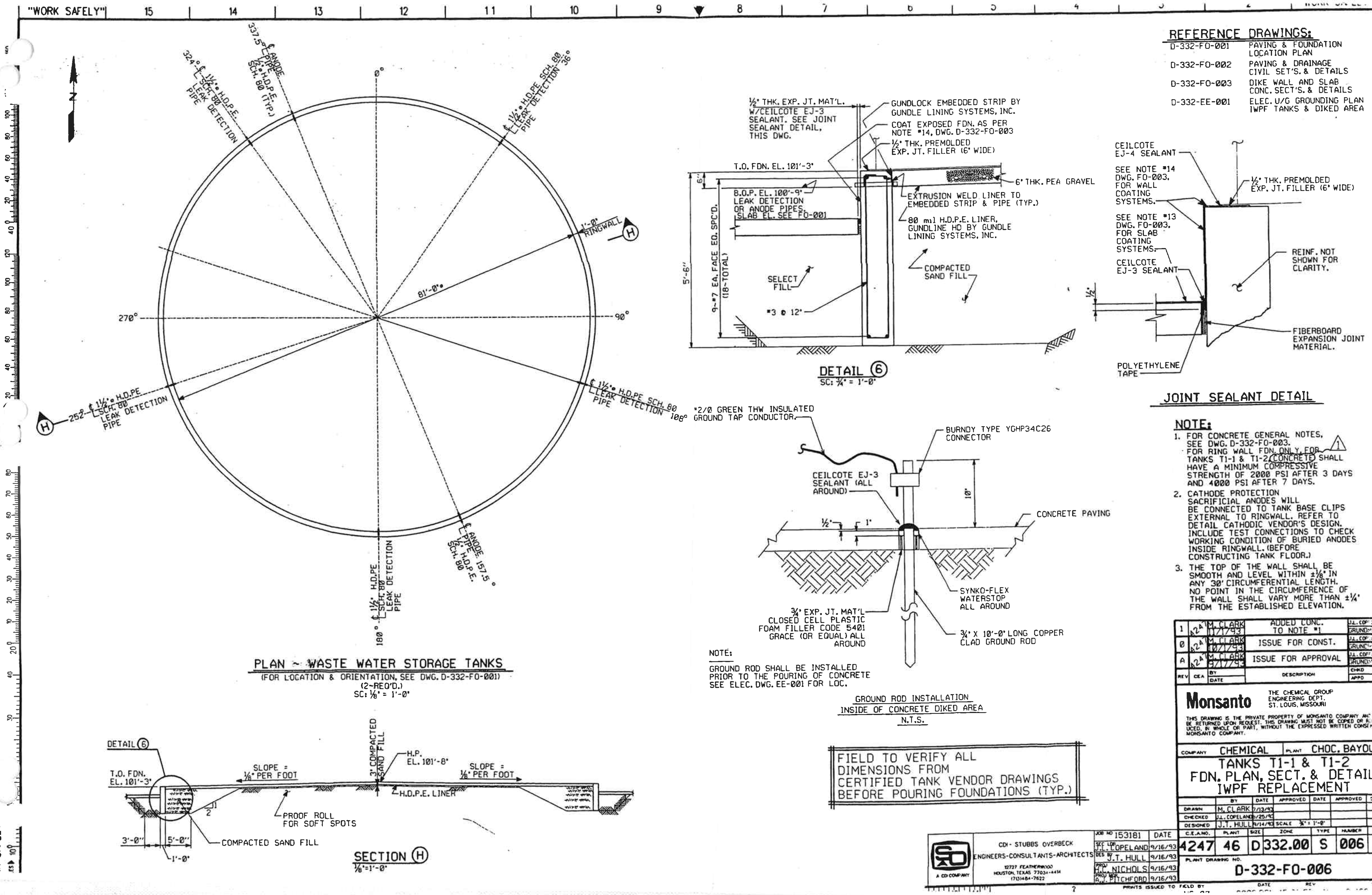
JOB NO. 153181

		DATE
SEC. LDR.	J.E. COPELAND	9/16/93
DES. BY	J.T. HULL	9/16/93
PROJ.	T.C. NICHOLS	9/16/93
PROJ. MGR.	B.J. PITCHFORD	9/16/93

"WORK SAFELY"



"WORK SAFELY"
REFERENCE DRAWINGS:
D-332-FO-002 CIVIL SECT'S. & DETAILS
D-332-FO-003 WALL & SLAB CIVIL SECT'S. & DETAILS
D-332-FO-004 TRUCK LOADING AREA PAVING PLAN
D-332-FO-005 TRUCK LOADING AREA CIVIL SECTIONS & DETAILS
D-332-FO-006 TANKS T1-1 & T1-2 FDN. PLAN, SECT. & DETAIL
D-332-FO-007 PUMP FOUNDATIONS PLANS, SECTIONS & DETAILS
D-332-FO-008 FILTERS, TK. T-4 & SUMP FDN. PLAN, SECT'S. & DETAILS
D-332-FO-009 PIPE RACK TO PIPEWAY FDN. PLAN
D-332-FO-010 PIPE SLEEPERS & SUPPORTS FDN. PLAN, SECT'S. & DETAILS
D-332-BE-006 M.C.C. BLDG. BE-14 & XFMR. FDN. PLAN, SECT'S. & DETAILS
D-332-BE-007 M.C.C. BLDG. BE-14 & XFMR. FDN. SECT'S. & DETAILS
D-332-SP-001 SLEEPERS & CABLE TRAY SUPT'S. STEEL PLANS, SECT'S. & DET'S.
D-332-SP-002 PIPE RACK TO PIPEWAY STEEL PLAN & ELEV.
D-332-SP-003 PIPE RACK TO PIPEWAY STEEL SECTIONS & DETAILS
D-332-SP-004 MISC. PIPE SUPT'S. STEEL PLAN, SECT'S. & DETAILS
D-332-EE-001 ELECTRICAL U/G GROUNDING PLAN IWPF TANK & DIKE AREA
D-332-GA-001 EQUIP. ARRANGEMENT PLAN
D-332-PP-003 PIPING PLAN TANK AREA T1-1 & T1-2
D-332-PP-004 PIPING PLAN TANK AREA T1-1 & T1-2
C-333-PU-258 FIRE WATER MONITOR
C-333-PU-259 FIRE WATER MONITOR
NOTE:
1. T.B.M. #2 S.W. CORNER OF CONCRETE PAD T.O.C. EL. 100.05'
2. REFER TO ELEC. GROUNDING DWG'S. FOR DETAILS PRIOR TO POURING CONC.
3. ALL PIPE & ELEC. SUPT'S. TO HAVE THE PREFIX 332.
LEGEND
99.69 = NEW ELEVATIONS
98.69 = EXIST. ELEVATION
= CRUSHED STONE ROADBED
= ASPHALT ROADBED
= GROUNDING PENETRATIONS. SEE NOTE #2, ABOVE.
FEB 11 1994
FOR CONSTRUCTION
TWELFTH ST.
12TH ST.
EDGE OF ROAD
'C' STREET
'A' STREET
TENTH ST.
10TH ST. W.2737.00
FUTURE CLARIFIER
FUTURE TANK
T1-1
T1-2
220'-0" (INSIDE)
260'-0" (INSIDE)
NEW 15' CRUSHED STONE ROADBED
NEW 10' WIDE CRUSHED STONE ROADBED SEE DWG. D-332-FO-002 FOR ROAD DETAILS.
RESURFACE THIS PORTION OF ROAD SEE DWG. D-332-FO-002 FOR DETAILS
Monsanto
THE CHEMICAL GROUP ENGINEERING DEPT. ST. LOUIS, MISSOURI
CHEMICAL
CHOC. BAYOU
PAVING & FOUNDATION LOCATION PLAN
IWPF REPLACEMENT
4247 46 D 332.00 S 001 4
SDI - STUBBS OVERBECK ENGINEERS-CONSULTANTS-ARCHITECTS


"WORK SAFELY"
REFERENCE DRAWINGS:
D-332-FO-001 PAVING & FOUNDATION LOCATION PLAN
D-332-FO-002 PAVING & DRAINAGE CIVIL SET'S. & DETAILS
D-332-FO-003 DIKE WALL AND SLAB CONC. SECT'S. & DETAILS
D-332-EE-001 ELEC. U/G GROUNDING PLAN IWPF TANKS & DIKED AREA
0°
90°
180°
270°
81'-0"⌀
1'-0" RINGWALL
324° ℄ 1½"⌀ H.D.P.E. SCH. 80 LEAK DETECTION PIPE
337.5° ℄ ANODE PIPE ½" H.D.P.E. SCH. 80 (TYP.)
℄ 1½"⌀ H.D.PE SCH. 80 LEAK DETECTION PIPE 36°
℄ 1½"⌀ H.D.PE SCH. 80 LEAK DETECTION PIPE 108°
℄ ANODE 157.5° PIPE ½" H.D.P.E. SCH. 80
180° ℄ 1½" H.D.PE SCH. 80 LEAK DETECTION PIPE
252° ℄ 1½"⌀ H.D.PE SCH. 80 LEAK DETECTION PIPE
PLAN ~ WASTE WATER STORAGE TANKS
(FOR LOCATION & ORIENTATION, SEE DWG. D-332-FO-001)
(2-REQ'D.)
SC: ⅛" = 1'-0"
DETAIL 6
T.O. FDN. EL. 101'-3"
SLOPE = ⅛" PER FOOT
3" COMPACTED SAND FILL
H.P. EL. 101'-8"
SLOPE = ⅛" PER FOOT
H.D.P.E. LINER
PROOF ROLL FOR SOFT SPOTS
COMPACTED SAND FILL
3'-0"
5'-0"
1'-0"
SECTION H
⅛"=1'-0"
½" THK. EXP. JT. MAT'L. W/CEILCOTE EJ-3 SEALANT. SEE JOINT SEALANT DETAIL, THIS DWG.
GUNDLOCK EMBEDDED STRIP BY GUNDLE LINING SYSTEMS, INC.
COAT EXPOSED FDN. AS PER NOTE #14, DWG. D-332-FO-003
½" THK. PREMOLDED EXP. JT. FILLER (6" WIDE)
T.O. FDN. EL. 101'-3"
6" THK. PEA GRAVEL
B.O.P. EL. 100'-9" LEAK DETECTION OR ANODE PIPES. SLAB EL. SEE FO-001
EXTRUSION WELD LINER TO EMBEDDED STRIP & PIPE (TYP.)
80 mil H.D.P.E. LINER, GUNDLINE HD BY GUNDLE LINING SYSTEMS, INC.
COMPACTED SAND FILL
SELECT FILL
#3 @ 12"
9-#7 EA. FACE EQ. SPC'D. (18-TOTAL)
5'-6"
6"
DETAIL 6
SC: ¾" = 1'-0"
CEILCOTE EJ-4 SEALANT
SEE NOTE #14 DWG. FO-003. FOR WALL COATING SYSTEMS.
SEE NOTE #13 DWG. FO-003. FOR SLAB COATING SYSTEMS.
CEILCOTE EJ-3 SEALANT
½" THK. PREMOLDED EXP. JT. FILLER (6" WIDE)
REINF. NOT SHOWN FOR CLARITY.
FIBERBOARD EXPANSION JOINT MATERIAL.
POLYETHYLENE TAPE
½"
JOINT SEALANT DETAIL
#2/0 GREEN THW INSULATED GROUND TAP CONDUCTOR.
BURNDY TYPE YGHP34C26 CONNECTOR
CEILCOTE EJ-3 SEALANT (ALL AROUND)
10"
½"
1"
CONCRETE PAVING
SYNKO-FLEX WATERSTOP ALL AROUND
¾" EXP. JT. MAT'L. CLOSED CELL PLASTIC FOAM FILLER CODE 5401 GRACE (OR EQUAL) ALL AROUND
¾" X 10'-0" LONG COPPER CLAD GROUND ROD
NOTE:
GROUND ROD SHALL BE INSTALLED PRIOR TO THE POURING OF CONCRETE SEE ELEC. DWG. EE-001 FOR LOC.
GROUND ROD INSTALLATION INSIDE OF CONCRETE DIKED AREA
N.T.S.
FIELD TO VERIFY ALL DIMENSIONS FROM CERTIFIED TANK VENDOR DRAWINGS BEFORE POURING FOUNDATIONS (TYP.)
NOTE:
1. FOR CONCRETE GENERAL NOTES, SEE DWG. D-332-FO-003. FOR RING WALL FDN. ONLY, FOR TANKS T1-1 & T1-2 CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 2000 PSI AFTER 3 DAYS AND 4000 PSI AFTER 7 DAYS.
2. CATHODE PROTECTION SACRIFICIAL ANODES WILL BE CONNECTED TO TANK BASE CLIPS EXTERNAL TO RINGWALL. REFER TO DETAIL CATHODIC VENDOR'S DESIGN. INCLUDE TEST CONNECTIONS TO CHECK WORKING CONDITION OF BURIED ANODES INSIDE RINGWALL. (BEFORE CONSTRUCTING TANK FLOOR.)
3. THE TOP OF THE WALL SHALL BE SMOOTH AND LEVEL WITHIN ±⅛" IN ANY 30' CIRCUMFERENTIAL LENGTH. NO POINT IN THE CIRCUMFERENCE OF THE WALL SHALL VARY MORE THAN ±¼" FROM THE ESTABLISHED ELEVATION.
1 M. CLARK ADDED CONC. TO NOTE #1
0 M. CLARK ISSUE FOR CONST.
A M. CLARK ISSUE FOR APPROVAL
REV CEA BY DATE DESCRIPTION CHKD APPD
Monsanto
THE CHEMICAL GROUP ENGINEERING DEPT. ST. LOUIS, MISSOURI
COMPANY CHEMICAL PLANT CHOC. BAYOU
TANKS T1-1 & T1-2
FDN. PLAN, SECT. & DETAIL
IWPF REPLACEMENT
DRAWN M. CLARK 7/13/93
CHECKED J.L. COPELAND
DESIGNED J.T. HULL SCALE ¾"=1'-0"
C.E.A.NO. 4247 PLANT 46 SIZE D ZONE 332.00 TYPE S NUMBER 006 REV 1
PLANT DRAWING NO. D-332-FO-006
CDI - STUBBS OVERBECK
ENGINEERS-CONSULTANTS-ARCHITECTS
A CDI COMPANY
JOB NO 153181 DATE
J.L. COPELAND 9/16/93
J.T. HULL 9/16/93
J.L. NICHOLS 9/16/93
A.J. PITCHFORD 9/16/93
PRINTS ISSUED TO FIELD BY

ATTACHMENT V.4
ENGINEERING REPORT FOR
IWPF TANKS (PERMIT UNITS 08 AND 09)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.4.4

Appendix V.4.4 Calculation of Secondary Containment Volume

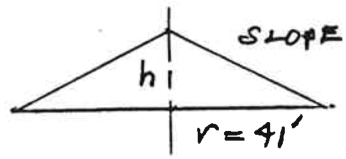
Monsanto	BY COCHRAN	DATE 2/2/93	TANK VOLUME AND SECONDARY CONTAINMENT	PAGE 7/8
	CEA 4247	EQUIPT. NUMBER T1-1/2		

TANK VOLUME

INSIDE DIAMETER = 82' ℄
HEIGHT OF WATER LEVEL = 30' 0"
(THIS IS THE ELEVATION OF THE BOTTOM OF THE SLOTTED RECTANGULAR OVERFLOW DUCT)

$$\text{STRAIGHT SIDE VOLUME} = \frac{\pi}{4} / D^2 / H / 7.48 \frac{\text{gals}}{\text{ft}^3}$$
$$= \frac{\pi}{4} / (82)^2 / 30 / 7.48$$
$$= 1{,}185{,}060.3 \text{ gals}$$

ADJUST VOLUME FOR LOSS DUE TO CONED BOTTOM



SLOPE = 1/8" : 1 FT $h = \frac{41}{8} = 5.125$"

$$\text{VOLUME OF CONE} = \frac{\pi}{3} r^2 h$$
$$= \frac{\pi}{3} / (41)^2 / \frac{5.125}{12} / 7.48$$
$$= 5623.55 \text{ gals}$$

NET TANK VOLUME = 1,185,060 − 5,624 = 1,179,436 ga

DIKED AREA VOLUME

TOTAL DIKED AREA = 260' X 220' = 57,200 FT²

ADJUST AREA FOR OTHER EQUIPMENT INSIDE THE DIKE:

EQUIPMENT	AREA CONSUMED, FT²	
2ND WASTE TANK	$\pi(82)^2/4$	= 5281
WASTE PUMPS	2 (4 X 6)	= 48
SULFITE TANK	$\pi(10)^2/4$	= 79
SULFITE PUMP	1 (2 X 3)	= 6
	TOTAL	= 5414

DIKED AREA VOLUME = (57,200 − 5414) X 4 FT HT X 7.48
= 1,549,437 gallons

ADDITIONAL SUMP VOLUME PROVIDED = 1 (4 X 4 X 4) 7.48 = 479 ga

TOTAL CONTAINMENT VOLUME = 1,549,437 + 479 = 1,549,916

CONTAINMENT VOLUME REQUIRED

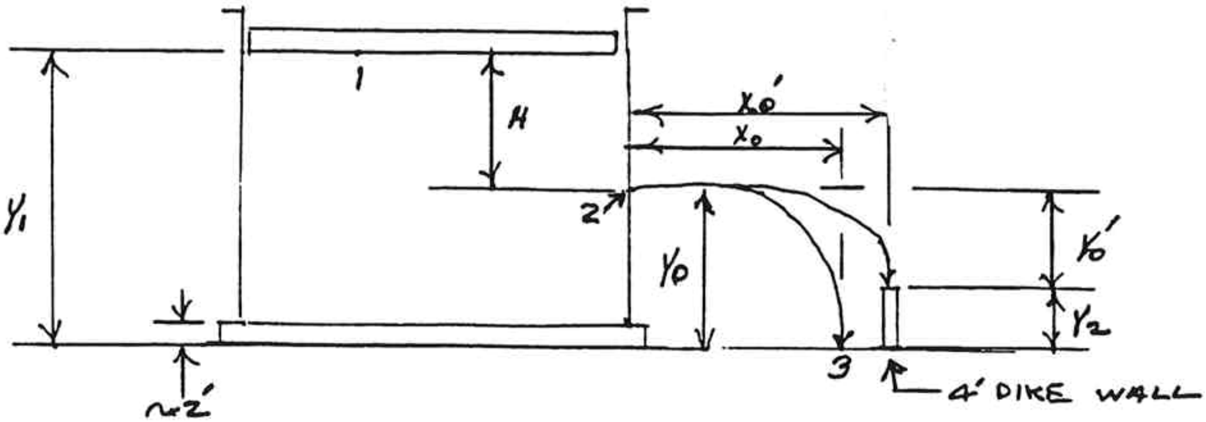
TANK VOLUME = 1,179,436 gals
10" RAINFALL = (260)(220) X 10/12 X 7.48 = 356,547 gals
TOTAL REQ'D = 1,535,983 gals

EXCESS CONTAINMENT CAPACITY = 1,549,916 − 1,535,983
= 13,933 gals

CE-241
REV. 1-70

Monsanto

BY	COCHRAN	DATE	2/2/93	CONTAINMENT AREA DESIGN	PAGE 8/8
CEA	4299	EQUIPT. NUMBER	T1-1/2		



ASSUME A HOLE IS PUNCHED IN THE TANK WALL AT POINT 2. DETERMINE THE DISTANCE THE LEAK WILL TRAVEL (X_0 AT POINT 3) ASSUMING THE TANK IS FULL AND THE HOLE IS LOCATED AT $Y_1/2$ WHICH WILL BE THE MAXIMUM DISTANCE

$$V_2 = \sqrt{2gH} = V_a = X_0/\sqrt{2Y_0/g}$$

$$X_0/\sqrt{2Y_0/g} = \sqrt{2gH}$$

$$X_0 = \sqrt{2gH(2Y_0/g)} = \sqrt{4HY_0}$$

SINCE $Y_0 = Y_1 - H$ $\quad X_0 = \sqrt{4H(Y_1-H)}$

$$Y_1 = 30' + 2' = 32' \quad H = \frac{32}{2} = 16$$

$$X_0 = \sqrt{4(16)(16)} = 32\ FT$$

DETERMINE CONDITION WITH RESPECT TO THE DIKE WALL

$$X_0' = \sqrt{4HY_0'} \qquad Y_0' = \frac{(X_0')^2}{4H}$$

IF: $Y_1 - Y_2 = H + Y_0'$ THE LEAK LANDS ON TOP OF THE DIKE

IF: $Y_1 - Y_2 > H + Y_0'$ CONTAINMENT IS INADEQUATE

IF: $Y_1 - Y_2 < H + Y_0'$ CONTAINMENT IS ADEQUATE

$$Y_0' = Y_0 - Y_2 = 16.0 - 4 = 12\ ft$$

$$X_0' = \sqrt{4(16)(12)} = 27.7\ ft$$

$Y_1 - Y_2 = 32 - 4 = 28\ FT \qquad H + Y_0' = 16 + 12 = 28\ FT$

THE LEAK WOULD LAND ON TOP OF THE WALL ASSUMING NO WIND AFFECTS.
A MINIMUM DISTANCE BETWEEN THE TANK AND DIKE WALL OF 30 FT SHOULD BE USED.
WE WILL USE A SPACING OF 35 FT MINIMUM FOR THE REVISED PLOT PLAN

ATTACHMENT V.4
ENGINEERING REPORT FOR
IWPF TANKS (PERMIT UNITS 08 AND 09)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.4.5

Appendix V.4.5 Class 2 Permit Modification Application for Storage of Sludge in IWPF Tanks

SOLUTIA®

Solutions for a better life.®

RCRA Class 2 Permit Modification
Permit No. HW – 50189-000

March 3, 2009

SOLUTIA
Solutions for a better life.™

Solutia Inc.
F.M. 2917
P.O. Box 711
Alvin, Texas 77512
Tel 281-581-2161

March 3, 2009

Mr. E. J. Biskup
Texas Commission on Environmental Quality
Waste Permits Division – MC 130
Industrial and Hazardous Waste Permits Section
P.O. Box 13087
Austin, Texas 78711-3087

Re: Application for a Class 2 RCRA Permit Modification, RCRA Permit No. HW-51089-000, Industrial Solid Waste Registration No. 30138, Solutia Inc., Alvin, Texas

Dear Mr. Biskup:

Enclosed please find an original plus three (3) copies of the Solutia Class 2 RCRA Permit Modification for the proposed changes to the IWPF Tanks (Permit Units 08 and 09) and to the waste codes managed in these permitted units.

The enclosed submittal includes replacement pages for the RCRA Permit Renewal Application and Application Addendum, replacement pages for the Solutia RCRA Permit, Section I of the Part B application form, an example of the public notification to be made following the submittal of this application, mailing labels for the adjacent landowners, and a photocopy of the fee payment for processing this application.

Please contact me at (281) 228-4313 or at grbrad@solutia.com should you have any questions regarding the enclosed submittal. We appreciate your continued support in our efforts to effectively manage our industrial solid waste program.

Sincerely,

Gina L. Bradley

Gina R. Bradley
Environmental Specialist

Enclosures

CLASS 2 PERMIT MODIFICATION

RCRA Permit No. HW-51089-000
Solutia Inc., - Alvin, Texas

TABLE OF CONTENTS

SOLUTIA
Solutions for a better life.

CLASS 2 PERMIT MODIFICATION

RCRA Permit No. HW-51089-000
Solutia, Inc., - Alvin, Texas

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This application is for the modification of RCRA Permit No. HW-50189-000 and has been prepared to propose changes in the tank management practice for two RCRA permitted tanks, IWPF Tank 332T1-1 (Permit Unit No. 8, NOR 59) and IWPF Tank 332T1-2 (Permit Unit No. 9, NOR 60). Submittal of this application constitutes a Class 2 modification to the Solutia RCRA permit per 30 TAC 305.69 (k)(G)(4) for the modification of a tank management practice. This management change consists is to allow for the storage of sludge as well as the previously permitted wastewater in these two tanks. In addition, Solutia proposes to update the EPA waste codes associated with wastes managed in permitted units.

On the basis of TCEQ requirements specified in the Part B Application Form (TCEQ-00376, Rev. 03/21/2008) for processing Class 2 permit modification applications, the following information or documents are provided in this application.

TCEQ Part B Application Form Requirement	Document Location
Explanation of why Class 2 permit modification is needed	Section 1 (See below)
Part B Section I plus Adjacent Landowners figure and Core Data Form	Section 2
Description of changes to RCRA Permit and Permit Application	Section 3
RCRA Permit Application Replacement Pages	Section 4
RCRA Permit Replacement Pages	Section 5
Example of Public Notice	Section 6
Adjacent Landowners Mailing Labels	Section 7
Photocopy of Fee Payment	Section 8

Explanation of Why the Class 2 Permit Modification is Needed

The tank management practice change for the two RCRA permitted tanks, IWPF Tank 332T1-1 (Permit Unit No. 8, NOR 59) and IWPF Tank 332T1-2 (Permit Unit No. 9, NOR 60) is needed to allow for the storage of sludge as well as the currently permitted wastewater in these two tanks.

A subsequent change to the RCRA permit is also being addressed in this Class 2 modification in which EPA waste codes are being updated for three wastes numbers (Waste No. 23, 31 and 36) listed in the RCRA Permit Table IV.B. After evaluation of the waste streams it was determined, by the definition of the mixture rule [40 CFR 261.3 (b)(2)] that these three waste numbers should carry some listed waste codes as defined by 40 CFR 261.31 and 261.32. Solutia is also taking a conservative approach and adding some additional toxicity waste codes as defined in 40 CFR 261.24 to these three waste numbers. These changes will require changes to Solutia's Waste Analysis Plan (WAP) submitted in the October 1, 2000 RCRA Permit Renewal Application Addendum.

Finally, as part of this Class 2 permit modification, due to additional research and based on generator's knowledge [40 CFR 262.11 (c)(2)], Solutia is removing the waste code P030 from the RCRA Permit Table IV.B as well as all of its references in the WAP submitted in the October 1, 2000 RCRA Permit Renewal Application Addendum.

CLASS 2 PERMIT MODIFICATION

RCRA Permit No. HW-51089-000
Solutia, Inc., - Alvin, Texas

PART B APPLICATION - SECTION I

Texas Commission on Environmental Quality
ATTN: Industrial and Hazardous Waste Permits Section MC130
Permits Division
P. O. Box 13087
Austin, Texas 78711-3087

INDUSTRIAL & HAZARDOUS WASTE PART B PERMIT APPLICATION

I. GENERAL INFORMATION

A. Facility Name:

B.

Solutia Inc. **(314) 674-1000**
575 Maryville Center Drive
P.O. Box 66760
St. Louis, Missouri 63166-6760

TCEQ Registration No.: **30138**

EPA I.D. No.: **TXD001700806**

County: **Brazoria**

If the application is submitted on behalf of a corporation, please identify the Charter Number as recorded with the Office of the Secretary of State for Texas.

0016370
(Charter Number)

B. Facility Contact

1. List those persons or firms, including a complete mailing address and telephone number, who will act as primary contact for the applicant during the processing of the permit application.

Mr. Paul Zawila **(281) 228-4361**
Environmental, Safety, and Health Lead **pwzawi@solutia.com**
Solutia Inc. - Chocolate Bayou Plant
P.O. Box 711
Alvin, Texas 77512-0711

2. If the application is submitted by a corporation or by a person residing out of state, the applicant must register an Agent in Service or Agent of Service with the Texas Secretary of State's office and provide a complete mailing address for the agent. The agent must be a Texas resident.

CT Corporation System **(214) 979-1172**
350 North St. Paul St., Suite 2900
Dallas, Texas 75201

3. List the individual who will be responsible for causing notice to be published in the newspaper and his/her mailing address, telephone number and fax number. If e-mail is available please provide an e-mail address.

Ms. Gina Bradley **(281)228-4313**
Environmental Specialist **grbrad@solutia.com**
Solutia Inc. – Chocolate Bayou Plant
P.O. Box 711
Alvin, Texas 77512-0711

4. For applications for new permits, renewals, major amendments and Class 3 modifications a copy of the administratively complete application must be made available at a public place in the county where the facility is, or will be, located for review and copying by the public. Identify the public place in the county (e.g., public library, county court house, city hall), including the address, where the application will be made available for review and copying by the public.

Alvin Public Library
105 South Gordon Street
Alvin, Texa 77511

1. If an applicant proposes a new industrial or hazardous waste facility that would accept municipal solid waste, the applicant shall hold a public meeting in the county in which the facility is proposed to be located. This meeting must be held before the 45th day after the date the application is filed. In addition, the applicant shall publish notice of the public meeting in accordance with 30 TAC 39.503(e)(5).

Not applicable to this application.

C. Operator[1]: Identify the entity who will conduct facility operations.

Solutia Inc. – Chocolate Bayou Plant
P.O. Box 711
Alvin, Texas 77512-0711
(281) 228-4000

D. Application Type and Facility Status

1.

☒ permit	☐ amendment	☒ modification
☐ new	☐ major	☐ Class 3
☐ interim status	☐ minor	☒ Class 2
☐ renewal		☐ Class 1[1]
☐ RD&D		☐ Class 1
☐ Compliance Plan		

2. Is this submittal part of a Consolidated Permit Processing request, in accordance with 30 TAC Chapter 33?

☐ Yes ☒ No

If yes, state the other TCEQ program authorizations requested.

3. Does the application contain confidential material? ☐ Yes ☒ No

If yes, cross-reference the confidential material *throughout the application* to Section XIII: Confidential Material, and submit as a separate Section XIII document or binder conspicuously marked "CONFIDENTIAL".

4. In either column, check all that apply.

[1]The operator has the duty to submit an application if the facility is owned by one person and operated by another [30 TAC 305.43(b)]. The permit will specify the operator and the owner who is listed on Part A of this application [Section 361.087, Texas Health and Safety Code].

☐ proposed hazardous waste management facility
☐ on-site
☐ off-site
☐ commercial
☐ recycle
☐ land disposal

☒ existing hazardous waste management facility
☒ on-site
☐ off-site
☐ commercial
☐ recycle
☐ land disposal
☐ areal or capacity expansion
☐ compliance plan

5. Is the facility within the Coastal Management Program boundary? ☒Yes. ☐No.

6. Provide a brief description of the portion of the facility covered by this application, including the changes for which an amendment or modification is requested.

This modification proposes to change the tank management practice for the two RCRA permitted tanks, IWPF Tank 332T1-1 (Permit Unit No. 8, NOR 59) and IWPF Tank 332T1-2 (Permit Unit No. 9, NOR 60). This management change is to allow for the storage of sludge as well as the currently permitted wastewater in these two tanks.

A Tank Integrity Engineering Report is included as ATTACHEMENT A to this part.

Additionally, this permit modification purpose is to update EPA waste codes associated with wastes managed in permitted units. These changes are summarized in the following table.

Permit/Compliance Plan Section	***Brief Description of Proposed Change***	***Modification or Amendment Type***	***Supporting Regulatory Citation***
Table V.C	Add waste No. 31 to Permit Units 08 and 09	2	30 TAC 305.69 (G)(4)
Table IV.B	Update EPA Waste Codes for Waste Nos. 23, 31, 36	2	30 TAC 305.69 (F)(3)(b)

7. Total acreage of the facility being permitted: **2500**

8. Identify the name of the drainage basin and segment where the facility is located:

Chocolate Bayou Tidal in Segment No. 1107 of the San Jacinto-Brazos Coastal Basin and New Bayou, thence to the Chocolate Bay in Segment No. 2432 of the Bays and Estuaries

E. Facility Siting Summary

Is the facility located or proposed to be located:

1. within a 100-year floodplain?

☒ YES ☐ NO

2. in wetlands?

☒ YES* ☐NO

***The Solutia Chocolate Bayou Plant contains areas that meet the definition of "wetlands" though the area of the IWPF tanks are not located within the areas that meet the definition of wetlands.**

3. in the critical habitat of an endangered species of plant or animal?

☐ YES ☒ NO

4. on the recharge zone of a sole-source aquifer?

☐ YES ☒ NO

5. in an area overlying a regional aquifer?

☒ YES ☐ NO

6. Within 2 of a mile (2,640 feet) of an established residence, church, school, day care center, surface water body used for a public drinking water supply, or dedicated public park? (Use only for a new commercial hazardous waste management facility or areal expansion of an existing commercial hazardous waste management facility or unit of that facility as defined in 30 TAC 335.202)

☐ YES ☐ NO **Not Applicable**

If YES, the TCEQ shall not issue a permit for this facility.

7. In an area in which the governing body of the county or municipality has prohibited the processing or disposal of municipal hazardous waste or industrial solid waste?

☐ YES ☒NO

If YES, provide a copy of the ordinance or order.

F. Wastewater and Stormwater Disposition

1. Is the disposal of any waste to be accomplished by a waste disposal well at this facility?

☐ NO ☒ YES (WDW Permit No(s). **013, 224, 318, 326, 359**

2. Will any point source discharge of effluent or rainfall runoff occur as a result of the proposed activities?

☐ YES ☒ NO

3. **If YES**, is this discharge regulated by a TPDES or TCEQ permit?

☐ YES Permit No. ______________(TCEQ)
Permit No. ______________(TPDES)
☐ NO Date TCEQ discharge permit application filed ________
Date TPDES discharge permit application filed________

G. Information Required to Provide Notice

State Officials List

Provide the name and mailing address for the State Senator and State Representative in the district in which the facility is or will be located. Either local district addresses or capitol addresses are acceptable. [30 TAC 39.103(b)]

Local Officials List

Provide the name and mailing address of the mayor and health authority of the municipality in whose territorial limits or extraterritorial jurisdiction the facility is or will be located. In addition, please provide the county judge and health authority of the county in which the facility is located. [30 TAC 39.103(c)]

Adjacent Landowners List

Submit a map indicating the boundaries of all adjacent parcels of land, and a list (see samples in the instructions) of the names and mailing addresses of all adjacent landowners and other nearby landowners who might consider themselves affected by the activities described by this application. Cross-reference this list to the map through the use of appropriate keying techniques. The map should be a USGS map, a city or county plat, or another map, sketch, or drawing with a scale adequate enough to show the cross-referenced affected landowners. The list should be updated prior to any required public notice. For all applications (***with the exception of Class 1 and Class 1[1] modifications***) this mailing list should be submitted on:

1. a Compact Disk using software compatible with MS Word [30 TAC 39.5(b)]; or

2. four sets of printed labels.

If the adjacent landowners list is submitted on computer disc, please label the disk with the applicant=s name and permit number. Within the file stored on the disk, type the permit number and applicant=s name on the top line before typing the addresses. Names and addresses must be typed in the format indicated below. This format is required by the U.S. Postal Service for machine readability. **Each letter in the name and address must be capitalized, contain no punctuation, and the appropriate two-character abbreviation must be used for the state. Each entity listed must be blocked and spaced consecutively as shown below.** The list should contain no more than 30 names, addresses, etc. (10 per column) per page.

Example:

Industrial Hazardous Waste Permit No. 50000, Texas Chemical Plant

TERRY M JENKINS
RR 1 BOX 34
WACO TX 76710

MR AND MRS EDWARD PEABODY
1405 MONTAGUE LN
WACO TX 76710-1234

A list submitted on computer disc should be the only item on that disc. Please do not submit a list on a disc that includes maps or other materials submitted with your application.

If you wish to provide the list on printed labels, please use sheets of labels that have 30 labels to a page (10 labels per column). Please provide **four complete sets of labels** of the adjacent landowners list.

The Adjacent Landowners List and Map is included as Figure G-1 to this part.

See Section 7 of this permit application for the Adjacent Landowners Mailing Labels

H. TCEQ Core Data Form

The TCEQ requires that a Core Data Form (Form 10400) be submitted on all incoming applications unless a Regulated Entity and Customer Reference Number has been issued by the TCEQ and no core data information has changed. For more information regarding the Core Data Form, call (512) 239-1575 or go to the TCEQ Web site at www.TCEQ.state.tx.us/permitting/projects/cr

The Core Data Form is included as ATTACHMENT B to this part.

I. Signature on Application

It is the duty of the operator to submit an application for a permit. The person who signs the application form will often be the operator himself; when another person signs on behalf of the applicant, his title or relationship to the applicant will be shown. In all cases, the person signing the form must be authorized to do so by the applicant. An application submitted by a corporation must be signed by a responsible corporate officer such as a president, secretary, treasurer, vice president, or by his duly authorized representative, if such representative is responsible for the overall operation of the facility from which the activity described in the form originates. In the case of a partnership or a sole proprietorship, the application must be signed by a general partner or the proprietor, respectively. In the case of a municipal, state, federal, or other public facility, the application must be signed by a principal executive officer, a ranking elected official, or another duly authorized employee. A person signing an application on behalf of an applicant must provide notarized proof of authorization.

SIGNATURE PAGE

I, **Paul Cartlidge**, **Site Manager**,
(Operator) (Title)

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

Signature: [signature] Date: 3/5/09

TO BE COMPLETED BY THE OPERATOR IF THE APPLICATION IS SIGNED BY AN AUTHORIZED REPRESENTATIVE FOR THE OPERATOR

I, ______________________, hereby designate ______________________
(Print or Type Name) (Print or Type Name)

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

____
Printed or Typed Name of Operator or Principal Executive Officer

____
Signature

SUBSCRIBED AND SWORN to before me by the said Paul Cartlidge

On this 5th day of March, 2009

My commission expires on the 16th day of September, 2009

JUNE M. WYATT
MY COMMISSION EXPIRES
September 16, 2009

Notary Public in and for June M. Wyatt

Brazoria County, Texas

(Note: Application Must Bear Signature & Seal of Notary Public)

SOLUTIA
Solutions for a better life.

CLASS 2 PERMIT MODIFICATION

RCRA Permit No. HW-51089-000
Solutia, Inc., - Alvin, Texas

ATTACHEMENT A

TANK INTEGRITY ENGINEERING REPORT

TANK CERTIFICATION

TANK: 332T1-1

REGULATORY REFERENCE: 40 CFR 265. 191

PREPARED FOR:

SOLUTIA INC.
CHOCOLATE BAYOU PLANT
ALVIN, TEXAS

March 2, 2009
CHEMIC JOB No. 9016

CHEMIC ENGINEERS
HITCHCOCK, TEXAS 77563
(409) 986-6504

REPORT CONTENTS

Certification by Registered Professional Engineer: D. Lucardi P.E.

Tank / Foundation Calculations

Support Drawings:	W-93-2579A-2 Rev. B W-93-2579A-3 Rev. B W-93-2579A-27 Rev. B 332FD-004

Copy of Certification for Secondary Containment

Copy of API 653 In Service Tank Inspection and Ultrasonic Inspection Reports

Regulatory References:	40 CFR 265.191

DATE: March 2, 2009

TO: Mr. Paul W. Zawila (SOLUTIA INC.)

FROM: Dedy Lucardi P.E. (CHEMIC ENGINEERS)

SUBJECT: Assessment of Tank 332T1-1

REFERENCE: EPA 40 CFR Sections 265.191 (July 1, 2008 Edition)
Tank contents: Hazardous waste liquid and solids as defined by EPA.

Tank 332T1-1 was assessed to insure the tank system's integrity. The assessment was done to insure its qualifications and capabilities to store hazardous waste sludge as well as the currently permitted wastewater. An API - 653 in service tank inspection, consisting of external visual and ultrasonic inspection was conducted to establish the condition of the tank shell and floating roof. Bottom plate (tank floor) condition was evaluated based on data from an acoustic emission inspection conducted in 10/2006. The results found that there was no indication that the tank system was at risk of failure.

Listed below are the requirements for the assessment under EPA Regulation 40 CFR 265.191:

1. Design Standard: The tank was inspected externally and based on the tank ultrasonic thickness reading provided by SOLUTIA and the calculations according to the API-650 (2007) – 5.6.3, F.4.1, F.4.2, API-653 (2008) - 4.3.3 and 4.4.5, the tank is adequately designed and has sufficient structural strength. Although the API - 653 in service tank inspection report notes that "there are weld spacing issues with nozzles on the first shell course that are not acceptable with current API code" the tank's construction is fully compliant with API code as it existed at the time the tank was constructed.

2. Hazardous Characteristic: The wastes are hazardous waste liquid and sludge collected from various sources (units) in Solutia plant.

3. Existing Corrosion Protection: Shell course #1 minimum thickness is required 0.328 in. + 0.125 in. for corrosion allowance = 0.453 in. which is less than the 0.637 in. (minimum thickness UT reading on the shell course#1). The shell minimum thickness shell courses #2 through #4 were found to be above the minimum required thickness and no significant material loss from general corrosion. Base plate thickness of 0.5 in, which are exceeded minimum require thickness of 0.225 in. and 0.25 in. per API-650 section 5.4.1. and API-653 – 4.4, Table 6-1.

   Measured sludge specific gravity is 1.1 vs. the original tank design specific gravity of 1.0. All minimum thickness calculations were performed using a specific gravity of 1.1.

   The floating roof and seal are in acceptable condition and suitable for service.

4. Documented Age of the Tank System: The tank 332T1-2 serial # 2579A was built by WYATT INDUSTRIES INC. The tank was constructed of carbon steel SA-516-55 and it was built in 1994. This information was obtained from the fabrication drawings #W-93-2579B-2.

5. Tank Foundation: The tank foundation is constructed of concrete ring wall type filled with compacted sand and 6" thick of pea gravel on the upper section. There is no major defect on tank foundation other than minor hairline cracking and it will be able maintain the load of a full liquid level in the tank.

6. Secondary Containment System: The secondary containment system is adequate and was previously addressed in a separate Facility Certification Report by Jimmy L. Means, Solutia Engineer on July 12, 2000.

7. Results of Leak Test, Internal Inspection or Other Tank Integrity Examination: The tank is in place and based on visual inspection, there are no defects or leaks detected. The calculation showed that tank is not requiring to be anchored to the foundation since tank friction forces is larger than the wind force.

Based on visual inspections, calculations and review of available documentation, I believe that tank 332T1-2 is adequately designed and is compatible for storage of the hazardous waste sludge as well as the currently permitted wastewater.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted.

Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

STATE OF TEXAS
DEDY LUCARDI
75006
REGISTERED
PROFESSIONAL ENGINEER

SIGNED: ______________________ DATE: 3-4-'09

D. Lucardi P.E.
Texas Registration No. 75006

CHEMIC ENGINEERS

SOLUTIA Inc

TANK 332T1-1 RERATE CALCULATIONS

CHOCOLATE BAYOU PLANT
Chocolate Bayou, Texas

By: Dedy Lucardi
Chemic Engineers

March 2, 2009
Chemic Project # 9016
REV-0

UnRegistered ETank Company - 9016
TANK REPORT: Printed - 02/27/2009 11:24:27 AM

ETANK SETTINGS SUMMARY

332T1-1

To Change These ETank Settings, Go To Tools->Options, Behavior Tab.

```
Do 650 Appendix F Calcs when Tank P = 0  -> Default : False
                                         -> This Tank : False
Show MAWP / MAWV Calcs                           : True
Enforce API Minimum thicknesses                  : True
Enforce API Maximum Roof thickness               : True
Enforce Minimum Self Supp. Cone Pitch (2 in 12)  : True
Force Non-Annular Btm. to Meet API-650 3.5.1     : False
Set t.actual to t.required Values                  : False
Maximum 650 App. S or App. M Multiplier is 1     : True
Enforce API Maximum Nozzle Sizes                 : True
Use Jawad External Pressure in Wind Girder Calcs : True
Max. Self Supported Roof thickness               : 0 in.
Max. Tank Corr. Allowance                        : 0 in.
Shell external pressure/wind t-min includes C.A. : False
```

SUMMARY OF DESIGN DATA and REMARKS

Job	: 9016
' of Calcs.	: 02/27/2009 , 11:24 AM
. or Insp. Date	: 02/23/2009
Designer	: Dedy Lucardi
Project	: Tank Certification
Tag Number	: 332T1-1
Plant	: Solutia
Plant Location	: Chocolate Bayou
Site	: Chocolate Bayou
Design Basis	: API-653 3rd Edition Addendum 2, 2005, & API-650 10th Edition Addendum 4, Dec 2005

- TANK NAMEPLATE INFORMATION

- Operating Ratio: 0.4
- Design Standard:
- API-650 10th Edition Addendum 4, Dec 2005 -

```
SHELL COURSE RE-RATING   (Bottom Course is #1)

Course # 1;   Material: A-516 Gr 55;   Width = 8.5ft

   API-653 ONE FOOT METHOD

   Sd = 23,595 PSI   (allowable design stress per API-653 4.3.3.1)

   RE-RATE CONDITION
   G = 1.1 (per API-653)

   < Re-Rate Condition G = 1.1 >

   H' = Effective liquid head at design pressure
      = H + 2.31*P(psi)/G
      = 34 + 2.31*0/1.1 = 34ft

   t-Calc = 2.6*OD*(H' - 1)*G/(Sd*E) + CA  (per API-653)
          = 2.6*82*(34 - 1)*1.1/(23,595*1) + 0.125
          = 0.453 in.

   hMax_1 = E*Sd*(t_1 - CA_1)/(2.6*OD*G) + 1
          = 1*23,595*(0.625 - 0.125) / (2.6 * 82 * 1.1) + 1
          = 51.3049 ft.

   Pmax_1 = (hMax_1 - H) * 0.433 * G
          = (51.3049 - 34) * 0.433 * 1.1
          = 8.2423 PSI

   Pmax_int_shell = Min(Pmax_int_shell, Pmax_1)
                  = Min(999, 8.2423)

   Pmax_int_shell = 8.2423 PSI

   HYDROSTATIC TEST CONDITION

   < Re-Rate Condition G = 1 >

   H' = Effective liquid head at design pressure
      = H + 2.31*P(psi)/G
      = 34 + 2.31*0/1 = 34ft

   t.test = 2.6*82*(34 - 1)/(25,960*1) = 0.271 in.

Course # 2;   Material: A-516 Gr 55;   Width = 8.5ft


   API-653 ONE FOOT METHOD

   Sd = 23,595 PSI   (allowable design stress per API-653 4.3.3.1)

   RE-RATE CONDITION
   G = 1.1 (per API-653)

   < Re-Rate Condition G = 1.1 >

   H' = Effective liquid head at design pressure
      = H + 2.31*P(psi)/G
      = 25.5 + 2.31*0/1.1 = 25.5ft
```

```
t-Calc = 2.6*OD*(H' - 1)*G/(Sd*E) + CA  (per API-653)
       = 2.6*82*(25.5 - 1)*1.1/(23,595*1) + 0.125
       = 0.3685 in.

hMax_2 = E*Sd*(t_2 - CA_2)/(2.6*OD*G) + 1
       = 1*23,595*(0.5 - 0.125) / (2.6 * 82 * 1.1) + 1
       = 38.7287 ft.

Pmax_2 = (hMax_2 - H) * 0.433 * G
       = (38.7287 - 25.5) * 0.433 * 1.1
       = 6.3008 PSI

Pmax_int_shell = Min(Pmax_int_shell, Pmax_2)
               = Min(8.2423, 6.3008)

Pmax_int_shell = 6.3008 PSI

HYDROSTATIC TEST CONDITION

< Re-Rate Condition G = 1 >

H' = Effective liquid head at design pressure
   = H + 2.31*P(psi)/G
   = 25.5 + 2.31*0/1 = 25.5ft

t.test = 2.6*82*(25.5 - 1)/(25,960*1) = 0.2012 in.
```

Course # 3; Material: A-516 Gr 55; Width = 8.5ft

```
API-653 ONE FOOT METHOD

Sd = 25,960 PSI   (allowable design stress per API-653 4.3.3.1)

RE-RATE CONDITION
G = 1.1 (per API-653)

< Re-Rate Condition G = 1.1 >

H' = Effective liquid head at design pressure
   = H + 2.31*P(psi)/G
   = 17 + 2.31*0/1.1 = 17ft

t-Calc = 2.6*OD*(H' - 1)*G/(Sd*E) + CA  (per API-653)
       = 2.6*82*(17 - 1)*1.1/(25,960*1) + 0.125
       = 0.2695 in.

hMax_3 = E*Sd*(t_3 - CA_3)/(2.6*OD*G) + 1
       = 1*25,960*(0.375 - 0.125) / (2.6 * 82 * 1.1) + 1
       = 28.6736 ft.

Pmax_3 = (hMax_3 - H) * 0.433 * G
       = (28.6736 - 17) * 0.433 * 1.1
       = 5.5601 PSI

Pmax_int_shell = Min(Pmax_int_shell, Pmax_3)
               = Min(6.3008, 5.5601)

Pmax_int_shell = 5.5601 PSI
```

UnRegistered ETank Company - 9016
TANK REPORT: Printed - 02/27/2009 11:24:27 AM

```
   HYDROSTATIC TEST CONDITION

   < Re-Rate Condition G = 1 >

   H' = Effective liquid head at design pressure
      = H + 2.31*P(psi)/G
      = 17 + 2.31*0/1 = 17ft

   t.test = 2.6*82*(17 - 1)/(27,000*1) = 0.1263 in.

Course # 4;   Material: A-516 Gr 55;   Width = 8.5ft


   API-653 ONE FOOT METHOD

   Sd = 25,960 PSI   (allowable design stress per API-653 4.3.3.1)

   RE-RATE CONDITION
   G = 1.1 (per API-653)

   < Re-Rate Condition G = 1.1 >

   H' = Effective liquid head at design pressure
      = H + 2.31*P(psi)/G
      = 8.5 + 2.31*0/1.1 = 8.5ft

   t-Calc = 2.6*OD*(H' - 1)*G/(Sd*E) + CA  (per API-653)
          = 2.6*82*(8.5 - 1)*1.1/(25,960*1) + 0.125
          = 0.1928 in.

   hMax_4 = E*Sd*(t_4 - CA_4)/(2.6*OD*G) + 1
          = 1*25,960*(0.366 - 0.125) / (2.6 * 82 * 1.1) + 1
          = 27.6773 ft.

   Pmax_4 = (hMax_4 - H) * 0.433 * G
          = (27.6773 - 8.5) * 0.433 * 1.1
          = 9.1341 PSI

   Pmax_int_shell = Min(Pmax_int_shell, Pmax_4)
                  = Min(5.5601, 9.1341)

   Pmax_int_shell = 5.5601 PSI

   HYDROSTATIC TEST CONDITION

   < Re-Rate Condition G = 1 >

   H' = Effective liquid head at design pressure
      = H + 2.31*P(psi)/G
      = 8.5 + 2.31*0/1 = 8.5ft

   t.test = 2.6*82*(8.5 - 1)/(27,000*1) = 0.0592 in.

< SHELL COURSE #1 SUMMARY >

   t-Calc = MAX(t-Calc_650, t_shell_min)
          = MAX(0.453, 0.2472)
          = 0.453 in.
```

```
  Course Minimum t shall not be less than 0.1" + CA
    (per API-653 Section 4.3.3.1)

  :-653min = 0.225 in.

t.required = MAX(t.design, t.min653)
           = MAX(0.453,0.225) = 0.453 in.

< API-653 4.3.2.1 >
t1 (lowest average thickness in the shell course)
t1 must be >= t.required = 0.453 in.
t2 (least min. thickness in an area of shell course)
t2 must be >= 0.6*(t.required - CA) + CA = 0.321800 in.
t.actual = 0.625 in.

Weight = Density*PI*[(12*OD) - t]*12*Width*t
       = 0.2833*PI*[(12*82)-0.625]*12*8.5*0.625
       = 55,795 lbf    (New)
       = 44,642 lbf    (Corroded)


< SHELL COURSE #2 SUMMARY >

  t-Calc = MAX(t-Calc_650, t_shell_min)
         = MAX(0.3685, 0.2472)
         = 0.3685 in.

  Course Minimum t shall not be less than 0.1" + CA
    (per API-653 Section 4.3.3.1)

  t-653min = 0.225 in.

 required = MAX(t.design, t.min653)
           = MAX(0.3685,0.225) = 0.3685 in.

< API-653 4.3.2.1 >
t1 (lowest average thickness in the shell course)
t1 must be >= t.required = 0.3685 in.
t2 (least min. thickness in an area of shell course)
t2 must be >= 0.6*(t.required - CA) + CA = 0.271100 in.
t.actual = 0.5 in.

Weight = Density*PI*[(12*OD) - t]*12*Width*t
       = 0.2833*PI*[(12*82)-0.5]*12*8.5*0.5
       = 44,642 lbf    (New)
       = 33,486 lbf    (Corroded)


< SHELL COURSE #3 SUMMARY >

  t-Calc = MAX(t-Calc_650, t_shell_min)
         = MAX(0.2695, 0.2472)
         = 0.2695 in.

  Course Minimum t shall not be less than 0.1" + CA
    (per API-653 Section 4.3.3.1)

  t-653min = 0.225 in.
```

```
t.required = MAX(t.design, t.min653)
           = MAX(0.2695,0.225) = 0.2695 in.

  API-653 4.3.2.1 >
   (lowest average thickness in the shell course)
t1 must be >= t.required = 0.2695 in.
t2 (least min. thickness in an area of shell course)
t2 must be >= 0.6*(t.required - CA) + CA = 0.211700 in.
t.actual = 0.375 in.

Weight = Density*PI*[(12*OD) - t]*12*Width*t
       = 0.2833*PI*[(12*82)-0.375]*12*8.5*0.375
       = 33,486 lbf     (New)
       = 22,327 lbf     (Corroded)


< SHELL COURSE #4 SUMMARY >

  t_shell_min governs.  See the STIFFENING RINGS Calculations.

  t-Calc = MAX(t-Calc_650, t_shell_min)
         = MAX(0.1928, 0.2472)
         = 0.2472 in.

  Course Minimum t shall not be less than 0.1" + CA
    (per API-653 Section 4.3.3.1)

  t-653min = 0.225 in.

t.required = MAX(t.design, t.min653)
           = MAX(0.2472,0.225) = 0.2472 in.

< API-653 4.3.2.1 >
   (lowest average thickness in the shell course)
   must be >= t.required = 0.2472 in.
t2 (least min. thickness in an area of shell course)
t2 must be >= 0.6*(t.required - CA) + CA = 0.198320 in.
t.actual = 0.366 in.

Weight = Density*PI*[(12*OD) - t]*12*Width*t
       = 0.2833*PI*[(12*82)-0.366]*12*8.5*0.366
       = 32,682 lbf     (New)
       = 21,523 lbf     (Corroded)
```

```
FLAT BOTTOM: NON-ANNULAR PLATE DESIGN

   Bottom Plate Material :  A-516 Gr 55
   Annular Bottom Plate Material :  A-36

<Weight of Bottom Plate>

   Bottom_Area = PI/4*(Bottom_OD)^2
               = PI/4*(988.0001)^2
               = 766,662 in^2

   Weight = Density * t.actual * Bottom_Area
          = 0.2833 * 0.5 * 766,662
          = 108,598 lbf    (New)
          = 81,448 lbf   (Corroded)

< API-653 >

   Calculation of Hydrostatic Test Stress & Product Design Stress
      (per API-653)

   t_1 : Original Bottom (1st) Shell Course thickness.

   H'= Max. Liq. Level + P(psi)/(0.433)
     = 34 + (0)/(0.433) = 34 ft

   St = Hydrostatic Test Stress in Bottom (1st) Shell Course
      = (2.6)(OD)(H' - 1)/t_1
      = (2.6)(82)(34 - 1)/(0.625)
      = 11,257 PSI.   (Within 24900 PSI limit for Non-Annular Bottom)

   Sd = Product Design Stress in Bottom (1st) Shell Course
      = (2.6)(OD)(H' - 1)(G)/(t_1 - ca_1)
      = (2.6)(82)(34 - 1)(1.1)/(0.5)
      = 15,478 PSI.   (Within 23200 PSI limit for Non-Annular Bottom)

   Non-Annular Bottom Plates

   t_min = 0.1 + 0.125 = 0.225 in. (per API-653 Table 6-1)

   t-Calc = t_min = 0.225 in.

< FLAT BOTTOM: NON-ANNULAR SUMMARY >

t.required = t-Calc = 0.225 in.
t.actual = 0.5 in.
```

```
STIFFENING RINGS (API-650)

   vs = Wind Velocity    = 125 mph
   vf = Velocity Factor = (vs/120)^2 = (125/120)^2 = 1.0851
   Re-Rate PV = 0 PSI, OR 0 In. H2O

(REF: 'Structural Analysis and Design of Process Equipment'
      2nd Edition, Jawad)
   (Combining effects of internal vacuum with vf)

   ve = Effective Velocity Factor
      = (25.6 * vf + 144 * SF * PV) / 25.6
                    = (25.6 * 1.0851 + 144 * 2 * 0) / 25.6
                    = 1.0851

 <TOP COMPRESSION RING CALCULATIONS>

   Z = Required Top Comp Ring Section Modulus (per API-650 3.9.6.1)
     = (Zm)(Ve)(h)(OD^2)
     = (0.0001)(1.0851)(34)(82^2)
     = 24.81 in^3, for Open Top Tank

       Actual Z = 47.1 in^3
       Using 16 x 6 x 2-1/2 x 1/4 (in) FORMED PLATE

 <INTERMEDIATE WIND GIRDER CALCULATIONS (PER API-650 Section 3.9.7)

       ME = 28,799,999/28,799,999
          = 1

       Hu = Maximum Height of Unstiffened Shell
          = {ME*600,000*t*SQRT[t/OD]^3} / Ve)
          = {1*600,000*0.366*SQRT[0.366/82]^3} / 1.0851
          = 60.35 ft

       Wtr     = Transposed Width of each Shell Course
               = Width*[ t_top_course / t_course ]^2.5

       Transforming Courses (1) to (4)

       Wtr(1) = 8.5*[ 0.366/0.625 ]^2.5 = 2.2306 ft
       Wtr(2) = 8.5*[ 0.366/0.5 ]^2.5 = 3.8967 ft
       Wtr(3) = 8.5*[ 0.366/0.375 ]^2.5 = 7.9991 ft
       Wtr(4) = 8.5*[ 0.366/0.366 ]^2.5 = 8.5 ft
       Htr  (Height of the Transformed Shell)
            = SUM{Wtr} = 22.6264 ft

       L0 = Unstiffened Shell Length
          = 22.6264/1 = 22.6264 ft


       No Intermediate Wind Girders Needed Since Hu >= L_0


   Ve_Max = {ME*600,000*t*SQRT[t/OD]^3} / L0
      = {1*600,000*0.366*SQRT[0.366/82]^3} / 22.6264
      = 2.8941
```

```
P_ext_shell_1  (EXTERNAL PRESSURE CHECK per Jawad,
   based on Ve_Max, L0, and t_top_course)
   = 25.6 * (vf - Ve_Max) / (144 * SF))
   = 25.6 * (1.0851 - 2.8941) / (144 * 2))
   = -0.1608 PSI or -4.46 IN. H2O


t_shell_min_1  (Shell Minimum t per Jawad,
                based on L0, and Ve),
   = {(L0*Ve*SQRT[OD]^3) / (ME*600,000)} ^ 0.4   (CA Incl. Later)
   = {(22.6264*1.0851*SQRT[82]^3) / (1*600,000)} ^ 0.4
   = 0.2472 in.


NOTE: Per User Design,
Wind Girder Calculations per Jawad N.A.

 Design Length (L0) = 22.6264 ft or 271.5168 in.
 Design Diameter (D0) = 82 ft or 984 in.

 M = max(M_seismic, M_wind) = 925,703 ft-lbf

 tq = thickness required for M
    = M/(R^2*PI*S*E)
    = 0.0006 in.

 tnp (Top Course thickness available to resist external pressure)
     = t_top_course - tq
     = 0.366 - 0.0006

     = 0.3654 in.


 Since D0/t > 1000, Will not Perform ASME Vacuum Calculations.

(REF: Per Jawad, for D0/t > 1000)

 Using Max(tnp, t_top_course)

(REF: Guidebook for the Design of ASME Section VIII Pressure Vessels)

 P_ext_shell_2   (Per Jawad, based on D0/t)
    = -0.866*E / [(L0/D0)*(D/t_top_course)^2.5]
    = -0.866*28,799,999/[(0.2759)*(984/0.366) ^ 2.5]
    = -0.2412 PSI or -6.68 IN. H2O


 t_shell_min_2  ( Back Calculate Using Course Actual values ),
    = D0 / [(0.866*E)/(PV*(L0/D0))]^(2/5) + ca_top_course
    = 984/[(0.866*28,799,999)/(0.036*(0.2759))]^(2/5)
      (Assuming API-650 3.2.4 applies, let
       PV = 0.036 PSI to ensure non-zero value in order
       to calculate t_shell_min_2)
    = 0.171 in.  (CA Incl. Later)


 P_ext_shell = P_ext_shell_2
    = -0.2412 PSI
```

```
      = -0.2412 PSI or -6.68 IN. H2O

    Since PV >= P_ext_shell,  No Stiffeners Required.

  ITERMEDIATE GIRDER CALCULATION SHELL THICKNESS SUMMARY>

    NOTE: Course t.exernal values below exclude Corrosion Allowance.

    t.external.1 = MAX(t_shell_min_1, t_shell_min_2)
                 = MAX(0.2472,0.171)
                 = 0.2472 in.

    t.external.2 = MAX(t_shell_min_1, t_shell_min_2)
                 = MAX(0.2472,0.171)
                 = 0.2472 in.

    t.external.3 = MAX(t_shell_min_1, t_shell_min_2)
                 = MAX(0.2472,0.171)
                 = 0.2472 in.

    t.external.4 = MAX(t_shell_min_1, t_shell_min_2)
                 = MAX(0.2472,0.171)
                 = 0.2472 in.

<BOTTOM COMPRESSION RING CALCULATIONS>

  Bottom Compression Ring: N.A.
```

```
WIND MOMENT (Per API-650 SECTION 3.11)

     vs = Wind Velocity = 125 mph
     vf = Velocity Factor = (vs/120)^2 = (125/120)^2 = 1.0851

     Xs (Moment Arm of Wind Force on Shell)
        = H/2 = (34)/2 = 17 ft

     As (Projected Area of Shell)
        = H*(OD + t_ins / 6)
        = (34)(82 + 0/6) = 2,788 ft^2

     M_shell (Moment Due to Wind Force on Shell)
             = (vf)(18)(As)(Xs)
             = (1.0851)(18)(2,788)(17) = 925,703 ft-lbf

     Mw (Wind moment)
            = M_shell = 925,703 ft-lbf

     W  = Net weight (PER API-650 3.11.3)
        = W_shell
        = 121,978 lbf

RESISTANCE TO OVERTURNING (per API-650 3.11.2)

   An unanchored Tank must meet these two criteria:
    1) 0.6*Mw + MPi < (MDL + MF_min_liq)/1.5
    2) Mw + 0.4MPi < (MDL + MF)/2

   Mw = Destabilizing Wind Moment = 925,703 ft-lbf

   MPi = Destabilizing Moment about the Shell-to-Bottom Joint from Design «
                                                               Pressure.
       = P*(PI*OD^2/4)*(144)*(OD/2)
       = 0*(3.1416*82^2/4)*(144)*(41)
       = 0 ft-lbf

   MDL = Stabilizing Moment about the Shell-to-Bottom Joint from the Shell and «
                                        Roof weight supported by the Shell.
       = (W_shell + W_roof)*OD/2
       = (121,978 + 0)*41
       = 5,001,098 ft-lbf

   ta = Bottom Plate thickness = 0.5 in.

   wa = Circumferential loading of contents along Shell-To-Bottom Joint.
      = 4.67*ta*SQRT(Sy_btm*H_liq)
      = 4.67*0.5*SQRT(30,000*34)
      = 2,358 lbf/ft

   wa_min_liq = Circumferential loading of Minimum-Level contents along «
                                                      Shell-To-Bottom Joint.
              = 4.67*ta*SQRT(Sy_btm*H_min_liq)
              = 4.67*0.5*SQRT(30,000*0)
              = 0 lbf/ft

   MF_min_liq = wa_min_liq*PI*OD
              = 0*3.1416*82
              = 0 lbf
```

```
   MF = Stabilizing Moment due to Bottom Plate and Liquid Weight.
      = (OD/2)*wa*PI*OD
      = (41)(2,358)(3.1416)(82)
      = 911,259 ft-lbf

   Criteria 1
   0.6*(925,703) + 0 < (5,001,098 + 0)/1.5
   Since 555,422 < 3,334,065, Tank is stable.

   Criteria 2
   925,703 + 0.4 * 0 < (5,001,098 + 911,259)/2
   Since 925,703 < 2,956,179, Tank is stable.

RESISTANCE TO SLIDING (per API-650 3.11.4)

     F_wind = vF*(15 * Ap_Vert + 18 * As)
            = 1.0851*(15 * 0 + 18 * 2,788)
            = 54,453 lbf

     F_friction = Maximum of 40% of Weight of Tank
          = 0.4 * (W_Roof_Corroded + W_Shell_Corroded +
                   W_Btm_Corroded + W_min_Liquid)
          = 0.4 * (0 + 121,978 + 81,448 + 0)
                = 81,370 lbf

     No anchorage needed to resist sliding since

        F_friction > F_wind
```

SEISMIC MOMENT (API-650 APPENDIX E & API-620 APPENDIX L)
Ms = 0 ft-lbf

* NOTE: Since Seismic Zone Coefficient (Z) = 0,
  Seismic calculations are not applicable.

<ANCHORAGE REQUIREMENTS>
No Anchorage Required.

ANCHOR BOLT DESIGN

This is a non-anchored Tank (NAT), since there are no anchor bolts.

plift Check for Open-Top NAT at MAWP is N.A., and no anchors are required due to wind moment or seismic calculations.

```
 * * Warning * *   Closed-top NAT at MAWP is subject to Uplift.

  U1 @ MAWP = (Uplift due to MAWP)
            - Corr. shell - [Corr. roof weight  + Structural weight]
            = 999 * 3.1416 / 4 * 6,724 * 144 «
            - 121,978 - [0 + 0 + 0 + 0]

 * * Warning * *   Closed-top NAT at MAWP is subject to Uplift.

  U1 @ MAWP = (Uplift due to MAWP)
            = MAWP * PI / 4 * D ^ 2 * 144 «
            - Corr. shell - Corr. roof weight
            = 999 * 3.1416 / 4 * 6,724 * 144 «
            - 121,978 - 0
      = 759,584,100 LBF

 * * Warning * *   NAT is subject to Uplift due to MAWP + Wind Load.

  U6 @ MAWP = (Uplift due to MAWP + Wind Load)
            = [(MAWP - 8 * t) * D^2 * 4.08] + [4 * Mw / D] - W1
            = [(999 - 8 * 0.375) * 6,724 * 4.08] «
            + [4 * 925,703 / 82] - 121,978
            = 759,373,900 LBF

 * * Warning * *   NAT is subject to Uplift due to MAWP + Seismic load.

    ' @ MAWP = (Uplift due to MAWP + Seismic Load)
            = [(MAWP - 8 * t) * D^2 * 4.08] + [4 * Ms / D] - W1
            = [(999 - 8 * 0.375) * 6,724 * 4.08] «
            + [4 * 0 / 82] - 121,978
            = 759,328,800 LBF

   Open-top NAT is okay for MAWP, Wind and Siesmic.

  MAWP_NAT: Solve U1 for MAWP, with U1 = 0:
  MAWP_NAT = 1 / (36 * PI * D ^ 2) * [Corroded (shell + roof) weight + «
                                                Structural weight]
           = 1/(36 * 3.1416 * 6,724) * [121,978 + (0 + 0 + 0 + 0)]
  MAWP_NAT = 1 / (36 * PI * D ^ 2) * [Corroded (shell + roof) weight]
           = 1/(36 * 3.1416 * 6,724) * [121,978 + 0]
           = 0.1594 PSI

  NOTE: Tank MAWP is limited to MAWP_NAT
```

ANCHOR BOLT CHAIRS NOT SPECIFIED.

CAPACITIES and WEIGHTS

Shell capacity to upper TL : 1,340,616 gal

	New Condition	Corroded
Shell	166,605 lbf	121,978 lbf
Roof Plates	0 lbf	0 lbf
Bottom	108,598 lbf	81,448 lbf
Total	275,203 lbf	203,426 lbf

Weight of Tank, Empty	275,203 lbf
Weight of Tank, Full	12,574,014 lbf
Weight of Tank, Full of Water	11,455,940 lbf
Foundation Area Req'd	5,281 ft^2
Foundation Loading, Empty	52.11 lbf/ft^2
Foundation Loading, Full	2,381 lbf/ft^2
Foundation Loading, Full of Water	2,169 lbf/ft^2

CHEMIC ENGINEERS

SOLUTIA Inc.

TANK 332T1-1 & T1-2 FOUNDATION CALCULATIONS SG=1.1

CHOCOLATE BAYOU PLANT
Chocolate Bayou, Texas

By: Y. Hendra
Chemic Engineers

March 2, 2009
Chemic Project # 9016
REV-0

CHEMIC ENGINEERS

JOB NO. 9016 PAGE 1 OF 5
DATE 2/27/09 BY Y.H.
CLIENT SOLUTIA
LOCATION CB - IWPF

SUBJECT CALC. FOR EXIST. 332 T-1 & 2 USING 1.1 SG. FLUID CONTRAST
REF DWG D-332-T1-4
D-332-F0-006

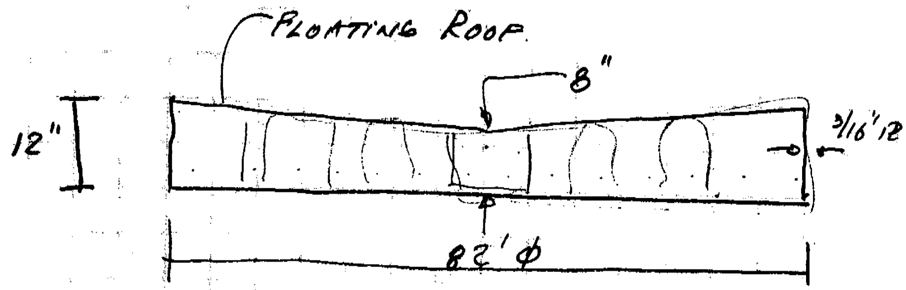
TANK ID = 82'
SG. CONTRAST = 1.1

RING WALL FDN ID = 81'-0"
RING WALL THICKNESS = 1'-0"

WT OF TANK WALL + BOTTOM = 276 007 # — FROM "B TANK" MODEL.

WT OF THE TANK ROOF (FLOATING ROOF).

ASSUME 3/16" THK PLATE WT = 7.65 #/SF.



$$\text{ROOF AREA} = \frac{\pi D^2}{4} = \frac{(3.14)(82)^2}{4} = 5278.3 \text{ SF.}$$

TOP & BOTT AREA = 5278.3 × 2 = 10556 SF

THE WALL AREA = $\pi D \times h$
$= (3.14)(82)(1) = 258$ SF

10814 SF

WT OF ROOF = 10814 × 7.65 = 82727 #

$$\text{WT/SF} = \frac{82727}{5278.3} = 15.67 \text{ \#/SF} = .11 \text{ \#/in}^2$$

CHEMIC ENGINEERS

JOB NO. 9016 PAGE 2 OF 5
DATE 2/27/09 BY Y.H.
CLIENT SOLUTIA
LOCATION C.B - IWPF

SUBJECT

WT OF BOTTOM TANK $= 20.4\ \#/SF \times \frac{\pi D^2}{4} = 20.4\ \#/SF \times \frac{(3.14)(82)^2}{4} = 107678\ \#$
(1/2" PL) 20.4 #/SF

WT OF SHELL = 276007 − 107678

= **168329 #**

STRESS @ RING WALL = RING WALL THICKNESS = 1'-0"

DUE TO WT OF SHELL $= \frac{168329}{\pi D} = \frac{168329}{(3.14)(82)} = 654\ \#/SF$

DUE TO ROOF ⇒ 6" PORTION OF ROOF ON TOP OF RING
$= \frac{15.67}{2} = 8\ \#/SF$

DUE TO FLUID ⇒ 6"
$1.1 \times 62.4 \times \frac{6"}{12"} \times 34'\ HT = 1169\ \#/SF$

DUE TO BOTT SHELL 20

1851 #/SF

W = WT OF SHELL & FLUID THAT SUPPORTED BY RING FDN. / LF

$= \frac{1851\ \#/SF}{1\ ft\ (\text{WIDTH OF RING FDN})} = 1851\ \#/LF$

CHEMIC ENGINEERS

JOB NO. 9016 PAGE 3 OF 5
DATE 2/27/01 BY Y.H
CLIENT SOLUTIA
LOCATION CB-DWPF

SUBJECT

STRESS @ THE SOIL = WITH 1.1 SG

DUE WT OF ROOF = 16 #/SF

DUE WT OF FLUID = 62.4 X 1.1 X 34 2334 #/SF

DUE WT OF BOTTOM = 20 #/SF

SOIL STRESS W/1.1 SG. = 2370 #/SF

AT PRESENT COND, THE SOIL STRESS

FLUID = 62.4 X 1 X 34 = 2122 #/SF

WT ROOF = 16 #/SF

WT BOTT = 20 #/SF

SOIL STRESS W/1.0 SG = 2158 #/SF

≈ 10% INCREASE ON SOIL STRESS

USUALLY ALLOWABLE SOIL BEARING PRESSURE HAS A MIN 2 SAFETY FACTOR

CHEMIC ENGINEERS

JOB NO. 9016 PAGE 4 OF 5
DATE 2/27/09 BY Y.H
CLIENT SOLUTIA
LOCATION CB - IWPF

SUBJECT

CHECK FOR RING WALL THICKNESS

$$t = \frac{W}{H \gamma_P - 80 d} \geq 12''$$

W = WT OF TANK THAT SUPPORTED BY RING WALL #/LF = 1851 #/LF
H = HEIGHT OF TANK = 34'
d = DEPTH OF RING = 5'-6"
γ_P = PRODUCT WT = 1.1 × 62.4 = 69 #/ft³

$$= \frac{1851 \ \#/ft}{(34')(69 \ \#/ft^3) - 80(5.5')}$$

$$= .97' < 1'$$

ACTUAL WIDTH OF RING WALL

CHEMIC ENGINEERS

JOB NO. 9016 PAGE 5 OF 5
DATE 2/27/09 BY Y.H
CLIENT SOLUTIA
LOCATION CB-IWPP

SUBJECT

CHECK FOR HOOP STRESS #/IN²

$$\text{HOOP REINFORCING} = \frac{R\,d\,K_A\,((SG)\,H + \gamma_s \frac{d}{2})}{f_s}$$

$$\frac{(82)(6.5)(.3)\left((69)(34) + 100\ \frac{6.5}{2}\right)}{42850\ \#/in^2}$$

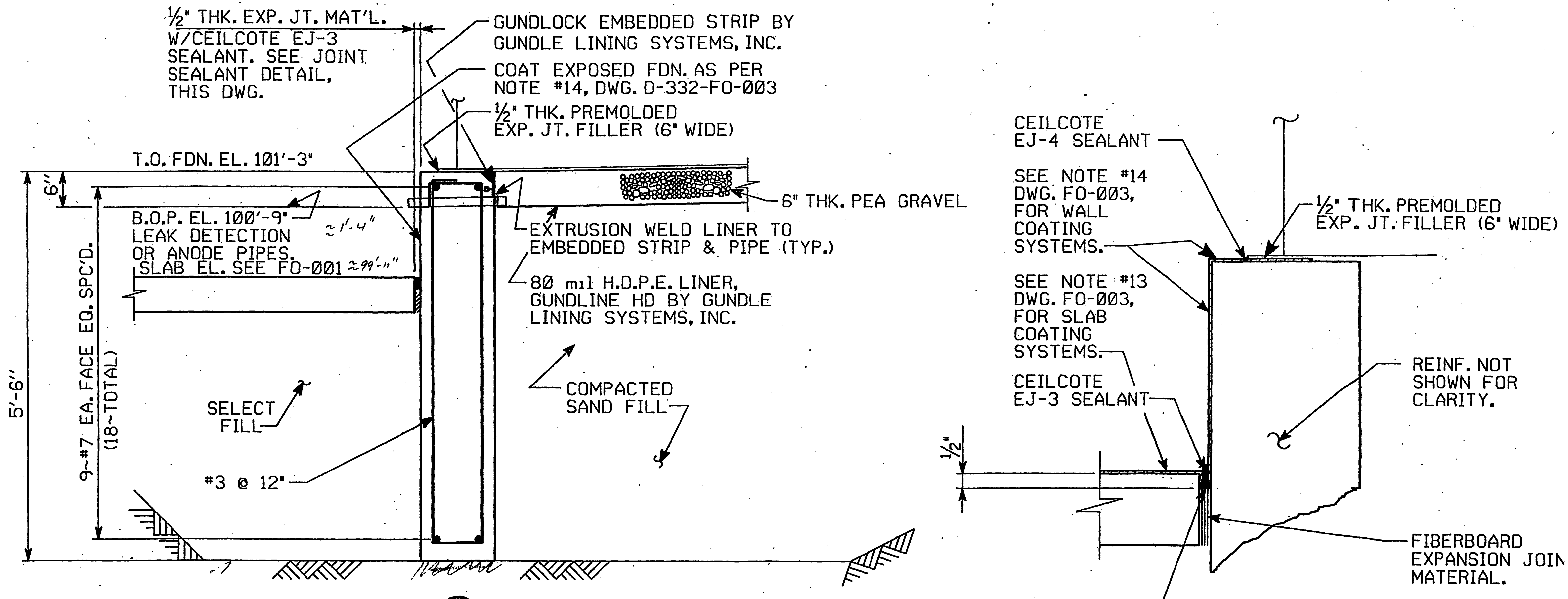
2621 #/ft²

$$= \frac{354621\ \#}{42850\ \#/in^2}$$

REQ'D A_s = 8.27 IN²

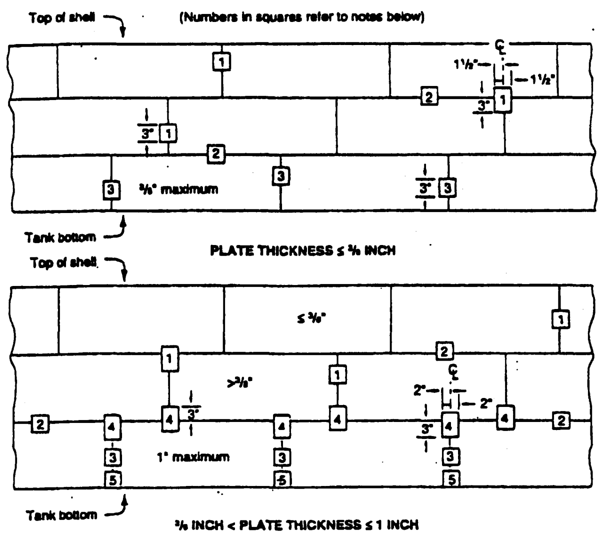
AVAILABLE REINF BAR = 18 #7 BARS
18 X .60 = 10.8 IN²
OK

R = TANK RADIUS = 82'
K_A = COEFF ACTIVE SOIL PRESSURE = .3
d = DEPTH OF RING = 6.5'
SG = SPECIFIC GRAVITY = 1.1 X 62.4 = 69 #/ft³
f_s = STEEL YIELD STRESS = 60 KSI
USE 1.4 FACTOR = 42.85 KSI = 42850 #/IN²
γ_s = 100 #/ft³



DETAIL 6
SC: ¾" = 1'-0"

RADIOGRAPHIC STANDARDS



Notes:
1. Vertical spot radiograph in accordance with 6.1.2.2. Item a: one in the first 10 feet and one in each 100 feet thereafter, 25 percent of which shall be at intersections.
2. Horizontal spot radiograph in accordance with 6.1.2.3: one in the first 10 feet and one in each 200 feet thereafter.
3. Vertical spot radiograph in each vertical seam in the lowest course (see 6.1.2.2. Item b). Spot radiographs that satisfy the requirements of Note 1 for the lowest course may be used to satisfy this requirement.
4. Spot radiographs of all intersections over 3/8 inch (see 6.1.2.2. Item b).
5. Spot radiograph of bottom of each vertical seam in lowest shell course over 3/8 inch (see 6.1.2.2. Item b).
6. Complete radiograph of each vertical seam over 1 inch. The complete radiograph may include the spot radiographs of the intersections if the film has a minimum width of 4 inches (see 6.1.2.2. Item c).

Figure 6-1—Radiographic Requirements for Tank Shells

Note: In this standard, the term *inspector*, as used in Sections V and VIII of the ASME Code, shall be interpreted to mean the purchaser's inspector.

6.1 Radiographic Method

For the purposes of this paragraph, plates shall be considered of the same thickness when the difference in their specified or design thickness does not exceed 1/32 inch.

6.1.1 APPLICATION

Radiographic inspection is required for shell butt welds (see 6.1.2.2 and 6.1.2.3), annular-plate butt welds (see 6.1.2.9), and flush-type connections with butt welds (see 3.7.8.11). Inspection by radiographic methods is not required for roof-plate or bottom-plate welds or for welds joining roof plates to the top angle, the top angle to the shell plate, shell plates to bottom plates, or appurtenances to the tank.

6.1.2 NUMBER AND LOCATION OF RADIOGRAPHS

6.1.2.1 Except when omitted under the provisions of A.3.4, radiographs shall be taken as specified in 6.1.2 through 6.1.8.

6.1.2.2 The following requirements apply to vertical joints:

a. For butt-welded joints in which the thinner shell plate is less than or equal to 3/8 inch thick, one spot radiograph shall be taken in the first 10 feet of completed vertical joint of each type and thickness welded by each welder or welding operator. The spot radiographs taken in the vertical joints of the lowest course may be used to meet the requirements of Note 3 in Figure 6-1 for individual joints. Thereafter, without regard to the number of welders or welding operators, one additional spot radiograph shall be taken in each additional 100 feet (approximately) and any remaining major fraction of vertical joint of the same type and thickness. At least 25 percent of the selected spots shall be at junctions of vertical and horizontal joints, with a minimum of two such intersections per tank. In addition to the foregoing requirements, one random spot radiograph shall be taken in each vertical joint in the lowest course (see the top panel of Figure 6-1).
b. For butt-welded joints in which the thinner shell plate is greater than 3/8 inch but less than or equal to 1 inch in thickness, spot radiographs shall be taken according to Item a. In addition, all junctions of vertical and horizontal joints in plates in this thickness range shall be radiographed: each film shall clearly show not less than 2 inches of weld length on each side of the vertical intersection. In the lowest course, two spot radiographs shall be taken in each vertical joint: one of the radiographs shall be as close to the bottom as is practicable, and the other shall be taken at random (see the center panel of Figure 6-1).
c. Vertical joints in which the shell plates are greater than 1 inch thick shall be fully radiographed. All junctions of vertical and horizontal joints in this thickness range shall be radiographed; each film shall clearly show not less than 2 inches of weld length on each side of the vertical intersection (see the bottom panel of Figure 6-1).
d. The butt weld around the periphery of an insert manhole or nozzle shall be completely radiographed.

6.1.2.3 One spot radiograph shall be taken in the first 10 feet of completed horizontal butt joint of the same type and thickness (based on the thickness of the thinner plate at the joint) without regard to the number of welders or welding operators. Thereafter, one radiograph shall be taken in each additional 200 feet (approximately) and any remaining major fraction of horizontal joint of the same type and thickness. These radiographs are in addition to the radiographs of junctions of vertical joints required by Item c of 6.1.2.2 (see Figure 6-1).

6.1.2.4 When two or more tanks are erected in the same location for the same purchaser, either concurrently or serially, the number of spot radiographs to be taken may be based on the aggregate footage of welds of the same type and thickness in each group of tanks rather than the footage in each individual tank.

6.1.2.5 It should be recognized that the same welder or welding operator may not weld both sides of the same butt joint. If two welders or welding operators weld opposite sides of the same butt joint, it is permissible to inspect their work with one spot radiograph. If the spot radiograph is rejected, further spot radiographs shall be taken to determine whether one or both of the welders or welding operators are at fault.

6.1.2.6 An equal number of spot radiographs shall be taken from the work of each welder or welding operator in proportion to the length of joints welded.

6.1.2.7 As welding progresses, radiographs shall be taken as soon as it is practicable. The locations where spot radiographs are to be taken may be determined by the purchaser's inspector.

6.1.2.8 Each radiograph shall clearly show a minimum of 3 inches of weld length. The film shall be centered on the weld and shall be of sufficient width to permit adequate space for the location of identification marks and a thickness gauge or penetrometer.

6.1.2.9 When bottom annular plates are required by 3.5.1, the radial joints shall be radiographed as follows: (a) For double butt-welded joints, one spot radiograph shall be taken on 10 percent of the radial joints; (b) For single-side welded joints using a backup bar, one spot radiograph shall be taken on 50 percent of the radial joints. Locations of radiographs shall preferably be at the outer edge where the shell-plate joint joins the annular plate. The minimum length of each radiograph shall be 6 inches. Extra care must be exercised in the interpretation of radiographs of single welded joints that have a backup bar. In some cases, additional exposures taken at an angle may determine whether questionable indications are acceptable.

SETTLEMENT TABLE

REG. PT DEGREE	BEFORE HYDROTEST FILL	AFTER HYDROTEST FILL

REG. PT DEGREE	BEFORE HYDROTEST FILL	AFTER HYDROTEST FILL

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
A Subsidiary of HOOTER CORPORATION

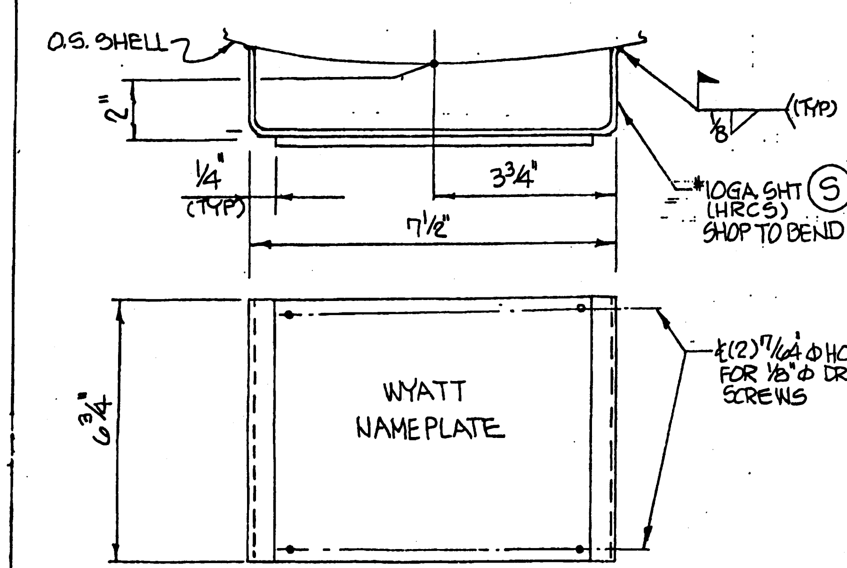
API STANDARD 650

APPENDIX	C	YEAR COMPLETED	1994
EDITION	9TH	REVISION NUMBER	
NOMINAL DIAMETER	82'-0" ID	NOMINAL HEIGHT	34'-0"
NOMINAL CAPACITY	27,919 BBLS	DESIGN LIQUID LEVEL	34'-0"
DESIGN SPECIFIC GRAVITY	1.0	MAXIMUM TEST LEVEL	29'-8 3/16"
DESIGN PRESSURE		DESIGN METAL TEMP.	40°F - 160°F
INT: 6" WC EXT ATMOSPHERIC		MAXIMUM OPERATING TEMP.	160°F
PURCHASER'S TANK NO.	332T1-1	PARTIAL STRESS RELIEF	NONE

MANUFACTURER'S SERIAL NO. 2579A
FABRICATED BY WYATT FIELD SERVICE COMPANY
ERECTED BY WYATT FIELD SERVICE COMPANY

SHELL COURSE	MATERIAL
SHELL RG# 1	5/8" PL (A-516-55)
SHELL RG# 2	1/2" PL (A-516-55)
SHELL RG'S #3 & #4	3/8" PL (A-516-55)

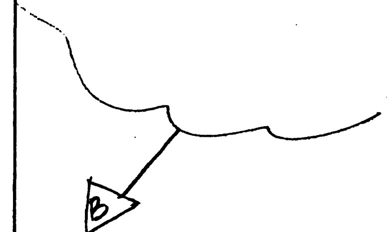
DETAIL OF NAMEPLATE



DETAIL OF NAMEPLATE BRACKET
ONE (1) REQ'D

NOTES

1. FIELD TO ESTABLISH & MARK (12) REF. POINTS EQ. SPACED AROUND THE TANK FOR MEASUREMENT OF SETTLEMENT.
2. FIELD TO ESTABLISH & MARK LOCATION FOR TRANSIT FOR EACH REF. POINT ON TANK.
3. MEASUREMENTS ARE TO BE MADE PRIOR TO FILLING & JUST BEFORE DRAINING THE TANK.



DESIGN DATA

DESIGN, FABRICATION, ERECTION & TESTING TO BE IN ACCORDANCE WITH API-650 9TH EDITION, JULY 1993

NAMEPLATE REQUIRED:	YES
DESIGN PRESSURE:	
INT:	6" W.C.
EXT:	ATMOSPHERIC.
DESIGN TEMPERATURE:	40°F - 160°F
SPECIFIC GRAVITY:	1.0
JOINT EFFICIENCY:	1.0
RADIOGRAPH:	SEE STANDARDS THIS SHT.
CORROSION ALLOWANCE:	1/8" WETED SURFACES
DESIGN LIQUID LEVEL:	34'-0"
ROOF CONSTRUCTION:	DOUBLE DECK FLOAT. ROOF
BOTTOM CONSTRUCTION:	BUTT WELDED
HYDROTEST:	SEE PROCEDURE THIS SHT.
WIND LOAD:	125 MPH
EARTHQUAKE ZONE:	0
NOMINAL CAPACITY:	27,919 BBL's TO OVERFLOW

HYDRO-TEST PROCEDURE

1. TANK BOTTOM & LOWER ROOF DECK ARE TO BE VACUUM BOX TESTED PER API 650 PARA. 5.3.3 & MONSANTO STD 2.5 STD 23
2. COMPLETE ALL NON-DESTRUCTIVE TESTING.
3. BLANK OFF ALL SHELL NOZZLES EXCEPT MK "L"
4. FILL THE TANK W/ POTABLE WATER (FURNISHED BY CUSTOMER) TO THE MAX. LIQUID LEVEL.
5. AFTER TANK IS FULL; THOROUGHLY CHECK THE TANK & FLOATING ROOF FOR LEAKS.
6. DRAIN THE TANK.
7. REMOVE ALL TEST COVERS & RETURN TO WYATT STOCK FOR FUTURE USE.

NDE NOTE

MT DENOTES MAGNETIC PARTICLE EXAMINATION OFF ALL NOZZLE TO SHELL ATTACHMENT WELDS (INCLUDING REINFORCING PAD TO SHELL) PRIOR TO HYDRO-TEST. ANY DEFECTS FOUND ARE TO BE REPAIRED & RETESTED.

GRINDING NOTE

G DENOTES ALL TANK INTERNAL WELDS SHALL BE GROUND SMOOTH (BUT NOT FLUSH)

I CERTIFY THAT THE ATTACHED TANK DRAWING MEETS THE REQUIREMENTS OF THE API-650 CODE, NINTH EDITION, JULY 1993.

REV. B 5/11/94 M.J.K.

STATE OF TEXAS
MICHAEL J. KOPECKY
48302
REGISTERED PROFESSIONAL ENGINEER

Michael J. Kopecky

P.O.#: 4247-7-0031
S/O 2579A ITEM: 332T1-1

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

DESIGN DATA & GENERAL NOTES
FOR
(1) 82'-0" ID x 34'-0" HIGH OPEN TOP FLOAT. ROOF
IWPF WASTE WATER STORAGE TANK

CUSTOMER: MONSANTO CO.
DRAWN: ODG DATE: 11-4-93
CHECKED: JKH APPROVED:

SCALE:
CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 11-24-93

B	REV. AS NOTED	5/11/94	ODG	JKH
A	REV. PER CUST. APPROVAL	11-23-93	ODG	JKH
NO.	REVISION	DATE	BY	CH

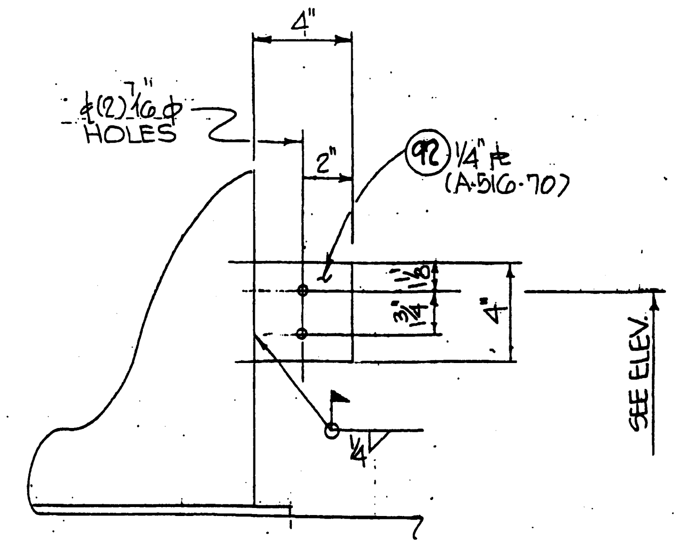
NO. W-93-2579A-2 REV. B

FIELD NOTES

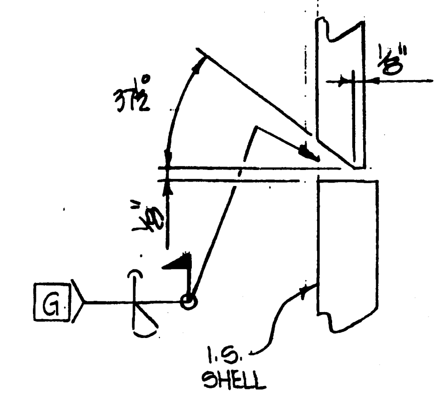
1. THE SHELL TO BOTTOM WELD SHALL BE PERFORMED AS FOLLOWS: (CUST. INSPECTOR TO WITHNESS TEST.)

   a. Complete the interior shell to bottom weld.
   b. Before making the exterior shell to bottom weld spray the interior shell to bottom weld with dye penetrant developer.
   c. With one inspector on the inside of the tank have someone on the outside of the tank spray the shell to bottom weld with water.
   d. Pinhole leaks will cause the developer to discolor.
   e. Repair any leaks. Recheck repairs for leaks.
   f. Clean up and install exterior shell to bottom weld.

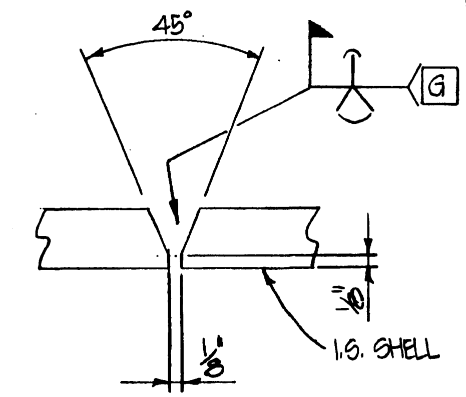
2. G SEE SHT#2 FOR GRINDING NOTE



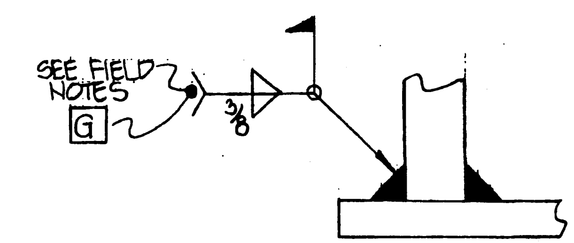
DETAIL OF GROUNDING LUG
(12) REQ'D MK "GL"



DETAIL "H"



DETAIL "V"



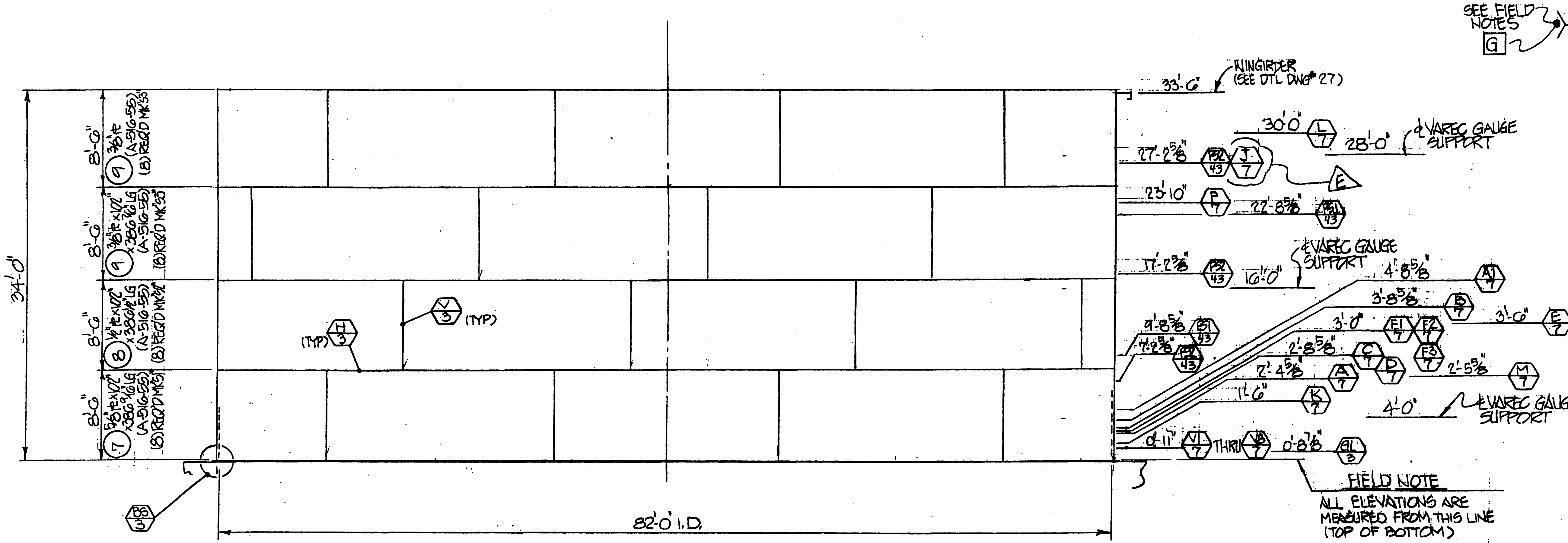
DETAIL "BS"

I CERTIFY THAT THE ATTACHED TANK DRAWING MEETS THE REQUIREMENTS OF THE API-650 CODE, NINTH EDITION, JULY 1993.

STATE OF TEXAS
MICHAEL J. KOPECKY
48302
REGISTERED PROFESSIONAL ENGINEER

REV. E 5/11/94 M.J.K.

Michael J. Kopecky



ELEVATION
(FOR TRUE ORIENT. SEE PLAN DWG#4)

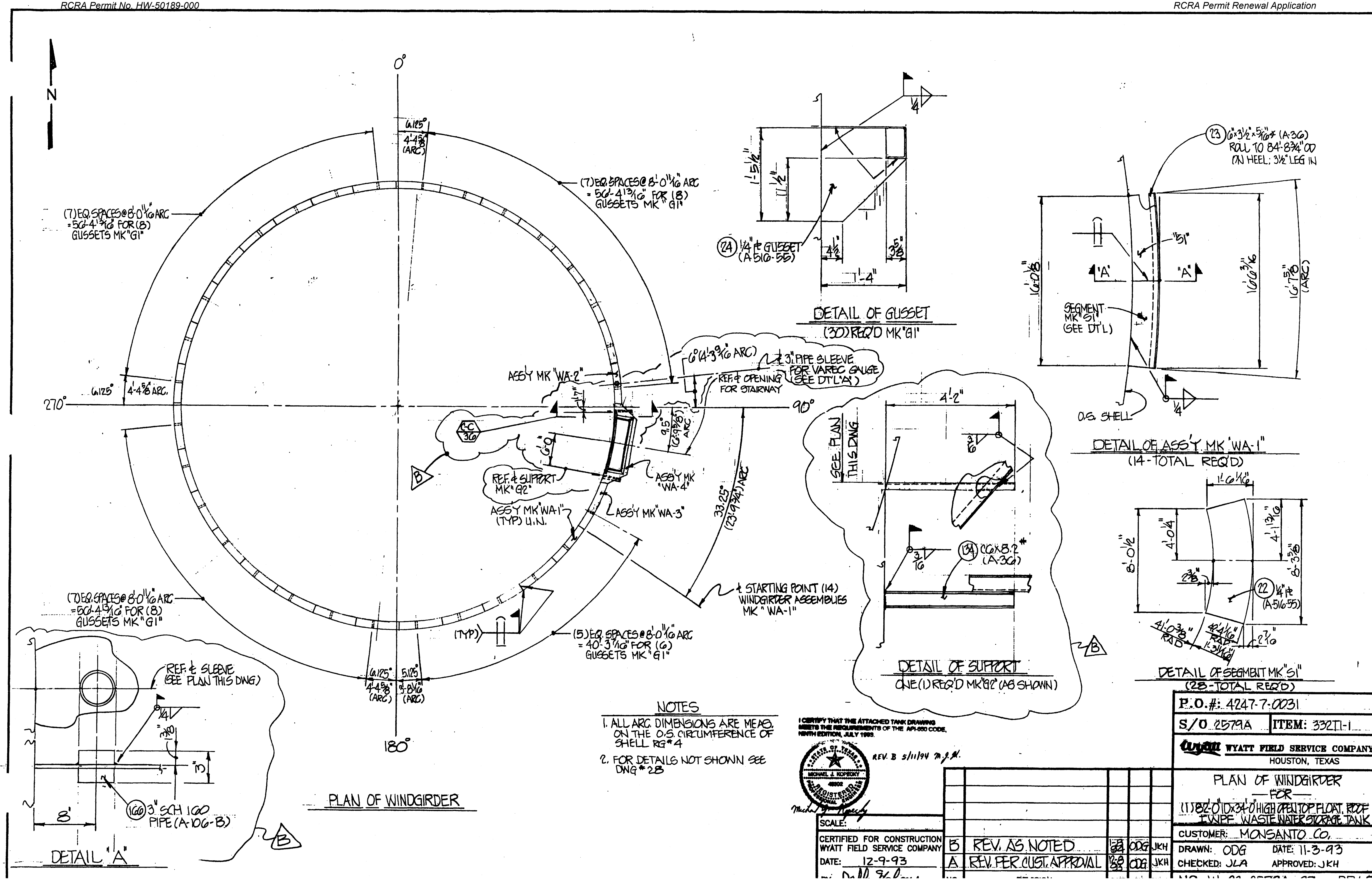
NO.	REVISION	DATE	BY	CHKD
E	REV. AS NOTED	1-27-94	ODG	JKH
D	REV. AS NOTED	1-19-94	ODG	JKH
C	ADD DWG # FOR "PS1" & "PS2"	12-29-93	~	JKH
B	REV. AS NOTED	11-23-93	ODG	JKH
A	REV. PER CUST. APPROVAL	11-?-93	ODG	JKH

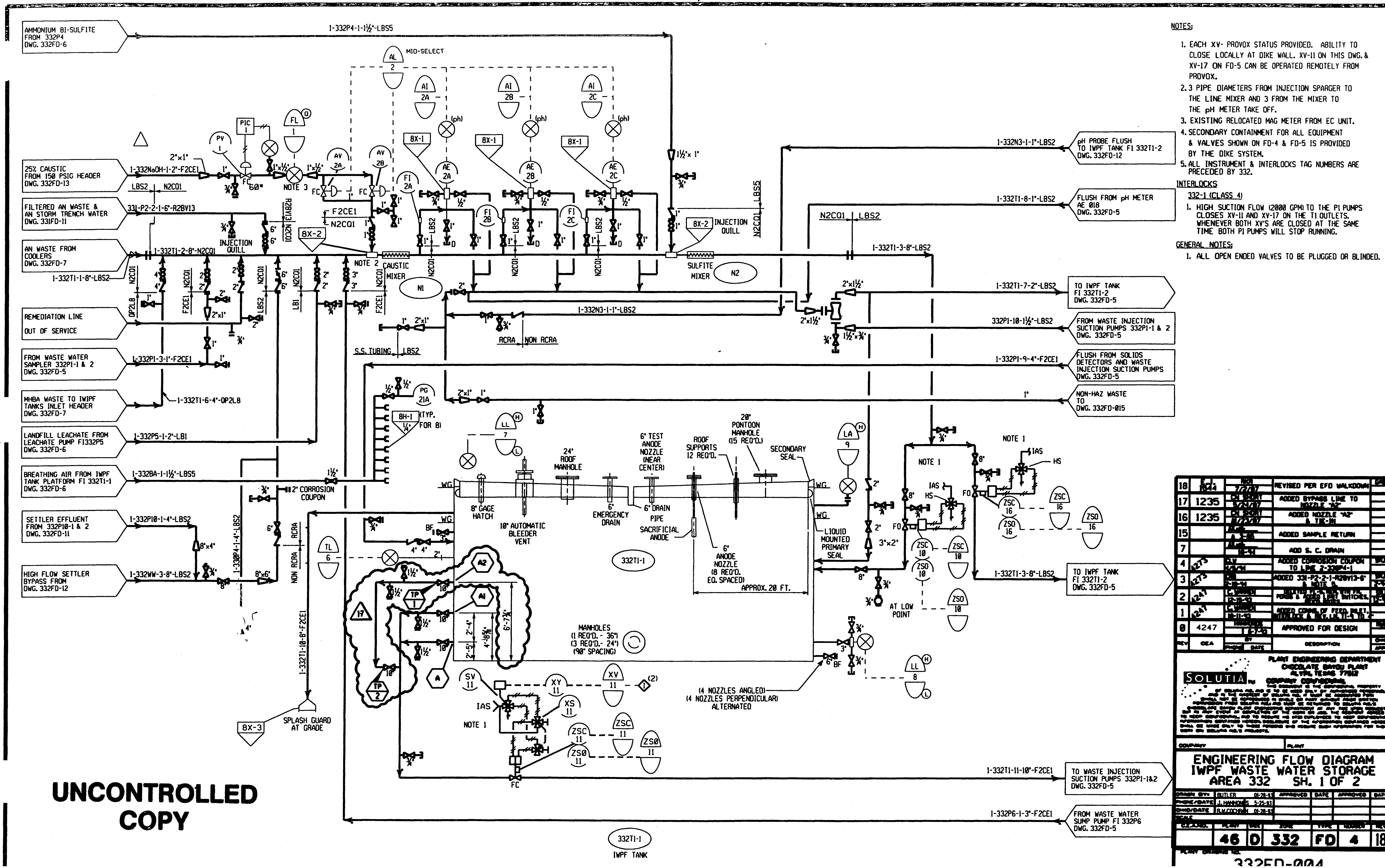
SCALE:
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 11-8-93
BY: [signature]

P.O.#: 4247-7-0031
S/O 2579A ITEM: 332TI-1
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

ELEVATION
FOR
(1) 82'-0" ID x 34'-0" HIGH OPEN TOP FLOAT. ROOF IWPF WASTE WATER STORAGE TANK

CUSTOMER: MONSANTO CO.
DRAWN: ODG DATE: 10-5-93
CHECKED: JKH APPROVED:
NO. W-93-2579A-2 REV E


N
0°
90°
180°
270°
(7) EQ. SPACES @ 8'-0 1/16" ARC = 56'-4 13/16" FOR (8) GUSSETS MK "G1"
(5) EQ. SPACES @ 8'-0 11/16" ARC = 40'-3 1/16" FOR (6) GUSSETS MK "G1"
ASS'Y MK "WA-2"
ASS'Y MK "WA-3"
ASS'Y MK "WA-4"
ASS'Y MK "WA-1" (TYP) U.N.
REF. ℄ SUPPORT MK "G2"
REF. ℄ OPENING FOR STAIRWAY
3" PIPE SLEEVE FOR VAREC GAUGE (SEE DT'L 'A')
℄ STARTING POINT (14) WINDGIRDER ASSEMBLIES MK "WA-1"
PLAN OF WINDGIRDER
DETAIL OF GUSSET
(30) REQ'D MK "G1"
(24) 1/4" ℄ GUSSET (A 516-55)
DETAIL OF ASS'Y MK 'WA-1"
(14-TOTAL REQ'D)
(23) 6"x3 1/2"x5/16" ∠ (A-36) ROLL TO 84'-8 3/4" OD ON HEEL; 3 1/2" LEG IN
SEGMENT MK "S1" (SEE DT'L)
O.S. SHELL
DETAIL OF SUPPORT
ONE (1) REQ'D MK "G2" (AS SHOWN)
(134) C6x8.2# (A-36)
SEE PLAN THIS DWG
DETAIL OF SEGMENT MK "S1"
(28-TOTAL REQ'D)
(22) 1/4" ℄ (A516-55)
DETAIL "A"
REF. ℄ SLEEVE (SEE PLAN THIS DWG)
(166) 3" SCH 160 PIPE (A-106-B)
NOTES
1. ALL ARC DIMENSIONS ARE MEAS. ON THE O.S. CIRCUMFERENCE OF SHELL RG#4
2. FOR DETAILS NOT SHOWN SEE DWG #28
I CERTIFY THAT THE ATTACHED TANK DRAWING MEETS THE REQUIREMENTS OF THE API-650 CODE, NINTH EDITION, JULY 1993.
REV. B 5/11/94
MICHAEL J. KOPECKY
REGISTERED PROFESSIONAL ENGINEER
SCALE:
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 12-9-93
B REV. AS NOTED ODG JKH
A REV. PER CUST. APPROVAL ODG JKH
P.O.#: 4247-7-0031
S/O 2579A
ITEM: 332T1-1
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS
PLAN OF WINDGIRDER
FOR
(1) 82'-0" ID x 34'-0" HIGH OPEN TOP FLOAT. ROOF TYPE WASTE WATER STORAGE TANK
CUSTOMER: MONSANTO CO.
DRAWN: ODG
DATE: 11-3-93
CHECKED: JLA
APPROVED: JKH


NOTES:
1. EACH XV- PROVOX STATUS PROVIDED. ABILITY TO CLOSE LOCALLY AT DIKE WALL. XV-11 ON THIS DWG.& XV-17 ON FD-5 CAN BE OPERATED REMOTELY FROM PROVOX.
2. 3 PIPE DIAMETERS FROM INJECTION SPARGER TO THE LINE MIXER AND 3 FROM THE MIXER TO THE pH METER TAKE OFF.
3. EXISTING RELOCATED MAG METER FROM EC UNIT.
4. SECONDARY CONTAINMENT FOR ALL EQUIPMENT & VALVES SHOWN ON FD-4 & FD-5 IS PROVIDED BY THE DIKE SYSTEM.
5. ALL INSTRUMENT & INTERLOCKS TAG NUMBERS ARE PRECEDED BY 332.
INTERLOCKS
332-1 (CLASS 4)
1. HIGH SUCTION FLOW (2000 GPM) TO THE P1 PUMPS CLOSES XV-11 AND XV-17 ON THE T1 OUTLETS. WHENEVER BOTH XV'S ARE CLOSED AT THE SAME TIME BOTH P1 PUMPS WILL STOP RUNNING.
GENERAL NOTES:
1. ALL OPEN ENDED VALVES TO BE PLUGGED OR BLINDED.
AMMONIUM BI-SULFITE FROM 332P4 DWG. 332FD-6
1-332P4-1-1½"-LBS5
25% CAUSTIC FROM 150 PSIG HEADER DWG. 332FD-13
1-332NaOH-1-2"-F2CE1
FILTERED AN WASTE & AN STORM TRENCH WATER DWG. 331FD-11
331-P2-2-1-6"-R28V13
AN WASTE FROM COOLERS DWG. 332FD-7
1-332T1-2-8"-N2C01
1-332T1-1-8"-LBS2
REMEDIATION LINE OUT OF SERVICE
FROM WASTE WATER SAMPLER 332P1-1 & 2 DWG. 332FD-5
1-332P1-3-1"-F2CE1
MHBA WASTE TO IWIPF TANKS INLET HEADER DWG. 332FD-7
1-332T1-6-4"-OP2L8
LANDFILL LEACHATE FROM LEACHATE PUMP FI332P5 DWG. 332FD-6
1-332P5-1-2"-LB1
BREATHING AIR FROM IWPF TANK PLATFORM FI 332T1-1 DWG. 332FD-6
1-332BA-1-1½"-LBS5
SETTLER EFFLUENT FROM 332P10-1 & 2 DWG. 332FD-11
1-332P10-1-4"-LBS2
HIGH FLOW SETTLER BYPASS FROM DWG. 332FD-12
1-332WW-3-8"-LBS2
MID-SELECT
INJECTION QUILL
CAUSTIC MIXER
SULFITE MIXER
NOTE 2
NOTE 3
2" CORROSION COUPON
S.S. TUBING
RCRA
NON RCRA
1-332N3-1-1"-LBS2
pH PROBE FLUSH TO IWPF TANK FI 332T1-2 DWG. 332FD-12
1-332T1-8-1"-LBS2
FLUSH FROM pH METER AE 018 DWG. 332FD-5
1-332T1-3-8"-LBS2
1-332T1-7-2"-LBS2
TO IWPF TANK FI 332T1-2 DWG. 332FD-5
332P1-10-1½"-LBS2
FROM WASTE INJECTION SUCTION PUMPS 332P1-1 & 2 DWG. 332FD-5
1-332P1-9-4"-F2CE1
FLUSH FROM SOLIDS DETECTORS AND WASTE INJECTION SUCTION PUMPS DWG. 332FD-5
NON-HAZ WASTE TO DWG. 332FD-015
8" GAGE HATCH
10" AUTOMATIC BLEEDER VENT
24" ROOF MANHOLE
6" EMERGENCY DRAIN
6" TEST ANODE NOZZLE (NEAR CENTER)
6" DRAIN PIPE
SACRIFICIAL ANODE
ROOF SUPPORTS 12 REQ'D.
20" PONTOON MANHOLE (15 REQ'D.)
6" ANODE NOZZLE (8 REQ'D. EQ. SPACED)
SECONDARY SEAL
LIQUID MOUNTED PRIMARY SEAL
APPROX. 20 FT.
332T1-1
MANHOLES (1 REQ'D. - 36") (3 REQ'D.- 24") (90° SPACING)
(4 NOZZLES ANGLED) (4 NOZZLES PERPENDICULAR) ALTERNATED
AT LOW POINT
NOTE 1
1-332T1-3-8"-LBS2
TO IWPF TANK FI 332T1-2 DWG. 332FD-5
1-332T1-11-10"-F2CE1
TO WASTE INJECTION SUCTION PUMPS 332P1-1&2 DWG. 332FD-5
1-332P6-1-3"-F2CE1
FROM WASTE WATER SUMP PUMP FI 332P6 DWG. 332FD-5
1-332T1-10-8"-F2CE1
SPLASH GUARD AT GRADE
332T1-1
IWPF TANK
UNCONTROLLED COPY
18 | REVISED PER EFD WALKDOWN
17 | 1235 | ADDED BYPASS LINE TO NOZZLE "A2"
16 | 1235 | ADDED NOZZLE "A2" & TIE-IN
15 | ADDED SAMPLE RETURN
7 | ADD S. C. DRAIN
4 | ADDED CORROSION COUPON TO LINE 2-332P4-1
3 | ADDED 331-P2-2-1-R28V13-6" & NOTE 5
0 | 4247 | APPROVED FOR DESIGN
PLANT ENGINEERING DEPARTMENT CHOCOLATE BAYOU PLANT ALVIN, TEXAS 77512
SOLUTIA
COMPANY CONFIDENTIAL
ENGINEERING FLOW DIAGRAM
IWPF WASTE WATER STORAGE
AREA 332 SH. 1 OF 2
46 D 332 FD 4 18
332FD-004

SECONDARY CONTAINMENT CERTIFICATION

Solutia

(From: Name, Location, Phone) Jimmy Lee Means, Engineering, 281-228-4055

Date: July 12, 2000

cc: W. A. Kibikas
E. A. Fiesinger

Subj: Certification of Volume Calculations

Ref: Attached calculations and previous calculations

To: J. T. Moos

Calculations were performed to verify that the modifications made to the existing Injection Well Pretreatment Facility by the Non-Hazardous Deepwell System Project did not exceed the excess volume of the secondary containment as required by the RCRA permit. Based upon the previous calculations performed by Mr. Gerald S. Hagy P.E., the excess volume of the secondary containment before the Non-Hazardous Deepwell System project is 36,747 gallons. Based upon the dimensional data from the project files, the new pump foundations, pumps, and miscellaneous pipe support foundations and new piping within the 4 ft elevation; the total volume of the modification is 3,135 gallons. Therefore the excess volume after the modifications made by the Non-Hazardous Deepwell System Project is 33,612 gallons.

STATE OF TEXAS
JIMMY LEE MEANS
54749
REGISTERED
PROFESSIONAL ENGINEER

Jimmy Lee Means
7/12/2000

33251-1, 2

PARSONS ENGINEERING SCIENCE, INC.

Client MONSANTO CHOCOLATE BAYOU Job No. ______ Sheet 1 of 5

Subject SECONDARY CONTAINMENT FOR SETTLERS AND 332T1'S AND EQUIPMENT By G. S. HAGY Date 6/9/95

Checked ______ Rev. ______

OBJECT OF CALCULATIONS -

DETERMINE EXCESS VOLUME WITHIN PERMITTED 332T1 DIKE AND WHETHER THIS IS ENOUGH TO PLACE NEW SETTLER TANKS (2) WITHIN THE SAME DIKE ENCLOSURE.

BACKGROUND

CALCULATIONS WERE MADE FOR THE RCRA PERMIT APPLICATION FOR 332T1-1&2 AND PUMPS (IN PFL AIW/ERT) TO DETERMINE THE SECONDARY CONTAINMENT VOLUME FOR ONE T1 TANK AND 10" OF RAINFALL. THESE CALCULATIONS BY COCHRAN DATED 2/2/93, SHOWED THERE WAS 13,933 GALS OF EXCESS VOLUME WITHIN THE 4' DIKE WITH DIMENSION OF 220' x 260'. REVIEWING THESE CALCULATIONS IT WAS NOTED THAT THE WEDGE FORMED FROM SLOPING THE DIKED AREA WHILE MAINTAINING A MINIMUM DIKE HEIGHT OF 4', WAS NOT CONSIDERED IN THE ORIGINAL CALCULATIONS, AND THUS WOULD BE AVAILABLE AS SECONDARY CONTAINMENT VOLUME ALLOWANCE.

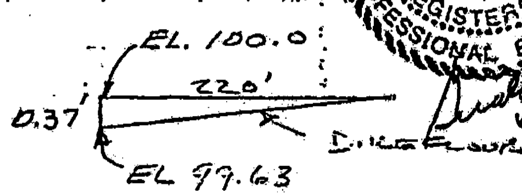
STATE OF TEXAS
GERALD S. HAGY
76657
REGISTERED
PROFESSIONAL ENGINEER

6/9/95

CALCULATIONS

1. VOLUME OF WEDGE

DIKED FLOOR AREA 220' x 260'



VOL. = 1/2 × 0.37 × 220' × 260'

= 10582 ft³

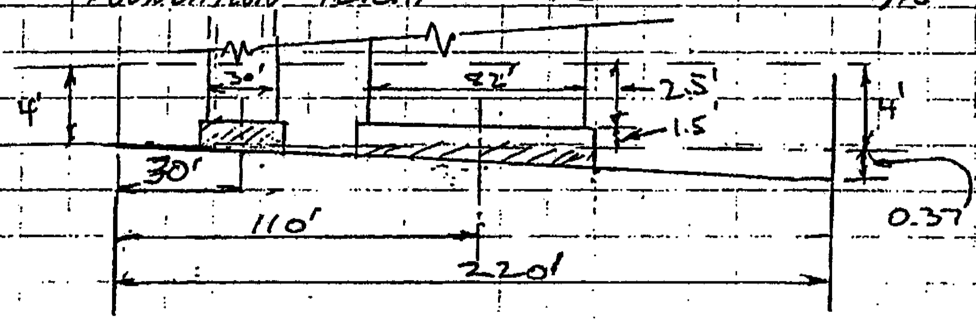
= 79,153 gal

PARSONS ENGINEERING SCIENCE, INC.

Client: MONSANTO – CHOCOLATE BAYOU | Job No. | Sheet 2 of 5
Subject: SECONDARY CONTAINMENT FOR SETTLERS AND EQUIPMENT | By: G.S. HAGG | Date: 9/6/95
Checked: | Rev.:

2. DISPLACED VOLUME OF 2 NEW SETTLER TANKS AND 3 NEW PUMPS PLUS DISPLACEMENT OF 2 EXISTING TANKS IN WEDGE.

	NEW TKS	EXISTING TKS
TANK DIAMETER	30'	82'
FOUNDATION "	31'	83'
FOUNDATION HEIGHT	1.5'	1.5'



VOLUME 2 NEW SETTLER TANKS UP TO 4' HIGH

$VOL = \frac{\pi}{4} 30'^2 \times 2.5' \times 2 = \underline{3533\ FT^3}$

VOLUME FOUNDATION SETTLER TANKS

SLOPE OF BOTTOM

$\frac{0.37}{220} = .00168$

$AVE\ HEIGHT = (45-15)0.00168 + 1.5 = 1.55'$

$VOL = 2\left[1.55 \times \frac{31^2}{4}\pi\right] = \underline{2340\ FT^3}$

6/9/95

VOLUME FOUNDATIONS EXISTING TANKS IN WEDGE

$AVG\ HEIGHT\ (151-69)0.00168 = .14'$

$VOL = 2\left[.14 \times \frac{81^2}{4}\pi\right] = \underline{1443\ FT^3}$

PARSONS ENGINEERING SCIENCE, INC.

Client MONSANTO - CHOCOLATE BAYOU Job No. ______ Sheet 3 of 5
Subject SECONDARY CONTAINMENT FOR SETTLERS AND EQUIPMENT By GS HAGY Date 9/9/95
Checked ______ Rev. ______

2 - CONT

VOLUME DISPLACED BY PUMPS
SULFITE PUMP 24 FT^3, EFFLUENT PUMPS 192 FT^3 = 216 FT^3

TOTAL DISPLACED VOLUME

2 SETTLER TANKS	3533 FT^3
2 SETTLER TANK FOUNDATIONS	2340 FT^3
2 EXISTING TANKS (VOL IN WEDGE)	1443 FT^3
PUMPS	216 FT^3
	7532 FT^3
=	56,339 gals

3. TOTAL VOLUME AVAILABLE FROM WEDGES AND ORIGINAL PERMIT EXCESS CALCULATIONS (2/4/93)

VOLUME AVAILABLE 79,153 + 13,933

= 93,086 gals

4. EXCESS VOLUME OVER WHAT'S NEEDED FOR TWO SETTLER TANKS AND 3 NEW PUMPS

EXCESS VOLUME = 93,086 gals - 56,339 gals
= 36,747 gals

CONCLUSION: PRESENT DIKE VOLUME IS ADEQUATE SECONDARY CONTAINMENT FOR ADDITION OF 2 30' DIAMETER TANKS AND 3 NEW PUMPS

STATE OF TEXAS
GERALD S. HAGY
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REGISTERED PROFESSIONAL ENGINEER

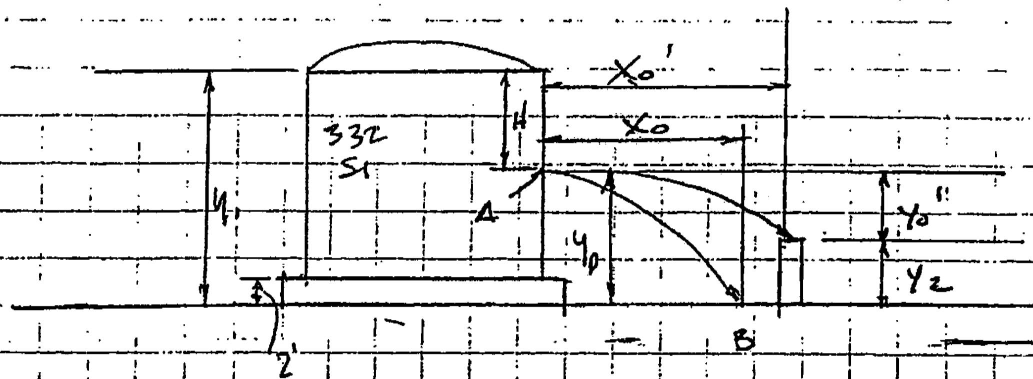
Gerald S. Hagy
6/9/95

PARSONS ENGINEERING SCIENCE, INC.

Client: MONSANTO - CHOCOLATE BAYOU
Job No.:
Sheet 4 of 5

Subject: SECONDARY CONTAINMENT FOR SETTLERS AND 332T1S AND EQUIP
By: G. S. HAGY
Date: 9/9/95

Checked:
Rev.:



ASSUME A HOLE IS PUNCHED AT LOCATION A. DETERMINE THE DISTANCE THE LEAK WILL TRAVEL (X_0 @ POINT B) ASSUMING THE TANK IS FULL AND THE HOLE IS LOCATED AT $Y_1/2$ WHICH WILL PRODUCE THE DISTANCE OUT FROM THE TANK

$$V_2 = \sqrt{2gH} = V_0 = X_0 / \sqrt{2Y_0/g}$$

$$\frac{X_0}{\sqrt{2Y_0/g}} = \sqrt{2gH}$$

$$X_0 = \sqrt{2gH(2Y_0/g)} = \sqrt{4HY_0}$$

SINCE $Y_0 = Y_1 - H$, $X_0 = \sqrt{4H(Y_1 - H)}$

$$Y_1 = 17', \quad H = 17/2 = 8.5'$$

$$X_0 = \sqrt{4(8.5)(8.5)} = 17'$$

STATE OF TEXAS
GERALD S. HAGY
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REGISTERED
PROFESSIONAL ENGINEER
6/9/95

DETERMINE CONDITION WITH RESPECT TO DIKE WALL

$X_0' = \sqrt{4HY_0}$ $\quad Y_0' = \dfrac{X_0'^2}{4H}$

IF $Y_1 - Y_2 = H + Y_0'$ THE LEAK LANDS ON TOP OF DIKE

IF $Y_1 - Y_2 > H + Y_0'$ CONTAINMENT IS INADEQUATE

IF $Y_1 - Y_2 < H + Y_0'$ CONTAINMENT IS ADEQUATE

PARSONS ENGINEERING SCIENCE, INC.

Client MONSANTO - CHOCOLATE BAYOU Job No.

Sheet 5 of 5

Subject SECONDARY CONTAINMENT FOR SETTLERS AND 332 T/S AND EQ.

By G. S. HAGY

Date 6/9/95

Checked

Rev.

$Y_0' = Y_0 - Y_2 = 8.5' - 4 = 4.5'$

$X_0 = \sqrt{4(8.5)(4.5)} = 12.4'$

$Y_1 - Y_2 = 17 - 4 = 13'$

$H + Y_0' = 8.5 + 4.5 = 13'$

LEAK WILL LAND ON TOP OF DIKE ASSUMING NO WIND AFFECTS

USE 15' FOR DISTANCE BETWEEN TANK AND DIKEWALL

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VOLUME CALCULATIONS FROM PROJECT DWGS. P#1

PUMP & PUMP FOUNDATIONS; 332P15-1&2

$V_P = [(11.5\ FT) \times (4.25\ FT) \times (4.0\ FT)] \times 2$

$V_P = 391\ FT^3$

$V_P = 2{,}925$ GALLONS

MISCELLANEOUS PIPE SUPPORTS; 5 TOTAL

$V_{PS} = [(1.5\ FT) \times (1.5\ FT) \times (1.$ [illegible] $)] \times 5$

$V_{PS} = 14\ FT^3$

$V_{PS} = 105$ GALLONS

STATE OF TEXAS
JIMMY LEE MEANS
54749
REGISTERED
PROFESSIONAL ENGINEER

Jimmy Lee Means
7/12/2000

PIPING; BELOW ELEVATION 104'-0"

$V_1 = 6$ FT OF 4 IN $= 6\ FT \times 0.0884\ FT^2 = 0.5\ FT^3$
$V_2 = 9$ FT OF 6 IN $= 9\ FT \times 0.2006\ FT^2 = 1.8\ FT^3$
$V_3 = 9$ FT OF 6 IN $= 9\ FT \times 0.2006\ FT^2 = 1.8\ FT^3$
$V_4 = 10$ FT OF 6 IN $= 10\ FT \times 0.2006\ FT^2 = 2.0\ FT^3$
$V_5 = 10$ FT OF 6 IN $= 10\ FT \times 0.2006\ FT^2 = 2.0\ FT^3$
$V_6 = 21$ FT OF 6 IN $= 21\ FT \times 0.2006\ FT^2 = 4.2\ FT^3$
$V_7 = 8$ FT OF 6 IN $= 8\ FT \times 0.2006\ FT^3 = 1.6\ FT^3$
$V_8 = 5$ FT OF 2 IN $= 5\ FT \times 0.0233\ FT^3 = \underline{0.1\ FT^3}$

$V_{PP} = 14\ FT^3$

$V_{PP} = 105$ GALLONS

VOLUME CALCULATIONS FROM PROJECT DWGS P#2

TOTAL VOLUME $= V_P + V_{PS} + V_{PP}$
$= (2925 \text{ GAL}) + (105 \text{ GAL}) + (105 \text{ GAL})$
$= 3{,}135$ GALLONS

EXCESS VOLUME BEFORE MODIFICATIONS	36,747 GAL
VOLUME OF MODIFICATIONS	(−) 3,135 GAL
EXCESS VOLUME AFTER MODIFICATIONS	33,612 GAL

STATE OF TEXAS
JIMMY LEE MEANS
54749
REGISTERED
PROFESSIONAL ENGINEER

Jimmy Lee Means
7/12/2000

Southern Services, Inc.

Dba. Southern Technical Services
P.O. Box 423 Lake Jackson, Texas 77566
(979) 265-3342 Fax (979) 265-1112

API 653 IN SERVICE TANK INSPECTION

EXTERNAL VISUAL AND ULTRASONIC REPORT

FOR

SOLUTIA, INC.

TANK # 332T1-1

CHOCOLATE BAYOU FACILITY

ALVIN, TX

Feb. 23, 2009

INTRODUCTION

Solutia, Inc. contracted Southern Services to provide inspection services for Tank # ***332T1-1***

This report documents the findings and provides a detailed evaluation of the external visual and ultrasonic inspection results per the applicable criteria of API 653 Standards.

Southern Services Inspection Personnel:

Jason McHam
API 653 AST Inspector Certification 29213
RT II, MTII, PTII, UTII

Neil Wilson
RT II, MTII, PTII, UTII

Jacob Blaylock
UTII

API 653

IN SERVICE

CERTIFICATE OF COMPLIANCE

ON

TANK # 332T1-1

FOR

SOLUTIA, INC

2/23/2009

THIS IS TO CERTIFY THAT THIS TANK HAS BEEN INSPECTED BY SOUTHERN SERVICES IN ACCORDANCE WITH THE APPLICABLE SECTION OF API 653.
ANY DISCREPANCIES FOUND DURING THIS INSPECTION HAVE BEEN ADDRESSED, AND REPAIRS OR MODIFICATIONS HAVE BEEN MADE TO MEET THE API 653 STANDARDS.

AS OF THE DATE INSPECTED, THIS TANK WILL REMAIN WITHIN THE API653 STANDARDS FOR THE NEXT 5 YEARS.

JASON MCHAM API # 29213
NEIL WILSON LEVEL II

Compliance

Tank # 332T1-1 needs the following discrepancies addressed to meet the API 653 requirements:

1) none.

there are weld spacing issues with nozzles on the first shell course that are not acceptable with current API code.

TABLE OF CONTENTS

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE
Owner: Solutia, Inc		Date: Feb. 23, 2009	
Location: ECU		Page: 1	
Tank: 332T1-1		WO#: 12319407	

1. TANK DESCRIPTION

GENERAL:		
	TANK NUMBER:	332T1-1
	TANK OWNER:	Solutia, Inc.
	DESIGN STD:	API 650
	TANK LOCATION:	ECU
	MANUFACTURER:	Wyatt Field Service Co.
	PRODUCT:	Waste Water
	SPECIFIC GRAVITY:	1.0
	DATA PLATE PRESENT:	Yes
DIMENSIONS:		
	DIAMETER:	82'
	HEIGHT:	34'
	FILL HEIGHT:	34'
	NOMINAL CAPACITY:	27,919 bbls
GEOMETRY:		
	FOUNDATION:	Concrete ring wall
	SHELL:	Butt-welded
	ROOF:	Double deck floating roof
DATES:		
	YEAR BUILT:	1994
	LAST COATED:	N/A
	LAST INSPECTED:	Apr-05
COATINGS:		
	SHELL:	White Paint
	ROOF:	White Paint

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

Owner:	Solutia, Inc	Date:	Feb. 23, 2009
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Tank:	332T1-1	WO#:	12319407

2. FOUNDATION INSPECTION

Foundation and the floor plate extension are both sealed. Seal is in good condition. Tank is in service so there was no settlement survey taken at this time.

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE
Owner: Solutia, Inc		Date: Feb. 23, 2009	
Location: ECU		Page: 3	
Tank: 332T1-1		WO#: 12319407	

3. SHELL INSPECTION

Shell calculations indicate that a safe fill height of 34 ft. can be utilized with product specific gravities up to 1 (ref API 653, para. 4.3.3.1). These calculations do not take into consideration any restrictions created by internal or external floating roofs, overflow vents, etc. 8 UT B-Scan drops were taken (as requested by customer) and all shell course thickness readings were found to be well above the minimum required thickness as per API 653 para. 4.3.3.1. No significant wall loss was found. A paint factor of .015" was removed for a more accurate representation of the thickness (the paint factor was achieved by comparing echo-to-echo mode and standard mode with both the B-Scan equipment and the 36DL+). Visual inspection found the paint to be in good but chalky condition.

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

Owner:	Solutia, Inc	Date:	Feb. 23, 2009
Location:	ECU	Page:	4
Tank:	332T1-1	WO#:	12319407

3.1 SHELL THICKNESS CALCULATIONS

The minimum acceptable shell plate thickness for tanks with a diameter equal to or less than 200 ft. is calculated as follows (API 653, Para. 4.3.3.1):

$$t\ \text{min} = \frac{2.6(H-1)DG}{SE}$$

Where:

S =	See Table	Allowable Stress (psi)
D =	82	Nominal Diameter of Tank (ft.)
G =	1	Highest Specific Gravity of Contents
H =	34	Product Height (ft.)
E =	1	Joint Efficiency

Using the smaller of 0.80Y or 0.429T for the bottom and second shell course
and the smaller of 0.88Y or 0.472T for all other courses

T-Min cannot be less than .100" for any shell course as per API 653 4.3.3.1.

Course	Course Height (ft.)	Product Height (ft.)	Joint Efficiency	Allowable Stress (psi)	Lowest Thickness Found (in.)	Required Thickness (in.)	Nominal Thickness (in.)
1	8.5	34	1	23,600	0.632	0.298	0.625
2	8.5	25.5	1	23,600	0.521	0.221	0.500
3	8.5	17	1	26,000	0.383	0.131	0.375
4	8.5	8.5	1	26,000	0.366	0.062	0.375

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

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3.2 SHELL UT READINGS

SHELL ULTRASONIC THICKNESS READINGS

(IN INCHES)

A = NORTH C=EAST E=SOUTH G=WEST

A (0°) Scan

READING NO:	1	2	3	4	Average
COURSE 1	0.637	0.643	0.661	0.656	0.649
COURSE 2	0.524	0.530	0.544	0.536	0.534
COURSE 3	0.385	0.402	0.408	0.396	0.398
COURSE 4	0.366	0.379	0.389	0.391	0.381

B (45°) Scan

READING NO:	1	2	3	4	Average
COURSE 1	0.632	0.661	0.658	0.645	0.649
COURSE 2	0.523	0.536	0.540	0.551	0.538
COURSE 3	0.383	0.402	0.395	0.386	0.392
COURSE 4	0.379	0.383	0.391	0.397	0.388

C (90°) Scan

READING NO:	1	2	3	4	Average
COURSE 1	0.634	0.642	0.654	0.659	0.647
COURSE 2	0.527	0.536	0.547	0.552	0.541
COURSE 3	0.400	0.429	0.417	0.403	0.412
COURSE 4	0.376	0.394	0.405	0.400	0.394

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

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Location:	ECU	Page:	6
Tank:	332T1-1	WO#:	12319407

3.2 SHELL UT READINGS

SHELL ULTRASONIC THICKNESS READINGS

A = NORTH C=EAST E=SOUTH G=WEST

D (135°) Scan

READING NO:	1	2	3	4	AVERAGE
COURSE 1	0.654	0.682	0.675	0.663	0.669
COURSE 2	0.525	0.542	0.553	0.552	0.543
COURSE 3	0.387	0.403	0.415	0.396	0.400
COURSE 4	0.403	0.424	0.430	0.415	0.418

E (180°) Scan

READING NO:	1	2	3	4	AVERAGE
COURSE 1	0.644	0.683	0.679	0.657	0.666
COURSE 2	0.521	0.539	0.540	0.546	0.537
COURSE 3	0.393	0.421	0.412	0.402	0.407
COURSE 4	0.399	0.414	0.425	0.431	0.417

F (225°) Scan

READING NO:	1	2	3	4	AVERAGE
COURSE 1	0.662	0.683	0.691	0.689	0.681
COURSE 2	0.533	0.561	0.556	0.549	0.550
COURSE 3	0.395	0.410	0.408	0.396	0.402
COURSE 4	0.402	0.426	0.433	0.415	0.419

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

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Tank:	332T1-1	WO#:	12319407

3.2 SHELL UT READINGS

SHELL ULTRASONIC THICKNESS READINGS

A = NORTH C=EAST E=SOUTH G=WEST

G (270°) Scan

READING NO:	1	2	3	4	AVERAGE
COURSE 1	0.670	0.696	0.702	0.689	0.689
COURSE 2	0.540	0.553	0.562	0.565	0.555
COURSE 3	0.400	0.423	0.416	0.409	0.412
COURSE 4	0.406	0.432	0.430	0.424	0.423

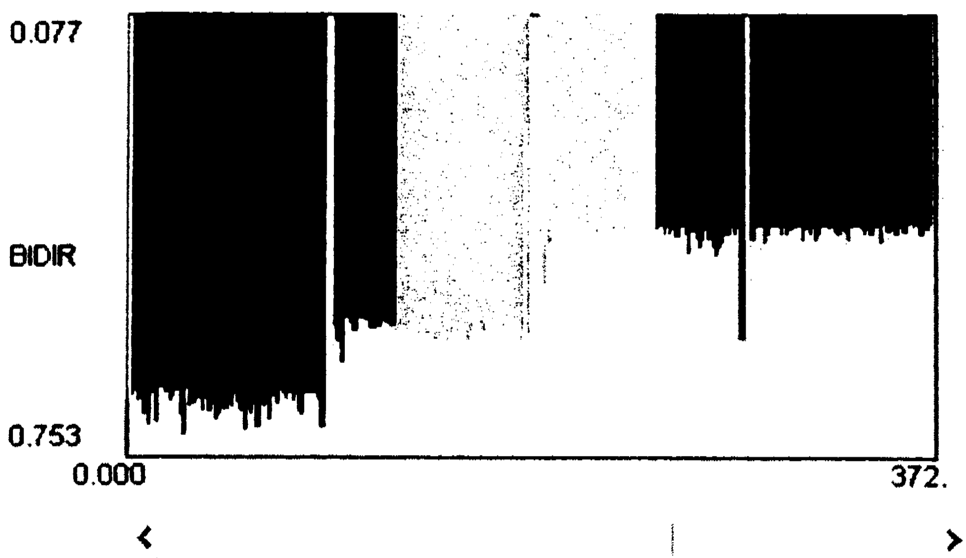
H (315°) Scan

READING NO:	1	2	3	4	AVERAGE
COURSE 1	0.670	0.692	0.688	0.683	0.683
COURSE 2	0.546	0.583	0.571	0.556	0.564
COURSE 3	0.410	0.414	0.429	0.435	0.422
COURSE 4	0.396	0.432	0.421	0.414	0.416

3.3 332T1-1 B-Scan Drop 1 (compressed form) pg. 8

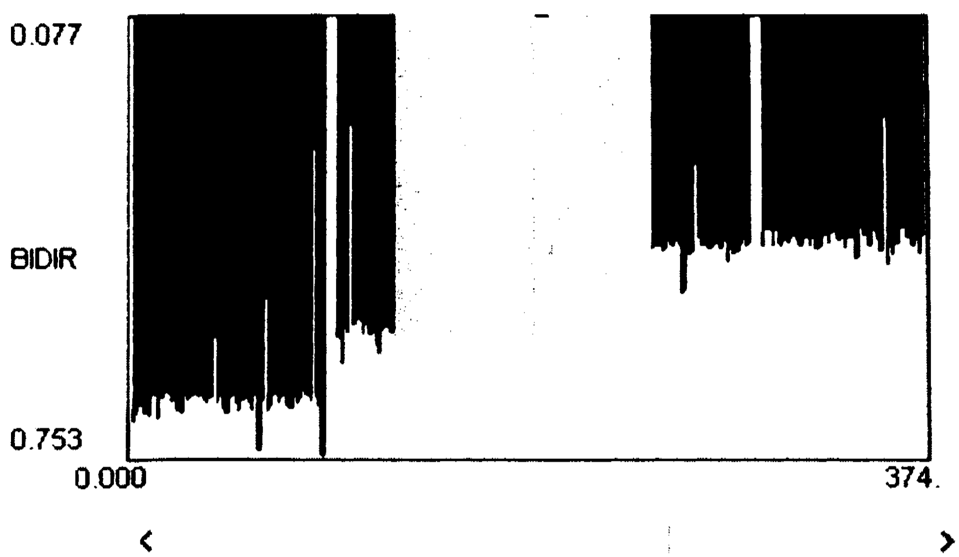
Low for entire course 1:	**0.637**	**Low for entire course 2:**	**0.523**
Average for entire course 1:	**0.660**	**Average for entire course 2:**	**0.543**
Low for entire course 3:	**0.385**	**Low for entire course 4:**	**0.365**
Average for entire course 3:	**0.407**	**Average for entire course 4:**	**0.388**

3.3 332T1-1 B-Scan Drop 2 (compressed form) pg. 9



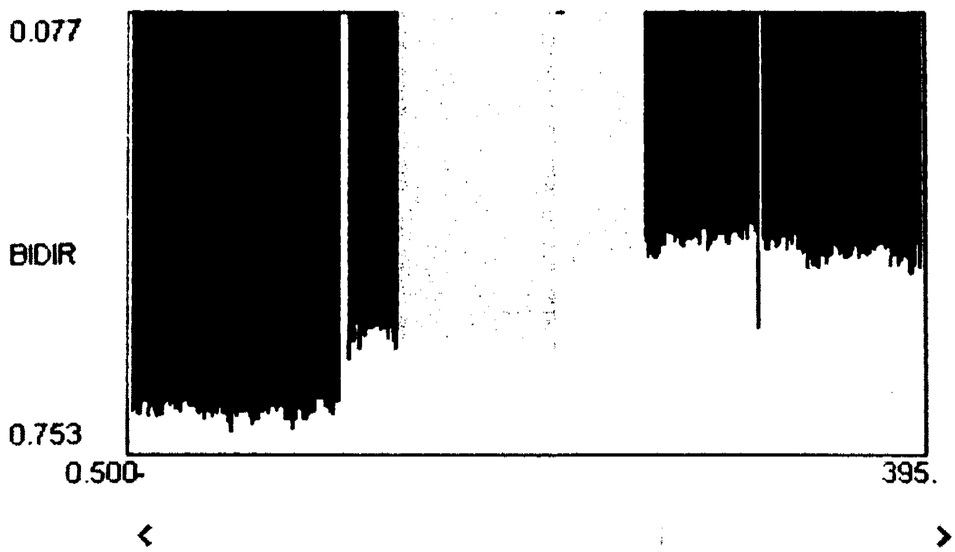
Low for entire course 1:	**0.632**	**Low for entire course 2:**	**0.523**
Average for entire course 1:	**0.658**	**Average for entire course 2:**	**0.540**
Low for entire course 3:	**0.383**	**Low for entire course 4:**	**0.379**
Average for entire course 3:	**0.395**	**Average for entire course 4:**	**0.391**

3.3 332T1-1 B-Scan Drop 3 (compressed form) pg. 10



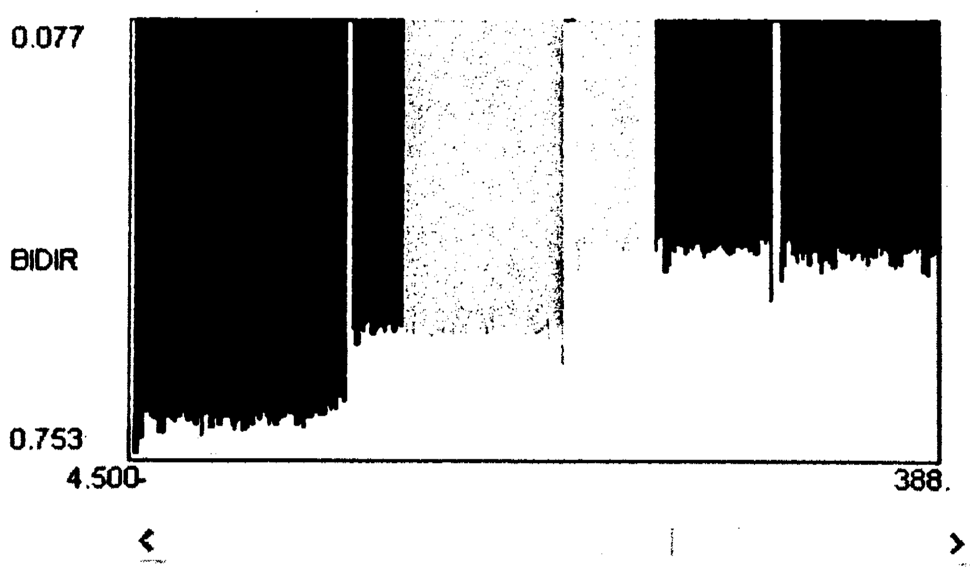
Low for entire course 1:	**0.634**	**Low for entire course 2:**	**0.527**
Average for entire course 1:	**0.654**	**Average for entire course 2:**	**0.547**
Low for entire course 3:	**0.400**	**Low for entire course 4:**	**0.376**
Average for entire course 3:	**0.417**	**Average for entire course 4:**	**0.405**

3.3 332T1-1 B-Scan Drop 4 (compressed form) pg. 11



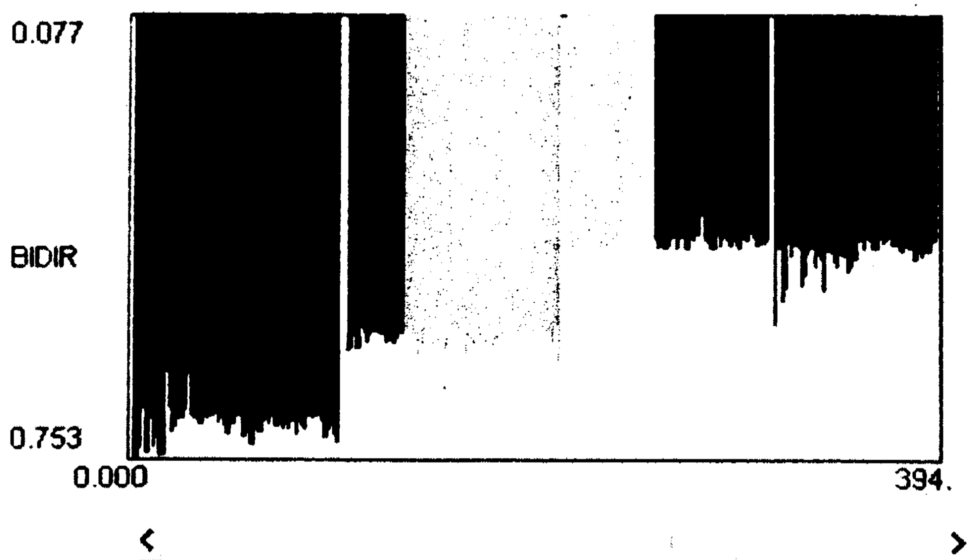
Low for entire course 1:	**0.654**	**Low for entire course 2:**	**0.525**
Average for entire course 1:	**0.675**	**Average for entire course 2:**	**0.553**
Low for entire course 3:	**0.387**	**Low for entire course 4:**	**0.403**
Average for entire course 3:	**0.415**	**Average for entire course 4:**	**0.430**

3.3 332T1-1 B-Scan Drop 5 (compressed form) pg. 12



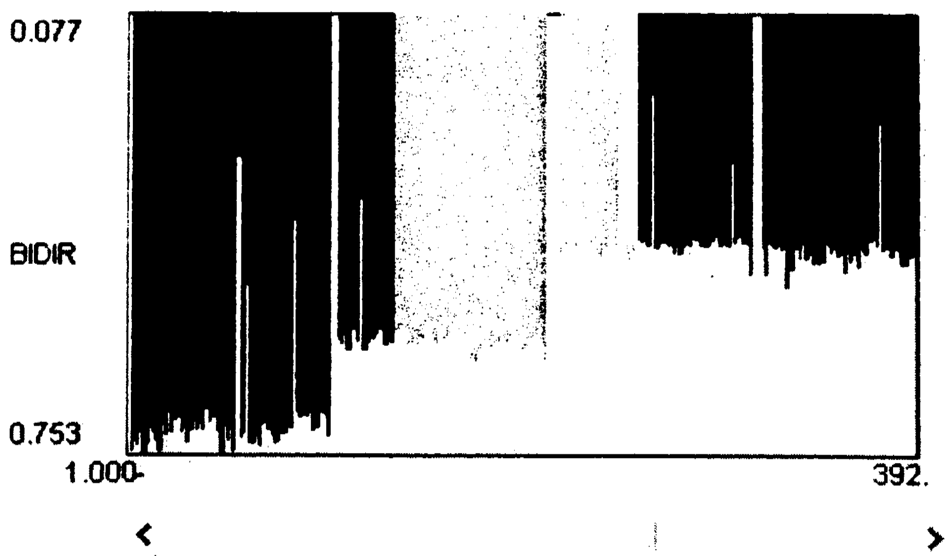
Low for entire course 1:	**0.644**	**Low for entire course 2:**	**0.521**
Average for entire course 1:	**0.679**	**Average for entire course 2:**	**0.540**
Low for entire course 3:	**0.393**	**Low for entire course 4:**	**0.399**
Average for entire course 3:	**0.412**	**Average for entire course 4:**	**0.425**

3.3 332T1-1 B-Scan Drop 6 (compressed form) pg. 13



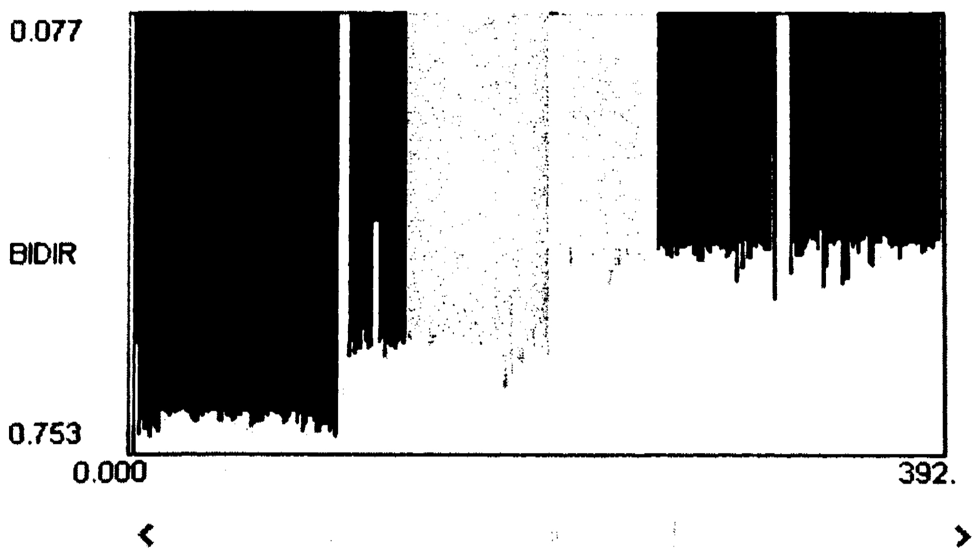
Low for entire course 1:	**0.662**	**Low for entire course 2:**	**0.533**
Average for entire course 1:	**0.691**	**Average for entire course 2:**	**0.556**
Low for entire course 3:	**0.395**	**Low for entire course 4:**	**0.402**
Average for entire course 3:	**0.408**	**Average for entire course 4:**	**0.433**

3.3 332T1-1 B-Scan Drop 7 (compressed form) pg. 14



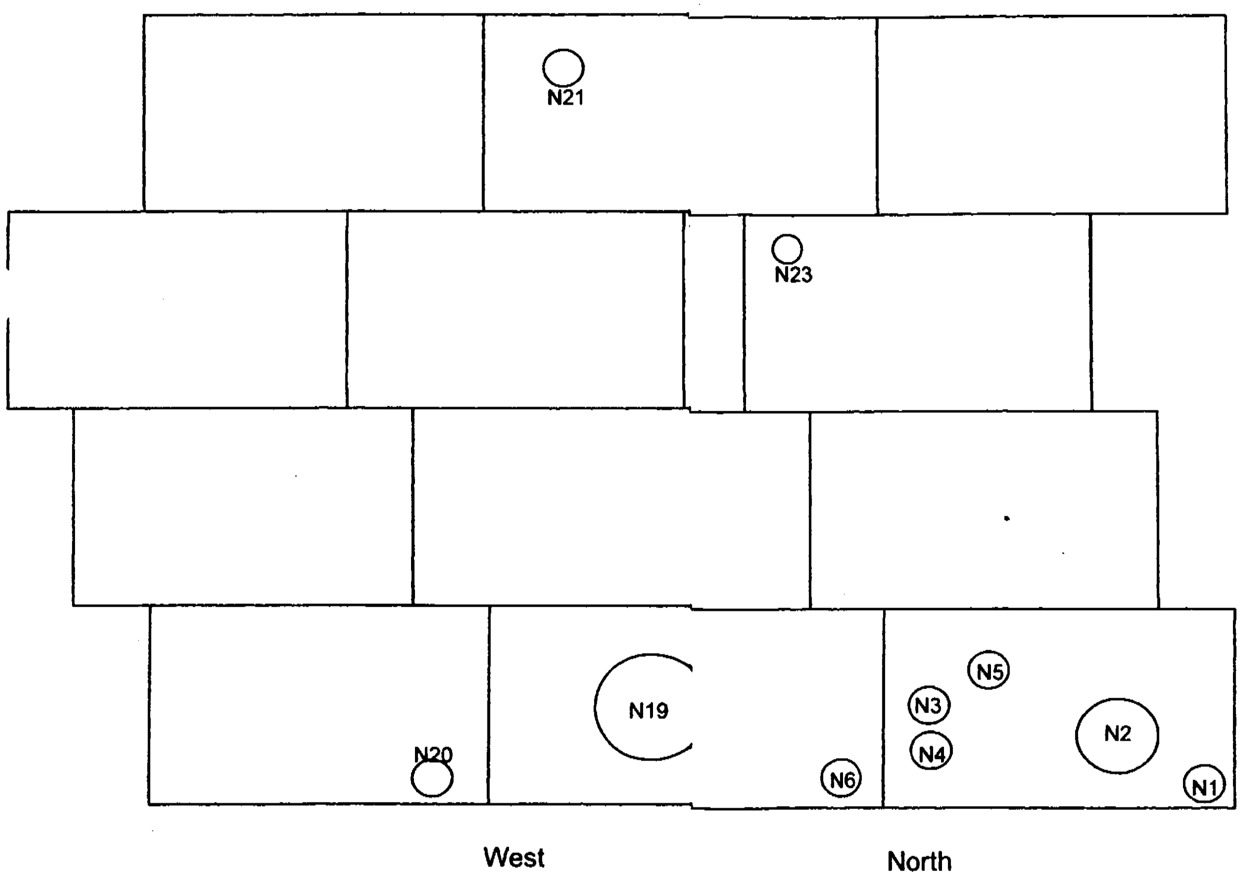
Low for entire course 1:	**0.670**	**Low for entire course 2:**	**0.540**
Average for entire course 1:	**0.702**	**Average for entire course 2:**	**0.562**
Low for entire course 3:	**0.400**	**Low for entire course 4:**	**0.406**
Average for entire course 3:	**0.416**	**Average for entire course 4:**	**0.430**

3.3 332T1-1 B-Scan Drop 8 (compressed form) pg. 15



Low for entire course 1:	**0.670**	**Low for entire course 3:**	**0.546**
Average for entire course 1:	**0.688**	**Average for entire course 3:**	**0.571**
Low for entire course 2:	**0.410**	**Low for entire course 4:**	**0.396**
Average for entire course 2:	**0.429**	**Average for entire course 4:**	**0.421**

4. SHELL LAYOUT



pg 16
Solutia, Inc.
Tank #332T1-1
2/23/09

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE
Owner: Solutia, Inc		Date: Feb. 23, 2009	
Location: ECU		Page: 17	
Tank: 332T1-1		WO#: 12319407	

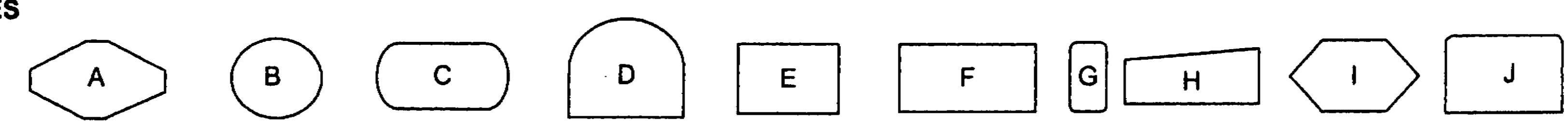
5. NOZZLE AND APPURTENANCES INSPECTION

All nozzles appear to be in good condition. All thickness measurements are above t-min and are near nominal. 4 UT readings were taken on each nozzle with no apparent signs of internal corrosion or pitting. There are areas of light surface corrosion on the carbon steel nuts and bolts. The ladders and platforms were also inspected and found to be in good working condition. All flanges, valves and associated piping appear to be in good condition. Nozzles N1, N6, N8, N13, N15, N17, N18, N19, and N20. All have weld spacing issues that do not meet compliance with current API code requirements.

5.1 NOZZLE AND APPURTENANCE TABLE

Item	Description	Size (in)	Reinforcing Plate				Nominal Neck Thickness (in.)	Lowest Thickness (in.)	Telltale Y/N	Comments
			Height (in.)	Width (in.)	Thick (in.)	Shape				
N1	Clean out	6"		18"	0.635	B	0.432	0.432		
N2	Manway	24"		54"	0.636	B	0.375	0.383		
N3	Outlet	10"	52"	23"	0.626	B	0.500	0.480		
N4	Outlet	10"	52"	23"	0.624	G	0.500	0.471		
N5		10"		23"	0.623	G		0.593		
N6	Clean out	6"		15"	0.639	B	0.432	0.430		
N7	Flush water	4"		12"	0.638	B	0.437	0.421		
N8	Clean out	6"		18"	0.632	B	0.432	0.417		
N9	PH sample drain	3"		11"	0.657	B	0.437	0.427		
N10	Manway	24"		54"	0.636	B	0.375	0.381		
N11	Temperature	2"					0.343	0.342		
N12	Level	3"		11"	0.630	B	0.437	0.433		
N13	Clean out	6"		15"	0.630	B	0.432	0.432		
N14	Inlet	8"		18"	0.629	B	0.500	0.500		
N15	Clean out	6"		18"	0.639	B	0.432	0.409		
N16	Manway	24"		54"	0.637	B	0.375	0.379		
N17	Clean out	6"		15"	0.634	B	0.432	0.429		
N18	Clean out	6"		18"	0.632	B	0.432	0.432		
N19	Manway	36"		78"	0.636	B	0.375	0.375		
N20	Clean out	6"		15"	0.639	B	0.432	0.430		
N21	Overflow	8"					0.500			N/A Out Of Reach
N22	High Level Alarm	3"					0.437			N/A Out Of Reach
N23	Spare @ 70% Level	3"					0.437			N/A Out Of Reach

SHAPES



1) Inadequate Weld Spacing 2) Inadequate Repad Thickness 3) Inadequate Repad Dimensions 4) Inadequate Centerline Elevation
5) Less Than 90° Intersection w/ Shell to Bottom Weld 6) No Reinforcing Plate 7) Square Cornered Repad
8) Inadequate Neck Thickness 9) Plugged Telltale Holes 10) No Telltale Holes

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE
Owner: Solutia, Inc		Date: Feb. 23, 2009	
Location: ECU		Page: 19	
Tank: 332T1-1		WO#: 12319407	

5.2 SHELL NOZZLE NECK THICKNESS READINGS

READING LOCATION

NOZZLE	A	B	C	D	E	F	G	H	SIZE (in.)
N1		0.442		0.436		0.444		0.432	6"
N2		0.383		0.383		0.383		0.383	24"
N3		0.480		0.517		0.520		0.517	10"
N4		0.522		0.517		0.471		0.502	10"
N5		0.593		0.596		0.602		0.604	10"
N6		0.430		0.463		0.430		0.434	6"
N7		0.422		0.421		0.433		0.443	4"
N8		0.417		0.435		0.421		0.432	6"
N9		0.438		0.434		0.442		0.427	3"
N10		0.381		0.381		0.381		0.385	24"
N11	0.368				0.342				2"
N12		0.433		0.435		0.441		0.449	3"
N13		0.433		0.432		0.441		0.449	6"
N14		0.501		0.507		0.500		0.505	8"
N15		0.443		0.409		0.434		0.426	6"
N16		0.380		0.379		0.381		0.381	24"
N17		0.435		0.429		0.435		0.455	6"
N18		0.432		0.445		0.454		0.446	6"
N19		0.375		0.375		0.375		0.375	24"
N20		0.458		0.445		0.430		0.441	6"
N21	N/A Out of reach								8"
N22									3"
N23									3"

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

Owner:	Solutia, Inc	Date:	Feb. 23, 2009
Location:	ECU	Page:	20
Tank:	332T1-1	WO#:	12319407

6. ROOF INSPECTION

Roof was inspected from platforms only. There is some light active corrosion on nuts and bolts. At the west platform underneath the deck there is an area that has moderate corrosion in-between the shell and the coating. This area should be cleaned and evaluated and then re-coated to stop further corrosion. Nozzle on east stair deck has flange, nuts and bolts all have light active corrosion. Pictures of the roof and corrosion can be found at G:drive MTS Photos - ECU -332T1-1_2-25-09.

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

Owner:	Solutia, Inc	Date:	Feb. 23, 2009
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Tank:	332T1-1	WO#:	12319407

7. FLOOR PLATE EXTENSION INSPECTION

2 UT readings were taken on each plate extension, 1 on each side of each weld. The readings started at the North position and went clockwise.

Plate #	READING 1	READING 2
N/A Due to Seal		

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE
Owner:	Solutia, Inc	Date:	Feb. 23, 2009
Location:	ECU	Page:	22
Tank:	332T1-1	WO#:	12319407

9. EQUIPMENT

ULTRASONIC

MODEL		SERIAL NO.	
36DL+		2201510	
Epoch IV		61502312	
TRANSDUCER	SERIAL NO.	FREQUENCY	SIZE
D790SM	204068	5MHZ	.312"
DHC711	570184	5MHZ	.250"
CALIBRATION BLOCK		SERIAL NO.	
C.S.		8883	

TANKPAC - TANK FLOOR MONITORING REPORT

TANK No: 332 TI-1
SOLUTIA, Chocolate Bayou, TX

Report No: H7174-88353-1

Date:	**10/06/2006**
Company:	**Solutia**
Location:	**Chocolate Bayou, TX**

By: **Mauricio Calva**

PAC Level III
(AE-TANKPAC per ASNT-TC-1A)

Approved by: **Miguel Marcial**

PAC Level III (AE)

CONAM Inspection & Engineering Services, Inc.

CONAM Inspection and Engineering Services Inc.
3214 Pasadena Freeway
Pasadena, TX 77503
Phone: (713) 473-6111

CONTENTS

1. INTRODUCTION AND BACKGROUND

This report describes work carried out on site and concerns the monitoring of storage tank(s) to evaluate the condition of the tank floor(s) as described by in PAL TANKPAC tank floor test method statement (Doc. 518). A Physical Acoustics TB-2000 testing system was used. Independent published verification of the TANKPAC test procedure by the oil industry, based on 600 tests carried out prior to June 1996, may be found at:
www.ndt.net/article/ecndt98/chemical/095/095.htm
The purpose of the test is to establish tank floor condition in order to help make decisions on tank maintenance timing and priority, the method forms part of a RBI program.

2. TEST PROCEDURES

Following tank isolation and settling, sensors are mounted around the tank circumference, tested in situ, and the tank monitored for a test period of one hour or more following Physical Acoustics TANKPAC test Procedures for Tank Floor testing, current issue (Doc.501).
Following data collection and removal of extraneous noise sources, four types of analysis are carried out:

All activity from the tank recorded above the system threshold, is **graded A-E** (least to most) according to PAL experience and corrected for tank type, size, test threshold and product.

All activity **located** on the tank floor, including corrosion, leakage, over-stress, etc. is shown on the "All Data" tank plot, based on a first-hit location analysis of signal hitting three sensors.

An analysis of data (found by experience) to be more characteristic of severe localized corrosion, "Potential Leakage" sites, is shown on the "Potential Leak" or PLD location plots.

Further evaluation of any highly active sources, for example to improve location accuracy, or to evaluate source activity and characteristics.

All tests are carried out to standard Physical Acoustics Ltd. procedures, the field worksheets (Doc.502) are kept as a quality control record together with the digital test data, with an overall quality plan (Doc.503) for the individual tank, according to PAL ISO 9001:2000 procedures. Engineers are trained and certified specifically in TANKPAC procedures, (training, experience, written, and practical examinations). Engineers are also certified level II-AE per ASNT-TC-1A.

Data and test results for the tank are detailed in the figures and appendix with the location plots.

3. LIMITATIONS

The method is experience-based and is able to determine overall floor condition, i.e. good, intermediate or poor, from the active corrosion, in order to determine if further (internal) inspection and repairs are required; it is therefore a very cost-effective maintenance-planning tool. It does not give information on remaining thickness, although it is able to separate badly corroded tanks from non-corroded tanks. Sources of emissions that are located may represent between 3% and 30% of the data (OAL/PLL %), so this location information must be used with care. Accuracy of source location degrades on large tanks in poor condition due to event "overlap".

The method is not suitable for assessing the internal condition of tanks where corrosion scale is periodically removed, mechanically or chemically, as this "resets" the condition, or whose contents change short-term, hence changing internal corrosion conditions. Corrosion that does not result in any scale formation, for example certain types of MIC may not be detected.

Tank floors that are leaking at the time of test:

Small leaks can be located; these do not have a significant effect on the test result and overall grading of the tank. It must be noted, however, that an actively corroding floor will mask the emissions from small leaks.

Large leaks can also be located but are likely to mask other activity from the floor.

4. RESULTS

4.1 Details of the standard test and analysis graphics are shown in the figures; a summary of the test results is given below:

4.2 Test Observations:
High noise on pipes due to working pumps, on tank is much lower.

4.3 Noise sources identified and removed from the data prior to analysis:
Condensation and pump noise removed.

4.4 AE source detail:
Large cluster of activity on north side of the tank.

4.5 Evaluation of overall data and located sources: **TANK I.D.:** 332 TI-1

Overall TANKPAC grade: B **ASL:** 31

TANKPAC "potential leak" sources:

1 ("A") grade sources: 9

2 ("B") grade sources: 1

3 ("C") grade sources: None

4 ("D") grade sources: None

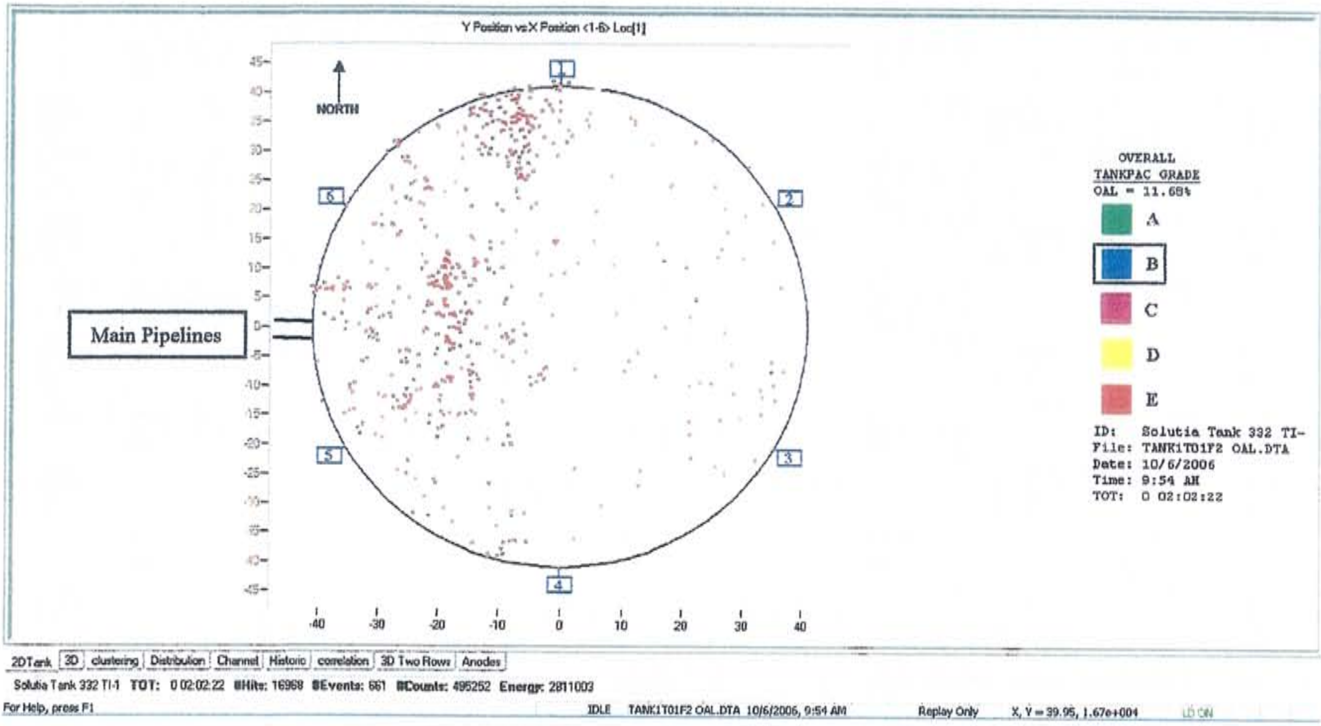
5 ("E") grade sources: None

Notes: Highly active and concentrated sources in the "all" or "potential leak" data may indicate a possible leak; however this can only be positively confirmed with a co-incident increase in ASL, or exceptionally high source event rate. Where this is confirmed it will be clearly stated "probable leak".

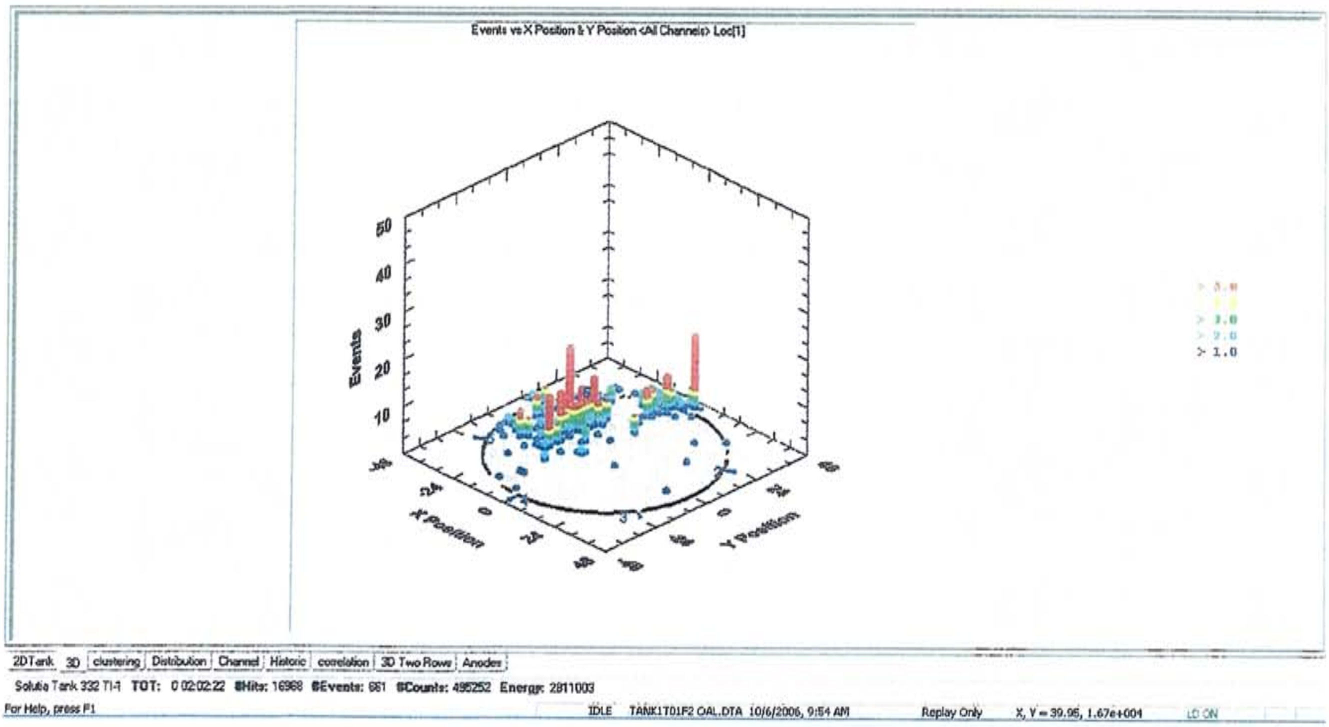
4.6 Composite **Grade I**
Maintenance action taken with a tank is a matter for the owner, taking into account all possible factors. The "composite grade" gives a guide for prioritization and re-test. Typical practice by TANKPAC users is to re-test or schedule for outage as below:

Composite Grade	Typical Re-test Period
I	**4-5 Years**
II	2 Years
III	1 Year*
IV	0.5 Year*

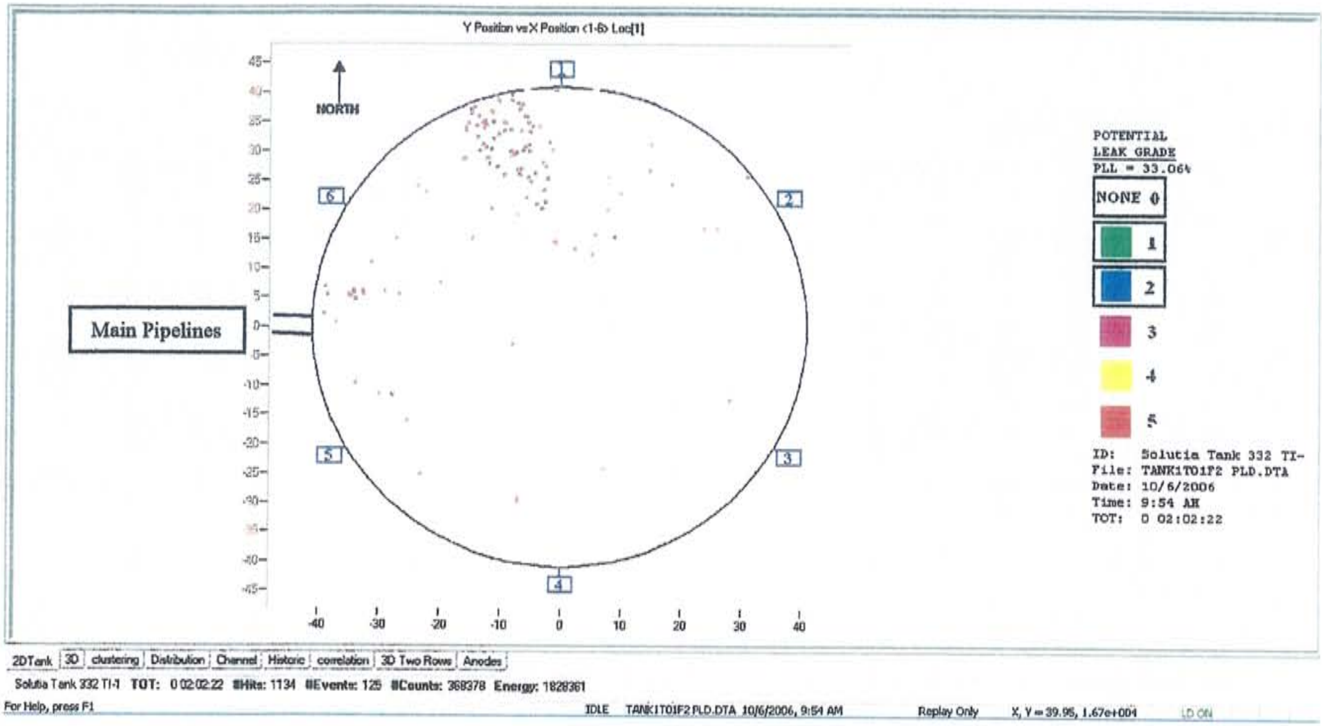
* Schedule for Inspection.



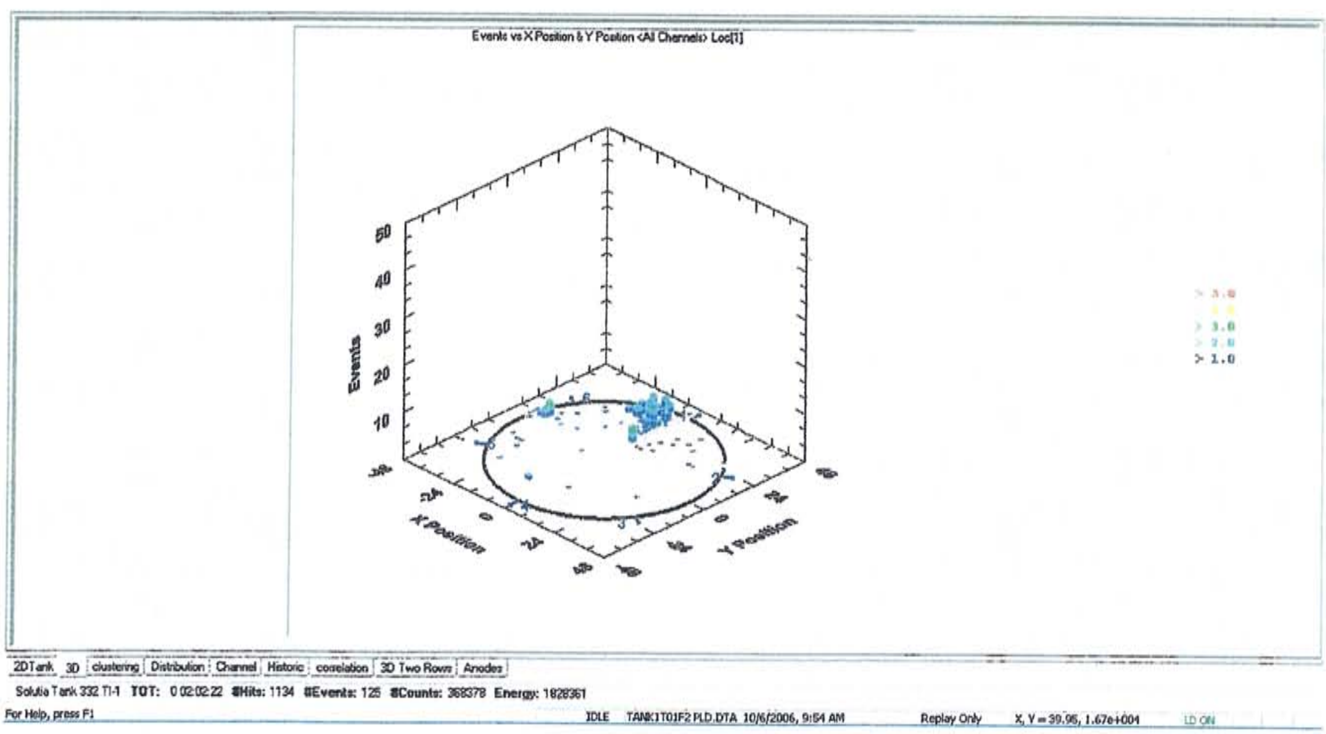
"ALL DATA" FLOOR LOCATION PLOT-PLAN VIEW



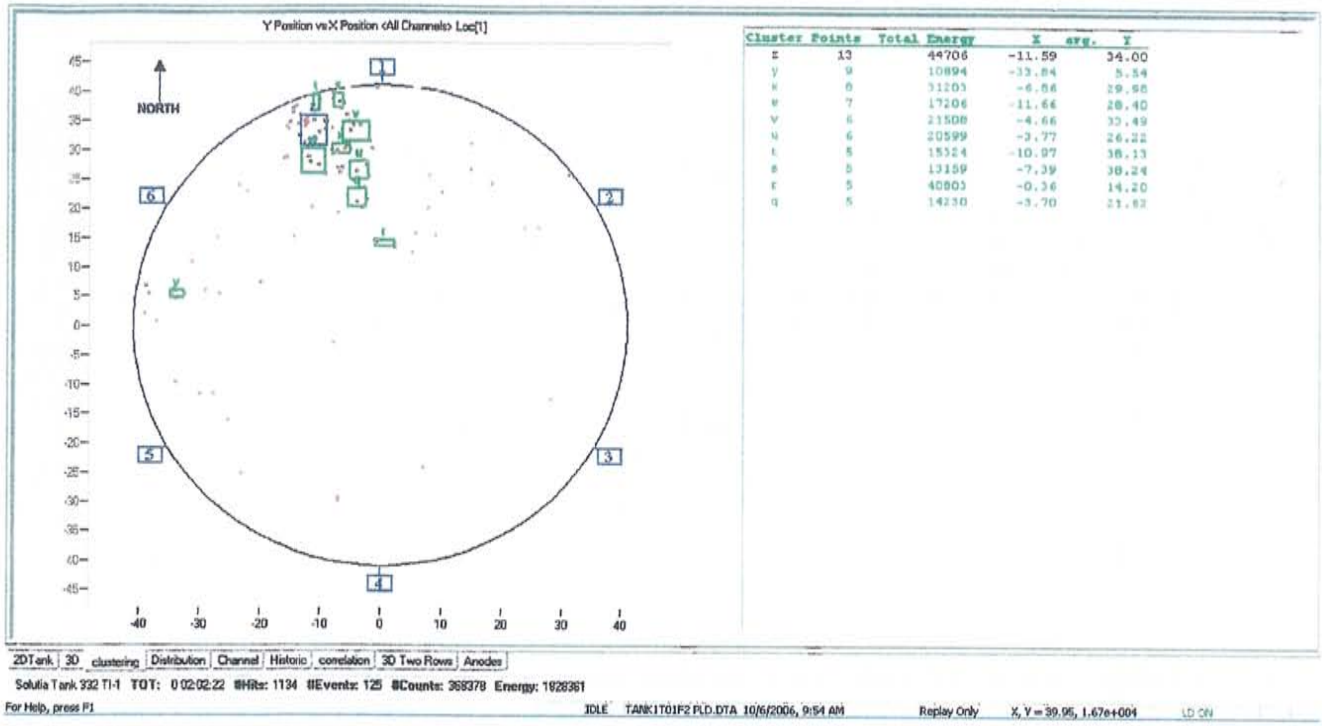
"ALL DATA" FLOOR LOCATION PLOT-3D VIEW.



"POTENTIAL LEAK" DATA---FLOOR LOCATION PLAN VIEW



"POTENTIAL LEAK" DATA---LOCATION-3D VIEW.



CLUSTER ANALYSIS SHOWING "POTENTIAL LEAK" SITES

TANKPAC TEST DATA
October 6, 2006

Customer:	Solutia	**Location:**	Chocolate Bayou, TX
Contact:	Jill Ingle	**Size, ft:**	82 ft
Vessel ID:	332 TI-1	**Operating Temp, F:**	140°F or less
Normal Contents:	Waste water	**Roof Type:**	Floating
Insulation:	None	**Base:**	Ringwall
Columns:	None	**Lining:**	Celicote 222 HT
Mixers:	None	**Heaters:**	None
Year built:	1994	**Anodes/CP:**	Internal/External Sacrificial anodes

Notes+Background: There is 3.5 feet of organic & inorganic sludge at bottom. There may be a thin layer of light organics floating.

AE test date:	10/06/2006	**AE system+calib:**	DiSP 56 (Houston)
Engineers/cert:	M. Calva, J. Sanchez	**AE test temp, F:**	110°F
AE test level, m:	50 %	**Sludge level, m:**	3.5 ft
Weather:	F1/Sunny	**Settling time, hrs:**	>12 hrs.
Sensors/No/Height:	LDS1/13/4.5 ft 8 in.	**TANKPAC test hits >XdB:**	23022> 43dB
ASL:	31		

Noise/filter detail: External noise on due to condensation and pump operation.

AE hits (TPG) >x dB:	17149> 40dB	**AE filt/JCL Hits >x dB:**	1134> 43dB
Overall AE grade:	B	**Grade compensation:**	0

Test Observations: Condensation and pump noise.

AE source detail: None
(All Data >40 events)

Concentrated PLD sources:

1- ("A") grades:	9
2 -("B") grades:	1
3-("C") grades:	None
4-("D") grades:	None
5-("E") grades:	None.

EXPLANATION AND GLOSSARY OF ABBREVIATIONS.

"Overall Data" :- This is the data due to active corrosion of the tank, plus any leak noise. The data may be evenly spread over the tank or localized, see below:

"Potential Leak Data/Sources": - This (PLD or JCL) is data characteristic of severe localized corrosion damage, graded "A" (minor) to "E" (highly active). **Not** actual leakage, but a future "potential leak" location.

"Leak Data": - If we are fairly sure the tank is actually leaking we will make a statement, "probable leak" to this effect, and if the source is located, give the location.

ASL: - This is the Average continuous Signal Level, in the case of very severe leaks being present this will increase (e.g. 1cm hole in Naptha tank ≈ 60dB), typically ASL is in the range of 18 – 30dB.

OAL: - Overall % of data located on the floor. This is a location "quality check", the range is usually between 5 – 30%, meaning that this percentage of emissions detected actually reached three sensors and could be located. For A/B grade tanks it is normal for this to be low as the signals are weak from minor or no corrosion activity. If the % is very low but the Overall tank grade is high this indicates the presence of dense sludge or the possibility of corrosion from the wall instead of the floor.

PLL: - The % of "Potential Leak" data located on the floor. This is the same as OAL but applied to the "Potential Leak" data.

Overall TANKPAC Grade: - This relates to the overall corrosion damage detected during the test.
A – Very Minor/No Damage
B – Minor Damage
C – Intermediate Damage
D – Active Damage
E – Highly Active Damage

Composite Grade: - This combines the Overall TANKPAC corrosion damage grade with the "Potential Leak" or severe localized damage grade, to produce a final grade with an associated recommendation according to the risk matrix below:

"PLD GRADE"	E/5	III	III	IV	IV	IV	I – No active damage, re-test in 4/5 years.
	D/4	II	III	III	IV	IV	II – Minor active damage, re-test in 2 years.
	C/3	II	II	III	III	III	III – Active damage re-test in max.1 year*.
	B/2	I	I	II	II	n/a	IV – Very active damage. Re-test in 0.5 year*.
	A/1	I	I	II	n/a	n/a	* or schedule for internal inspection
"OVERALL GRADE"	→	A	B	C	D	E	n/a should not occur at standard threshold

Note: Should a leak be highly probable this will be stated separately, and may influence the grade. This final Composite Grade has been developed by PAL customers from more than 10 years experience and allows simple prioritization of tanks for internal inspection.

Tankpac test hits >xdB: - The total amount of data (including extraneous noise sources) recorded above the test threshold (xdB) during the test.

AE hits (TPG) >xdB:- TANKPAC Grading Hits. This shows how much data (excluding noise sources) the tank floor has emitted above the standard test threshold for that size and type of tank.

AE filt/JCL Hits >xdB: - "Potential Leak" Hits. This shows the amount of data above the test threshold which is representative of "Potential Leak" data or severe localized damage.

TANK CERTIFICATION

TANK: 332T1-2

REGULATORY REFERENCE: 40 CFR 265. 191

PREPARED FOR:

SOLUTIA INC.
CHOCOLATE BAYOU PLANT
ALVIN, TEXAS

March 2, 2009
CHEMIC JOB No. 9016

CHEMIC ENGINEERS
HITCHCOCK, TEXAS 77563
(409) 986-6504

REPORT CONTENTS

Certification by Registered Professional Engineer: D. Lucardi P.E.

Tank / Foundation Calculations

Support Drawings: W-93-2579B-2 Rev. B
W-93-2579B-3 Rev. B
W-93-2579B-27 Rev. B
332FD-004

Copy of Certification for Secondary Containment

Copy of API 653 In Service Tank Inspection and Ultrasonic Inspection Reports

Regulatory References: 40 CFR 265.191

DATE: March 2, 2009

TO: Mr. Paul W. Zawila (SOLUTIA INC.)

FROM: Dedy Lucardi P.E. (CHEMIC ENGINEERS)

SUBJECT: Assessment of Tank 332T1-2

REFERENCE: EPA 40 CFR Sections 265.191 (July 1, 2008 Edition)
Tank contents: Hazardous waste liquid and solids as defined by EPA.

Tank 332T1-2 was assessed to insure the tank system's integrity. The assessment was done to insure its qualifications and capabilities to store hazardous waste sludge as well as the currently permitted wastewater. An API - 653 in service tank inspection, consisting of external visual and ultrasonic inspection, was conducted to establish the condition of the tank shell and floating roof. Bottom plate (tank floor) condition was evaluated based on data from an acoustic emission inspection conducted in 10/2006. The results found that there was no indication that the tank system was at risk of failure.

Listed below are the requirements for the assessment under EPA Regulation 40 CFR 265.191:

1. Design Standard: The tank was inspected externally and based on the tank ultrasonic thickness reading provided by SOLUTIA and the calculations according to the API-650 (2007) – 5.6.3, F.4.1, F.4.2, API-653 (2008) - 4.3.3 and 4.4.5, the tank is adequately designed and has sufficient structural strength. Although the API - 653 in service tank inspection report notes that "there are weld spacing issues with nozzles on the first shell course that are not acceptable with current API code" the tank's construction is fully compliant with API code as it existed at the time the tank was constructed.

2. Hazardous Characteristic: The wastes are hazardous waste liquid and sludge collected from various sources (units) in Solutia plant.

3. Existing Corrosion Protection: Shell course #1 minimum thickness is required 0.328 in. + 0.125 in. for corrosion allowance = 0.453 in. which is less than the 0.637 in. (minimum thickness UT reading on the shell course#1). The shell minimum thickness shell courses #2 through #4 were found to be above the minimum required thickness and no significant material loss from general corrosion. Base plate thickness of 0.5 in, which are exceeded minimum require thickness of 0.225 in. and 0.25 in. per API-650 section 5.4.1. and API-653 – 4.4, Table 6-1.

   Measured sludge specific gravity is 1.1 vs. the original tank design specific gravity of 1.0. All minimum thickness calculations were performed using a specific gravity of 1.1.

   The floating roof and seal are in acceptable condition and suitable for service.

4. Documented Age of the Tank System: The tank 332T1-2 serial # 2579A was built by WYATT INDUSTRIES INC. The tank was constructed of carbon steel SA-516-55 and it was built in 1994. This information was obtained from the fabrication drawings #W-93-2579B-2.

5. Tank Foundation: The tank foundation is constructed of concrete ring wall type filled with compacted sand and 6" thick of pea gravel on the upper section. There is no major defect on tank foundation other than minor hairline cracking and it will be able maintain the load of a full liquid level in the tank.

6. Secondary Containment System: The secondary containment system is adequate and was previously addressed in a separate Facility Certification Report by Jimmy L. Means, Solutia Engineer on July 12, 2000.

7. Results of Leak Test, Internal Inspection or Other Tank Integrity Examination: The tank is in place and based on visual inspection, there are no defects or leaks detected. The calculation showed that tank is not requiring to be anchored to the foundation since tank friction forces is larger than the wind force. While the

Based on visual inspections, calculations and review of available documentation, I believe that tank 332T1-2 is adequately designed and is compatible for storage of the hazardous waste sludge as well as the currently permitted wastewater.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted.

Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

STATE OF TEXAS
DEDY LUCARDI
75006
REGISTERED
PROFESSIONAL ENGINEER

SIGNED: ______________________ DATE: 3-4-09

D. Lucardi P.E.
Texas Registration No. 75006

CHEMIC
ENGINEERS

SOLUTIA Inc

TANK 332T1-2 RERATE CALCULATIONS

CHOCOLATE BAYOU PLANT
Chocolate Bayou, Texas

By: Dedy Lucardi
Chemic Engineers

March 2, 2009
Chemic Project # 9016
REV-0

332T1-2

ETANK SETTINGS SUMMARY

To Change These ETank Settings, Go To Tools->Options, Behavior Tab.

```
No 650 Appendix F Calcs when Tank P = 0  -> Default : False
                                          -> This Tank : False
Show MAWP / MAWV Calcs                            : True
Enforce API Minimum thicknesses                   : True
Enforce API Maximum Roof thickness                : True
Enforce Minimum Self Supp. Cone Pitch (2 in 12)   : True
Force Non-Annular Btm. to Meet API-650 3.5.1      : False
Set t.actual to t.required Values                 : False
Maximum 650 App. S or App. M Multiplier is 1      : True
Enforce API Maximum Nozzle Sizes                  : True
Use Jawad External Pressure in Wind Girder Calcs  : True
Max. Self Supported Roof thickness                : 0 in.
Max. Tank Corr. Allowance                         : 0 in.
Shell external pressure/wind t-min includes C.A.  : False
```

SUMMARY OF DESIGN DATA and REMARKS

Job	: 9016-1
Date of Calcs.	: 02/27/2009 , 11:19 AM
Mfg. or Insp. Date	: 02/23/2009
Designer	: Dedy Lucardi
Project	: Tank Certification
Tag Number	: 332T1-2
Plant	: Solutia
Plant Location	: Chocolate Bayou
Site	: Chocolate Bayou
Design Basis	: API-653 3rd Edition Addendum 2, 2005, & API-650 10th Edition Addendum 4, Dec 2005

- TANK NAMEPLATE INFORMATION

- Operating Ratio: 0.4
- Design Standard:
- API-650 10th Edition Addendum 4, Dec 2005

SHELL COURSE RE-RATING (Bottom Course is #1)

Course # 1; Material: A-516 Gr 55; Width = 8.5ft

API-653 ONE FOOT METHOD

Sd = 23,595 PSI (allowable design stress per API-653 4.3.3.1)

RE-RATE CONDITION
G = 1.1 (per API-653)

< Re-Rate Condition G = 1.1 >

```
H' = Effective liquid head at design pressure
   = H + 2.31*P(psi)/G
   = 34 + 2.31*0/1.1 = 34ft

t-Calc = 2.6*OD*(H' - 1)*G/(Sd*E) + CA  (per API-653)
       = 2.6*82*(34 - 1)*1.1/(23,595*1) + 0.125
       = 0.453 in.

hMax_1 = E*Sd*(t_1 - CA_1)/(2.6*OD*G) + 1
       = 1*23,595*(0.625 - 0.125) / (2.6 * 82 * 1.1) + 1
       = 51.3049 ft.

Pmax_1 = (hMax_1 - H) * 0.433 * G
       = (51.3049 - 34) * 0.433 * 1.1
       = 8.2423 PSI

Pmax_int_shell = Min(Pmax_int_shell, Pmax_1)
               = Min(999, 8.2423)

Pmax_int_shell = 8.2423 PSI
```

HYDROSTATIC TEST CONDITION

< Re-Rate Condition G = 1 >

```
H' = Effective liquid head at design pressure
   = H + 2.31*P(psi)/G
   = 34 + 2.31*0/1 = 34ft

t.test = 2.6*82*(34 - 1)/(25,960*1) = 0.271 in.
```

Course # 2; Material: A-516 Gr 55; Width = 8.5ft

API-653 ONE FOOT METHOD

Sd = 23,595 PSI (allowable design stress per API-653 4.3.3.1)

RE-RATE CONDITION
G = 1.1 (per API-653)

< Re-Rate Condition G = 1.1 >

```
H' = Effective liquid head at design pressure
   = H + 2.31*P(psi)/G
   = 25.5 + 2.31*0/1.1 = 25.5ft
```

```
t-Calc = 2.6*OD*(H' - 1)*G/(Sd*E) + CA  (per API-653)
       = 2.6*82*(25.5 - 1)*1.1/(23,595*1) + 0.125
       = 0.3685 in.

hMax_2 = E*Sd*(t_2 - CA_2)/(2.6*OD*G) + 1
       = 1*23,595*(0.5 - 0.125) / (2.6 * 82 * 1.1) + 1
       = 38.7287 ft.

Pmax_2 = (hMax_2 - H) * 0.433 * G
       = (38.7287 - 25.5) * 0.433 * 1.1
       = 6.3008 PSI

Pmax_int_shell = Min(Pmax_int_shell, Pmax_2)
               = Min(8.2423, 6.3008)

Pmax_int_shell = 6.3008 PSI

HYDROSTATIC TEST CONDITION

< Re-Rate Condition G = 1 >

H' = Effective liquid head at design pressure
   = H + 2.31*P(psi)/G
   = 25.5 + 2.31*0/1 = 25.5ft

t.test = 2.6*82*(25.5 - 1)/(25,960*1) = 0.2012 in.

Course # 3;   Material: A-516 Gr 55;   Width = 8.5ft

API-653 ONE FOOT METHOD

Sd = 25,960 PSI   (allowable design stress per API-653 4.3.3.1)

RE-RATE CONDITION
G = 1.1 (per API-653)

< Re-Rate Condition G = 1.1 >

H' = Effective liquid head at design pressure
   = H + 2.31*P(psi)/G
   = 17 + 2.31*0/1.1 = 17ft

t-Calc = 2.6*OD*(H' - 1)*G/(Sd*E) + CA  (per API-653)
       = 2.6*82*(17 - 1)*1.1/(25,960*1) + 0.125
       = 0.2695 in.

hMax_3 = E*Sd*(t_3 - CA_3)/(2.6*OD*G) + 1
       = 1*25,960*(0.372 - 0.125) / (2.6 * 82 * 1.1) + 1
       = 28.3415 ft.

Pmax_3 = (hMax_3 - H) * 0.433 * G
       = (28.3415 - 17) * 0.433 * 1.1
       = 5.4019 PSI

Pmax_int_shell = Min(Pmax_int_shell, Pmax_3)
               = Min(6.3008, 5.4019)

Pmax_int_shell = 5.4019 PSI
```

HYDROSTATIC TEST CONDITION

< Re-Rate Condition G = 1 >

```
H' = Effective liquid head at design pressure
   = H + 2.31*P(psi)/G
   = 17 + 2.31*0/1 = 17ft

t.test = 2.6*82*(17 - 1)/(27,000*1) = 0.1263 in.
```

Course # 4; Material: A-516 Gr 55; Width = 8.5ft

API-653 ONE FOOT METHOD

Sd = 25,960 PSI (allowable design stress per API-653 4.3.3.1)

RE-RATE CONDITION
G = 1.1 (per API-653)

< Re-Rate Condition G = 1.1 >

```
H' = Effective liquid head at design pressure
   = H + 2.31*P(psi)/G
   = 8.5 + 2.31*0/1.1 = 8.5ft

t-Calc = 2.6*OD*(H' - 1)*G/(Sd*E) + CA  (per API-653)
       = 2.6*82*(8.5 - 1)*1.1/(25,960*1) + 0.125
       = 0.1928 in.

hMax_4 = E*Sd*(t_4 - CA_4)/(2.6*OD*G) + 1
       = 1*25,960*(0.375 - 0.125) / (2.6 * 82 * 1.1) + 1
       = 28.6736 ft.

Pmax_4 = (hMax_4 - H) * 0.433 * G
       = (28.6736 - 8.5) * 0.433 * 1.1
       = 9.6087 PSI

Pmax_int_shell = Min(Pmax_int_shell, Pmax_4)
               = Min(5.4019, 9.6087)

Pmax_int_shell = 5.4019 PSI
```

HYDROSTATIC TEST CONDITION

< Re-Rate Condition G = 1 >

```
H' = Effective liquid head at design pressure
   = H + 2.31*P(psi)/G
   = 8.5 + 2.31*0/1 = 8.5ft

t.test = 2.6*82*(8.5 - 1)/(27,000*1) = 0.0592 in.
```

< SHELL COURSE #1 SUMMARY >

```
t-Calc = MAX(t-Calc_650, t_shell_min)
       = MAX(0.453, 0.2518)
       = 0.453 in.
```

```
  Course Minimum t shall not be less than 0.1" + CA
    (per API-653 Section 4.3.3.1)

  .-653min = 0.225 in.

 t.required = MAX(t.design, t.min653)
            = MAX(0.453,0.225) = 0.453 in.

 < API-653 4.3.2.1 >
 t1 (lowest average thickness in the shell course)
 t1 must be >= t.required = 0.453 in.
 t2 (least min. thickness in an area of shell course)
 t2 must be >= 0.6*(t.required - CA) + CA = 0.321800 in.
 t.actual = 0.625 in.

 Weight = Density*PI*[(12*OD) - t]*12*Width*t
        = 0.2833*PI*[(12*82)-0.625]*12*8.5*0.625
        = 55,795 lbf     (New)
        = 44,642 lbf     (Corroded)


< SHELL COURSE #2 SUMMARY >

  t-Calc = MAX(t-Calc_650, t_shell_min)
         = MAX(0.3685, 0.2518)
         = 0.3685 in.

  Course Minimum t shall not be less than 0.1" + CA
    (per API-653 Section 4.3.3.1)

  t-653min = 0.225 in.

  required = MAX(t.design, t.min653)
           = MAX(0.3685,0.225) = 0.3685 in.

 < API-653 4.3.2.1 >
 t1 (lowest average thickness in the shell course)
 t1 must be >= t.required = 0.3685 in.
 t2 (least min. thickness in an area of shell course)
 t2 must be >= 0.6*(t.required - CA) + CA = 0.271100 in.
 t.actual = 0.5 in.

 Weight = Density*PI*[(12*OD) - t]*12*Width*t
        = 0.2833*PI*[(12*82)-0.5]*12*8.5*0.5
        = 44,642 lbf     (New)
        = 33,486 lbf     (Corroded)


< SHELL COURSE #3 SUMMARY >

  t-Calc = MAX(t-Calc_650, t_shell_min)
         = MAX(0.2695, 0.2518)
         = 0.2695 in.

  Course Minimum t shall not be less than 0.1" + CA
    (per API-653 Section 4.3.3.1)

  t-653min = 0.225 in.
```

```
t.required = MAX(t.design, t.min653)
           = MAX(0.2695,0.225) = 0.2695 in.

   API-653 4.3.2.1 >
  t1 (lowest average thickness in the shell course)
 t1 must be >= t.required = 0.2695 in.
 t2 (least min. thickness in an area of shell course)
 t2 must be >= 0.6*(t.required - CA) + CA = 0.211700 in.
 t.actual = 0.372 in.

 Weight = Density*PI*[(12*OD) - t]*12*Width*t
        = 0.2833*PI*[(12*82)-0.372]*12*8.5*0.372
        = 33,218 lbf     (New)
        = 22,059 lbf     (Corroded)


< SHELL COURSE #4 SUMMARY >

   t_shell_min governs.  See the STIFFENING RINGS Calculations.

   t-Calc = MAX(t-Calc_650, t_shell_min)
          = MAX(0.1928, 0.2518)
          = 0.2518 in.

   Course Minimum t shall not be less than 0.1" + CA
     (per API-653 Section 4.3.3.1)

   t-653min = 0.225 in.

 t.required = MAX(t.design, t.min653)
            = MAX(0.2518,0.225) = 0.2518 in.

   API-653 4.3.2.1 >
    (lowest average thickness in the shell course)
 t1 must be >= t.required = 0.2518 in.
 t2 (least min. thickness in an area of shell course)
 t2 must be >= 0.6*(t.required - CA) + CA = 0.201080 in.
 t.actual = 0.375 in.

 Weight = Density*PI*[(12*OD) - t]*12*Width*t
        = 0.2833*PI*[(12*82)-0.375]*12*8.5*0.375
        = 33,486 lbf     (New)
        = 22,327 lbf     (Corroded)
```

FLAT BOTTOM: NON-ANNULAR PLATE DESIGN

Bottom Plate Material : A-516 Gr 55
Annular Bottom Plate Material : A-36

<Weight of Bottom Plate>

```
Bottom_Area = PI/4*(Bottom_OD)^2
            = PI/4*(988.0001)^2
            = 766,662 in^2

Weight = Density * t.actual * Bottom_Area
       = 0.2833 * 0.5 * 766,662
       = 108,598 lbf   (New)
       = 81,448 lbf   (Corroded)
```

< API-653 >

Calculation of Hydrostatic Test Stress & Product Design Stress (per API-653)

t_1 : Original Bottom (1st) Shell Course thickness.

```
H'= Max. Liq. Level + P(psi)/(0.433)
  = 34 + (0)/(0.433) = 34 ft

St = Hydrostatic Test Stress in Bottom (1st) Shell Course
   = (2.6)(OD)(H' - 1)/t_1
   = (2.6)(82)(34 - 1)/(0.625)
   = 11,257 PSI.   (Within 24900 PSI limit for Non-Annular Bottom)

Sd = Product Design Stress in Bottom (1st) Shell Course
   = (2.6)(OD)(H' - 1)(G)/(t_1 - ca_1)
   = (2.6)(82)(34 - 1)(1.1)/(0.5)
   = 15,478 PSI.   (Within 23200 PSI limit for Non-Annular Bottom)
```

Non-Annular Bottom Plates

t_min = 0.1 + 0.125 = 0.225 in. (per API-653 Table 6-1)

t-Calc = t_min = 0.225 in.

< FLAT BOTTOM: NON-ANNULAR SUMMARY >

t.required = t-Calc = 0.225 in.
t.actual = 0.5 in.

STIFFENING RINGS (API-650)

vs = Wind Velocity = 125 mph
vf = Velocity Factor = (vs/120)^2 = (125/120)^2 = 1.0851
Re-Rate PV = 0 PSI, OR 0 In. H2O

(REF: 'Structural Analysis and Design of Process Equipment'
2nd Edition, Jawad)
(Combining effects of internal vacuum with vf)

ve = Effective Velocity Factor
= (25.6 * vf + 144 * SF * PV) / 25.6
= (25.6 * 1.0851 + 144 * 2 * 0) / 25.6
= 1.0851

<TOP COMPRESSION RING CALCULATIONS>

Z = Required Top Comp Ring Section Modulus (per API-650 3.9.6.1)
= (Zm)(Ve)(h)(OD^2)
= (0.0001)(1.0851)(34)(82^2)
= 24.81 in^3, for Open Top Tank

Actual Z = 47.1 in^3
Using 16 x 6 x 2-1/2 x 1/4 (in) FORMED PLATE

<INTERMEDIATE WIND GIRDER CALCULATIONS (PER API-650 Section 3.9.7)

ME = 28,799,999/28,799,999
= 1

Hu = Maximum Height of Unstiffened Shell
= {ME*600,000*t*SQRT[t/OD]^3} / Ve)
= {1*600,000*0.375*SQRT[0.375/82]^3} / 1.0851
= 64.13 ft

Wtr = Transposed Width of each Shell Course
= Width*[t_top_course / t_course]^2.5

Transforming Courses (1) to (4)

Wtr(1) = 8.5*[0.375/0.625]^2.5 = 2.3703 ft
Wtr(2) = 8.5*[0.375/0.5]^2.5 = 4.1407 ft
Wtr(3) = 8.5*[0.375/0.372]^2.5 = 8.6724 ft
Wtr(4) = 8.5*[0.375/0.375]^2.5 = 8.5 ft
Htr (Height of the Transformed Shell)
= SUM{Wtr} = 23.6834 ft

L0 = Unstiffened Shell Length
= 23.6834/1 = 23.6834 ft

No Intermediate Wind Girders Needed Since Hu >= L_0

Ve_Max = {ME*600,000*t*SQRT[t/OD]^3} / L0
= {1*600,000*0.375*SQRT[0.375/82]^3} / 23.6834
= 2.9381

```
P_ext_shell_1  (EXTERNAL PRESSURE CHECK per Jawad,
    based on Ve_Max, L0, and t_top_course)
    = 25.6 * (vf - Ve_Max) / (144 * SF))
    = 25.6 * (1.0851 - 2.9381) / (144 * 2))
    = -0.1647 PSI or -4.56 IN. H2O


t_shell_min_1  (Shell Minimum t per Jawad,
               based on L0, and Ve),
    = {(L0*Ve*SQRT[OD]^3) / (ME*600,000)} ^ 0.4   (CA Incl. Later)
    = {(23.6834*1.0851*SQRT[82]^3) / (1*600,000)} ^ 0.4
    = 0.2518 in.


NOTE: Per User Design,
Wind Girder Calculations per Jawad N.A.

 Design Length (L0) = 23.6834 ft or 284.2008 in.
 Design Diameter (D0) = 82 ft or 984 in.

 M = max(M_seismic, M_wind) = 925,703 ft-lbf

 tq = thickness required for M
    = M/(R^2*PI*S*E)
    = 0.0006 in.

 tnp (Top Course thickness available to resist external pressure)
     = t_top_course - tq
     = 0.375 - 0.0006

     = 0.3744 in.


 Since D0/t > 1000, Will not Perform ASME Vacuum Calculations.

(REF: Per Jawad, for D0/t > 1000)

 Using Max(tnp, t_top_course)

(REF: Guidebook for the Design of ASME Section VIII Pressure Vessels)

 P_ext_shell_2   (Per Jawad, based on D0/t)
    = -0.866*E / [(L0/D0)*(D/t_top_course)^2.5]
    = -0.866*28,799,999/[(0.2888)*(984/0.375) ^ 2.5]
    = -0.2448 PSI or -6.79 IN. H2O


 t_shell_min_2  ( Back Calculate Using Course Actual values ),
    = D0 / [(0.866*E)/(PV*(L0/D0))]^(2/5) + ca_top_course
    = 984/[(0.866*28,799,999)/(0.036*(0.2888))]^(2/5)
      (Assuming API-650 3.2.4 applies, let
       PV = 0.036 PSI to ensure non-zero value in order
       to calculate t_shell_min_2)
    = 0.1742 in.  (CA Incl. Later)


P_ext_shell = P_ext_shell_2
    = -0.2448 PSI
```

```
    = -0.2448 PSI or -6.79 IN. H2O

   Since PV >= P_ext_shell,  No Stiffeners Required.

 INTERMEDIATE GIRDER CALCULATION SHELL THICKNESS SUMMARY>

   NOTE: Course t.exernal values below exclude Corrosion Allowance.

   t.external.1 = MAX(t_shell_min_1, t_shell_min_2)
                = MAX(0.2518,0.1742)
                = 0.2518 in.

   t.external.2 = MAX(t_shell_min_1, t_shell_min_2)
                = MAX(0.2518,0.1742)
                = 0.2518 in.

   t.external.3 = MAX(t_shell_min_1, t_shell_min_2)
                = MAX(0.2518,0.1742)
                = 0.2518 in.

   t.external.4 = MAX(t_shell_min_1, t_shell_min_2)
                = MAX(0.2518,0.1742)
                = 0.2518 in.

<BOTTOM COMPRESSION RING CALCULATIONS>

  Bottom Compression Ring: N.A.
```

```
WIND MOMENT (Per API-650 SECTION 3.11)

      vs = Wind Velocity = 125 mph
      vf = Velocity Factor = (vs/120)^2 = (125/120)^2 = 1.0851

      Xs (Moment Arm of Wind Force on Shell)
         = H/2 = (34)/2 = 17 ft

      As (Projected Area of Shell)
         = H*(OD + t_ins / 6)
         = (34)(82 + 0/6) = 2,788 ft^2

      M_shell (Moment Due to Wind Force on Shell)
              = (vf)(18)(As)(Xs)
              = (1.0851)(18)(2,788)(17) = 925,703 ft-lbf

      Mw (Wind moment)
             = M_shell = 925,703 ft-lbf

      W  = Net weight (PER API-650 3.11.3)
         = W_shell
         = 122,514 lbf

RESISTANCE TO OVERTURNING (per API-650 3.11.2)

    An unanchored Tank must meet these two criteria:
     1) 0.6*Mw + MPi < (MDL + MF_min_liq)/1.5
     2) Mw + 0.4MPi < (MDL + MF)/2

    Mw = Destabilizing Wind Moment = 925,703 ft-lbf

    MPi = Destabilizing Moment about the Shell-to-Bottom Joint from Design «
                                                                   Pressure.
        = P*(PI*OD^2/4)*(144)*(OD/2)
        = 0*(3.1416*82^2/4)*(144)*(41)
        = 0 ft-lbf

    MDL = Stabilizing Moment about the Shell-to-Bottom Joint from the Shell and «
                                           Roof weight supported by the Shell.
        = (W_shell + W_roof)*OD/2
        = (122,514 + 0)*41
        = 5,023,074 ft-lbf

    ta = Bottom Plate thickness = 0.5 in.

    wa = Circumferential loading of contents along Shell-To-Bottom Joint.
       = 4.67*ta*SQRT(Sy_btm*H_liq)
       = 4.67*0.5*SQRT(30,000*34)
       = 2,358 lbf/ft

    wa_min_liq = Circumferential loading of Minimum-Level contents along «
                                                        Shell-To-Bottom Joint.
               = 4.67*ta*SQRT(Sy_btm*H_min_liq)
               = 4.67*0.5*SQRT(30,000*0)
               = 0 lbf/ft

    MF_min_liq = wa_min_liq*PI*OD
               = 0*3.1416*82
               = 0 lbf
```

```
MF = Stabilizing Moment due to Bottom Plate and Liquid Weight.
   = (OD/2)*wa*PI*OD
   = (41)(2,358)(3.1416)(82)
   = 911,259 ft-lbf

Criteria 1
0.6*(925,703) + 0 < (5,023,074 + 0)/1.5
Since 555,422 < 3,348,716, Tank is stable.

Criteria 2
925,703 + 0.4 * 0 < (5,023,074 + 911,259)/2
Since 925,703 < 2,967,167, Tank is stable.
```

RESISTANCE TO SLIDING (per API-650 3.11.4)

```
F_wind = vF*(15 * Ap_Vert + 18 * As)
       = 1.0851*(15 * 0 + 18 * 2,788)
       = 54,453 lbf

F_friction = Maximum of 40% of Weight of Tank
     = 0.4 * (W_Roof_Corroded + W_Shell_Corroded +
              W_Btm_Corroded + W_min_Liquid)
     = 0.4 * (0 + 122,514 + 81,448 + 0)
           = 81,585 lbf

No anchorage needed to resist sliding since

   F_friction > F_wind
```

SEISMIC MOMENT (API-650 APPENDIX E & API-620 APPENDIX L)
Ms = 0 ft-lbf

* NOTE: Since Seismic Zone Coefficient (Z) = 0,
Seismic calculations are not applicable.

ꞏHORAGE REQUIREMENTS>
No Anchorage Required.

ANCHOR BOLT DESIGN

This is a non-anchored Tank (NAT), since there are no anchor bolts.

```
   Jplift Check for Open-Top NAT at MAWP is N.A., and no anchors
   are required due to wind moment or seismic calculations.

 * * Warning * *   Closed-top NAT at MAWP is subject to Uplift.

  U1 @ MAWP = (Uplift due to MAWP)
            - Corr. shell - [Corr. roof weight  + Structural weight]
            = 999 * 3.1416 / 4 * 6,724 * 144 «
            - 122,514 - [0 + 0 + 0 + 0]

 * * Warning * *   Closed-top NAT at MAWP is subject to Uplift.

  U1 @ MAWP = (Uplift due to MAWP)
            = MAWP * PI / 4 * D ^ 2 * 144 «
            - Corr. shell - Corr. roof weight
            = 999 * 3.1416 / 4 * 6,724 * 144 «
            - 122,514 - 0
      = 759,583,500 LBF

 * * Warning * *   NAT is subject to Uplift due to MAWP + Wind Load.

  U6 @ MAWP = (Uplift due to MAWP + Wind Load)
            = [(MAWP - 8 * t) * D^2 * 4.08] + [4 * Mw / D] - W1
            = [(999 - 8 * 0.375) * 6,724 * 4.08] «
            + [4 * 925,703 / 82] - 122,514
            = 759,373,400 LBF

 * * Warning * *   NAT is subject to Uplift due to MAWP + Seismic load.

    ' @ MAWP = (Uplift due to MAWP + Seismic Load)
            = [(MAWP - 8 * t) * D^2 * 4.08] + [4 * Ms / D] - W1
            = [(999 - 8 * 0.375) * 6,724 * 4.08] «
            + [4 * 0 / 82] - 122,514
            = 759,328,300 LBF

   Open-top NAT is okay for MAWP, Wind and Siesmic.

  MAWP_NAT: Solve U1 for MAWP, with U1 = 0:
  MAWP_NAT = 1 / (36 * PI * D ^ 2) * [Corroded (shell + roof) weight + «
                                                     Structural weight]
           = 1/(36 * 3.1416 * 6,724) * [122,514 + (0 + 0 + 0 + 0)]
  MAWP_NAT = 1 / (36 * PI * D ^ 2) * [Corroded (shell + roof) weight]
           = 1/(36 * 3.1416 * 6,724) * [122,514 + 0]
           = 0.1601 PSI

  NOTE: Tank MAWP is limited to MAWP_NAT
```

ANCHOR BOLT CHAIRS NOT SPECIFIED.

CAPACITIES and WEIGHTS

Shell capacity to upper TL : 1,340,608 gal

	New Condition	Corroded
Shell	167,141 lbf	122,514 lbf
Roof Plates	0 lbf	0 lbf
Bottom	108,598 lbf	81,448 lbf
Total	275,739 lbf	203,962 lbf

Weight of Tank, Empty	:	275,739 lbf
Weight of Tank, Full	:	12,574,477 lbf
Weight of Tank, Full of Water	:	11,456,410 lbf
Foundation Area Req'd	:	5,281 ft^2
Foundation Loading, Empty	:	52.21 lbf/ft^2
Foundation Loading, Full	:	2,381 lbf/ft^2
Foundation Loading, Full of Water	:	2,169 lbf/ft^2

CHEMIC ENGINEERS

SOLUTIA Inc.

TANK 332T1-1 & T1-2 FOUNDATION CALCULATIONS SG=1.1

CHOCOLATE BAYOU PLANT
Chocolate Bayou, Texas

By: Y. Hendra
Chemic Engineers

March 2, 2009
Chemic Project # 9016
REV-0

CHEMIC ENGINEERS

JOB NO. 9016 PAGE 1 OF 5
DATE 2/27/09 BY Y.M.
CLIENT SOLUTIA
LOCATION CB - IWPF

SUBJECT CALC. FOR EXIST. 332 T-1 & 2 USING 1.1 S.G. FLUID CONTENT
REF DWG D-332-T1-4
D-332-FO-006

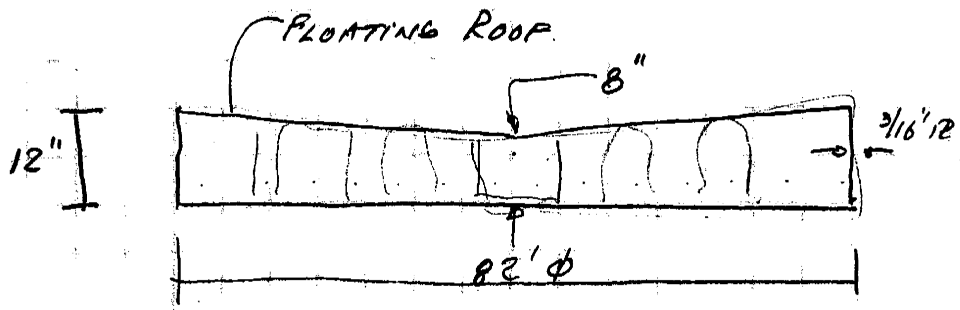
TANK ID = 82'
SG. CONTENT = 1.1

RING WALL FDN ID = 81'-0"
RING WALL THICKNESS = 1'-0"

WT OF TANK WALL + BOTTOM = 276 007 # — FROM "B TANK" MODEL.

WT OF THE TANK ROOF (FLOATING ROOF).

ASSUME 3/16" THK PLATE WT = 7.65 #/SF.



$$\text{ROOF AREA} = \frac{\pi D^2}{4} = \frac{(3.14)(82)^2}{4} = 5278.3 \text{ SF.}$$

TOP & BOTT AREA = 5278.3 × 2 = 10556 SF

THE WALL AREA = $\pi D \times h$
= (3.14)(82)(1) = 258 SF

10 814 SF

WT OF ROOF = 10814 × 7.65 = 82727 #

$$\text{WT / SF} = \frac{82727}{5278.3} = 15.67 \text{ \#/SF} = .11 \text{ \#/in}^2$$

CHEMIC ENGINEERS

JOB NO. 9016 PAGE 2 OF 5
DATE 2/27/09 BY Y.H
CLIENT SOLUTIA
LOCATION C.B - IWPF

SUBJECT

WT OF BOTTOM TANK = 20.4 #/SF × $\frac{\pi D^2}{4}$ = 20.4 #/SF × $\frac{(3.14)(82)^2}{4}$ = 107678 #
(1/2" PL) 20.4 #/SF

WT OF SHELL = 276007 - 107678

= 168329 #

STRESS @ RING WALL = RING WALL THICKNESS = 1'-0"

DUE TO WT OF SHELL = $\frac{168329}{\pi D}$ = $\frac{168329}{(3.14)(82)}$ = 654 #/SF

DUE TO ROOF ⇒ 6" PORTION OF ROOF ON TOP OF RING
= $\frac{15.67}{2}$ = 8 #/SF

DUE TO FLUID ⇒ 6"
1.1 × 62.4 × $\frac{6"}{12"}$ × 34' HT = 1169 #/SF

DUE TO BOTT SHELL 20

1851 #/SF

W = WT OF SHELL & FLUID THAT SUPPORTED BY RING FDN. /LF

= $\frac{1851 \text{ \#/SF}}{1' \text{ (WIDTH OF RING FDN)}}$ = 1851 #/LF

CHEMIC ENGINEERS

JOB NO. 9016 PAGE 3 OF 5
DATE 2/27/04 BY Y.H
CLIENT SOLUTIA
LOCATION CB-DWPF

SUBJECT

STRESS @ THE SOIL = WITH 1.1 SG

DUE WT OF ROOF = 16 #/SF

DUE WT OF FLUID = 62.4 X 1.1 X 34 2334 #/SF

DUE WT OF BOTTOM = 20 #/SF

SOIL STRESS W/1.1 SG. = 2370 #/SF

AT PRESENT COND, THE SOIL STRESS

FLUID = 62.4 X 1 X 34 = 2122 #/SF

WT ROOF = 16 #/SF

WT BOTT = 20 #/SF

SOIL STRESS W/1.0 SG = 2158 #/SF

≈ 10% INCREASE ON SOIL STRESS

USUALLY ALLOWABLE SOIL BEARING PRESSURE HAS A MIN 2 SAFETY FACTOR

CHEMIC ENGINEERS

JOB NO. 9016 PAGE 4 OF 5
DATE 2/27/09 BY Y.H
CLIENT SOLUTIA
LOCATION CB - IWPF

SUBJECT

CHECK FOR RING WALL THICKNESS

$$t = \frac{W}{H\gamma_P - 80d} \geq 12''$$

W = WT OF TANK THAT SUPPORTED BY RING WALL #/LF = 1851 #/LF
H = HEIGHT OF TANK = 34'
d = DEPTH OF RING = 5'-6"
γ_P = PRODUCT WT = 1.1 × 62.4 = 69 #/ft³

$$= \frac{1851\ \#/ft}{(34')(69\ \#/ft^3) - 80(5.5')}$$

$$= .97' < 1'$$

ACTUAL WIDTH OF RING WALL

CHEMIC ENGINEERS

JOB NO. 9016 PAGE 5 OF 5
DATE 2/27/09 BY Y.H
CLIENT SOLUTIA
LOCATION CB-IWPP

SUBJECT

CHECK FOR HOOP STRESS #/IN²

$$\text{HOOP REINFORCING} = \frac{Rd\ K_A \cdot ((SG)\ H + \gamma_s \frac{d}{2})}{f_s}$$

$$\frac{(82)(5.5)(.3)\left((69)(34) + 100\ \frac{5.5}{2}\right)}{42850\ \#/in^2}$$

354621 #/ft²

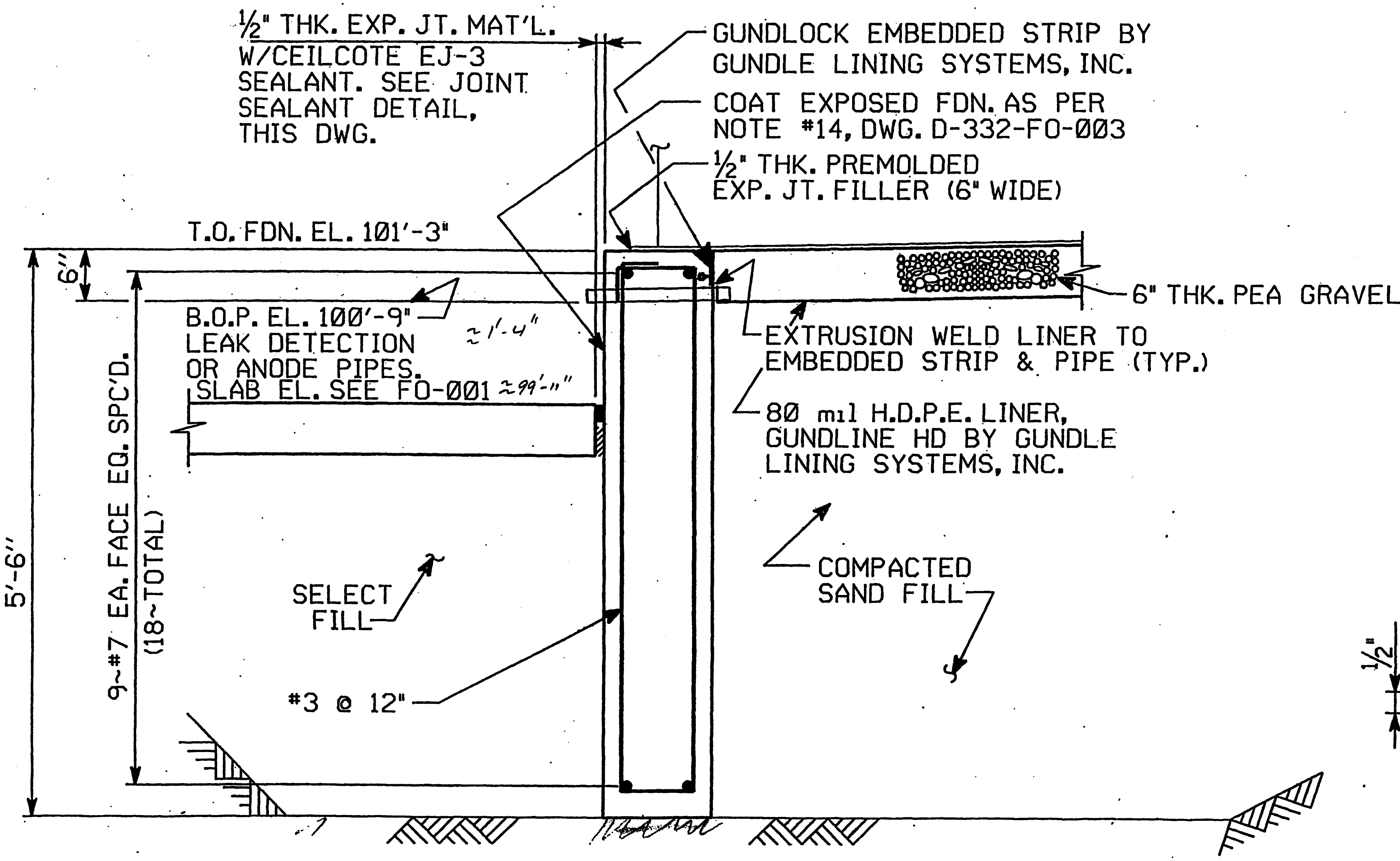
$$= \frac{354621\ \#}{42850\ \#/in^2}$$

REQ'D AS = 8.27 IN²

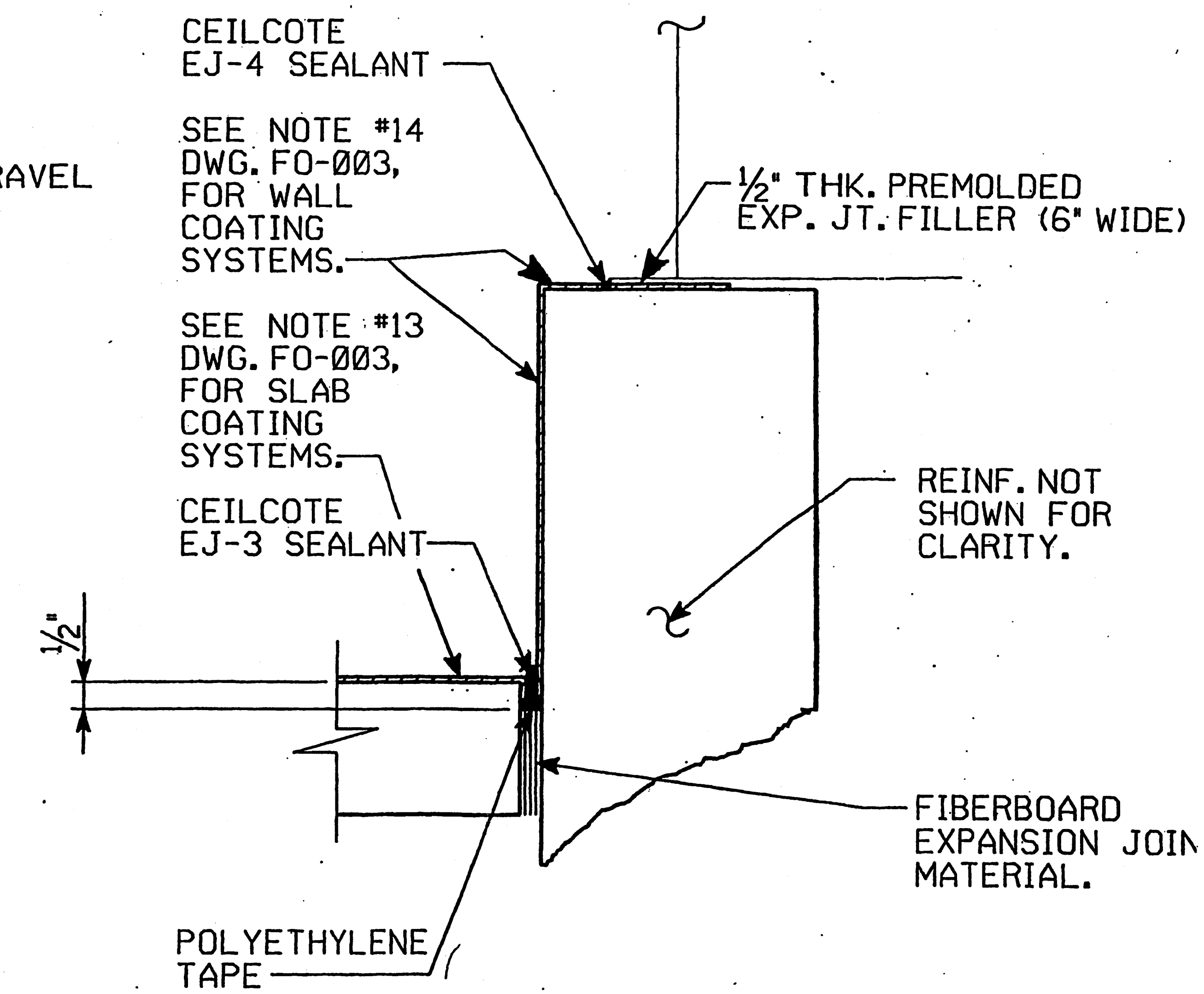
AVAILABLE REINF BAR = 18 # 7 BARS
18 X .60 = 10.8 IN²

OK

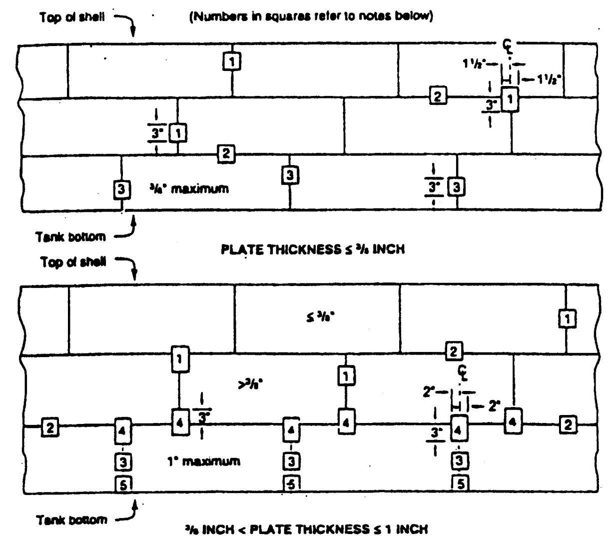
Rd = TANK RADIUS = 82'
K_A = COEFF ACTIVE SOIL PRESSURE = .3
d = DEPTH OF RING = 5.5'
SG = SPECIFIC GRAVITY = 1.1 X 62.4 = 69 #/ft³
fs = STEEL YIELD STR = 60 KSI
USE 1.4 FACTOR = 42.85 KSI = 42850 #/IN²
γ_s = 100 #/ft³



DETAIL 6
SC: ¾" = 1'-0"



RADIOGRAPHIC STANDARDS



Notes:
1. Vertical spot radiograph in accordance with 6.1.2.2. Item a: one in the first 10 feet and one in each 100 feet thereafter, 25 percent of which shall be at intersections.
2. Horizontal spot radiograph in accordance with 6.1.2.3: one in the first 10 feet and one in each 200 feet thereafter.
3. Vertical spot radiograph in each vertical seam in the lowest course (see 6.1.2.2. Item b). Spot radiographs that satisfy the requirements of Note 1 for the lowest course may be used to satisfy this requirement.
4. Spot radiographs of all intersections over 3/8 inch (see 6.1.2.2. Item b).
5. Spot radiograph of bottom of each vertical seam in lowest shell course over 3/8 inch (see 6.1.2.2. Item b).
6. Complete radiograph of each vertical seam over 1 inch. The complete radiograph may include the spot radiographs of the intersections if the film has a minimum width of 4 inches (see 6.1.2.2. Item c).

Figure 6-1—Radiographic Requirements for Tank Shells

Note: In this standard, the term *inspector*, as used in Sections V and VIII of the ASME Code, shall be interpreted to mean the purchaser's inspector.

6.1 Radiographic Method

For the purposes of this paragraph, plates shall be considered of the same thickness when the difference in their specified or design thickness does not exceed 1/32 inch.

6.1.1 APPLICATION

Radiographic inspection is required for shell butt welds (see 6.1.2.2 and 6.1.2.3), annular-plate butt welds (see 6.1.2.9), and flush-type connections with butt welds (see 3.7.8.11). Inspection by radiographic methods is not required for roof-plate or bottom-plate welds or for welds joining roof plates to the top angle, the top angle to the shell plate, shell plates to bottom plates, or appurtenances to the tank.

6.1.2 NUMBER AND LOCATION OF RADIOGRAPHS

6.1.2.1 Except when omitted under the provisions of A.3.4, radiographs shall be taken as specified in 6.1.2 through 6.1.8.

6.1.2.2 The following requirements apply to vertical joints:

a. For butt-welded joints in which the thinner shell plate is less than or equal to 3/8 inch thick, one spot radiograph shall be taken in the first 10 feet of completed vertical joint of each type and thickness welded by each welder or welding operator. The spot radiographs taken in the vertical joints of the lowest course may be used to meet the requirements of Note 3 in Figure 6-1 for individual joints. Thereafter, without regard to the number of welders or welding operators, one additional spot radiograph shall be taken in each additional 100 feet (approximately) and any remaining major fraction of vertical joint of the same type and thickness. At least 25 percent of the selected spots shall be at junctions of vertical and horizontal joints, with a minimum of two such intersections per tank. In addition to the foregoing requirements, one random spot radiograph shall be taken in each vertical joint in the lowest course (see the top panel of Figure 6-1).
b. For butt-welded joints in which the thinner shell plate is greater than 3/8 inch but less than or equal to 1 inch in thickness, spot radiographs shall be taken according to Item a. In addition, all junctions of vertical and horizontal joints in plates in this thickness range shall be radiographed; each film shall clearly show not less than 2 inches of weld length on each side of the vertical intersection. In the lowest course, two spot radiographs shall be taken in each vertical joint: one of the radiographs shall be as close to the bottom as is practicable, and the other shall be taken at random (see the center panel of Figure 6-1).
c. Vertical joints in which the shell plates are greater than 1 inch thick shall be fully radiographed. All junctions of vertical and horizontal joints in this thickness range shall be radiographed; each film shall clearly show not less than 2 inches of weld length on each side of the vertical intersection (see the bottom panel of Figure 6-1).
d. The butt weld around the periphery of an insert manhole or nozzle shall be completely radiographed.

6.1.2.3 One spot radiograph shall be taken in the first 10 feet of completed horizontal butt joint of the same type and thickness (based on the thickness of the thinner plate at the joint) without regard to the number of welders or welding operators. Thereafter, one radiograph shall be taken in each additional 200 feet (approximately) and any remaining major fraction of horizontal joint of the same type and thickness. These radiographs are in addition to the radiographs of junctions of vertical joints required by Item c of 6.1.2.2 (see Figure 6-1).

6.1.2.4 When two or more tanks are erected in the same location for the same purchaser, either concurrently or serially, the number of spot radiographs to be taken may be based on the aggregate footage of welds of the same type and thickness in each group of tanks rather than the footage in each individual tank.

6.1.2.5 It should be recognized that the same welder or welding operator may not weld both sides of the same butt joint. If two welders or welding operators weld opposite sides of the same butt joint, it is permissible to inspect their work with one spot radiograph. If the spot radiograph is rejected, further spot radiographs shall be taken to determine whether one or both of the welders or welding operators are at fault.

6.1.2.6 An equal number of spot radiographs shall be taken from the work of each welder or welding operator in proportion to the length of joints welded.

6.1.2.7 As welding progresses, radiographs shall be taken as soon as it is practicable. The locations where spot radiographs are to be taken may be determined by the purchaser's inspector.

6.1.2.8 Each radiograph shall clearly show a minimum of 3 inches of weld length. The film shall be centered on the weld and shall be of sufficient width to permit adequate space for the location of identification marks and a thickness gauge or penetrometer.

6.1.2.9 When bottom annular plates are required by 3.5.1, the radial joints shall be radiographed as follows: (a) For double butt-welded joints, one spot radiograph shall be taken on 10 percent of the radial joints; (b) For single-side welded joints using a backup bar, one spot radiograph shall be taken on 50 percent of the radial joints. Locations of radiographs shall preferably be at the outer edge where the shell-plate joint joins the annular plate. The minimum length of each radiograph shall be 6 inches. Extra care must be exercised in the interpretation of radiographs of single welded joints that have a backup bar. In some cases, additional exposures taken at an angle may determine whether questionable indications are acceptable.

SETTLEMENT TABLE

REG. PT. DEGREE	BEFORE HYDROTEST FILL	AFTER HYDROTEST FILL

REG. PT. DEGREE	BEFORE HYDROTEST FILL	AFTER HYDROTEST FILL

NOTES

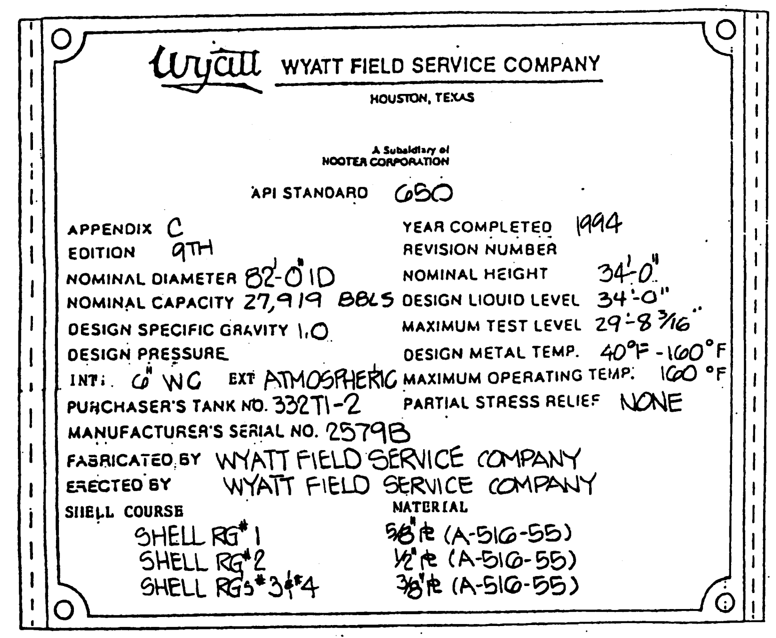
1. FIELD TO ESTABLISH & MARK (12) REF. POINTS EQ. SPACED AROUND THE TANK FOR MEASUREMENT OF SETTLEMENT.
2. FIELD TO ESTABLISH & MARK LOCATION FOR TRANSIT FOR EACH REF. POINT ON TANK.
3. MEASUREMENTS ARE TO BE MADE PRIOR TO FILLING & JUST BEFORE DRAINING THE TANK.

B

DESIGN DATA

DESIGN, FABRICATION, ERECTION & TESTING TO BE IN ACCORDANCE WITH API-650 9TH EDITION, JULY 1993

NAMEPLATE REQUIRED:	YES
DESIGN PRESSURE:	
INT:	6" W.C.
EXT:	ATMOSPHERIC.
DESIGN TEMPERATURE:	40°F - 160°F
SPECIFIC GRAVITY:	1.0
JOINT EFFICIENCY:	1.0
RADIOGRAPH:	SEE STANDARDS THIS SHT.
CORROSION ALLOWANCE:	1/8" WETED SURFACES
DESIGN LIQUID LEVEL:	34'-0"
ROOF CONSTRUCTION:	DOUBLE DECK FLOAT. ROOF
BOTTOM CONSTRUCTION:	BUTT WELDED
HYDROTEST:	SEE PROCEDURE THIS SHT.
WIND LOAD:	125 MPH
EARTHQUAKE ZONE:	0
NOMINAL CAPACITY:	27,919 BBLS TO BOTTOM OF OVERFLOW



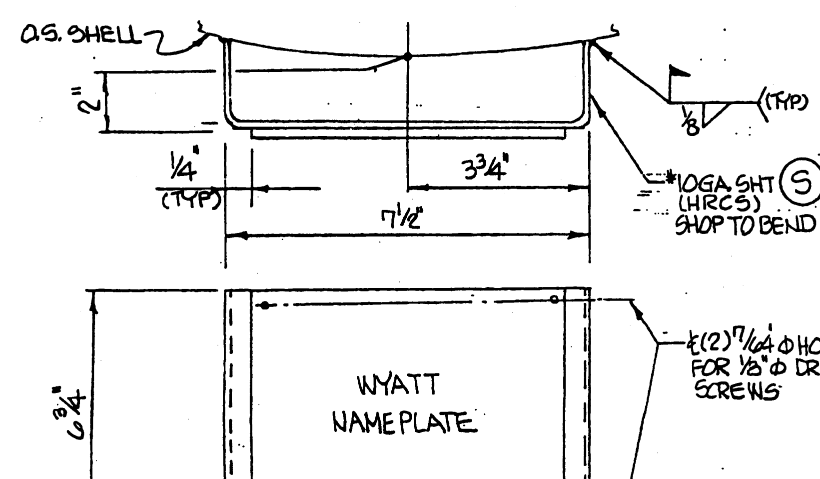
DETAIL OF NAMEPLATE

HYDRO-TEST PROCEDURE

1. TANK BOTTOM & LOWER ROOF DECK ARE TO BE VACUUM BOX TESTED PER API 650 PARA. 5.3.3 & MONSANTO STD 2.5 STD 23
2. COMPLETE ALL NON-DESTRUCTIVE TESTING.
3. BLANK OFF ALL SHELL NOZZLES EXCEPT MK "L"
4. FILL THE TANK W/ POTABLE WATER (FURNISHED BY CUSTOMER) TO THE MAX. LIQUID LEVEL.
5. AFTER TANK IS FULL; THOROUGHLY CHECK THE TANK & FLOATING ROOF FOR LEAKS.
6. DRAIN THE TANK.
7. REMOVE ALL TEST COVERS & RETURN TO WYATT STOCK FOR FUTURE USE.

NDE NOTE

MT DENOTES MAGNETIC PARTICLE EXAMINATION OFF ALL NOZZLE TO SHELL ATTACHMENT WELDS (INCLUDING REINFORCING PAD TO SHELL) PRIOR TO HYDRO-TEST. ANY DEFECTS FOUND ARE TO BE REPAIRED & RETESTED.



DETAIL OF NAMEPLATE BRACKET
ONE (1) REQ'D

I CERTIFY THAT THE ATTACHED TANK DRAWING MEETS THE REQUIREMENTS OF THE API-650 CODE, NINTH EDITION, JULY 1993.

STATE OF TEXAS
MICHAEL J. KOPECKY
48302
REGISTERED PROFESSIONAL ENGINEER

REV. B 5/12/94 M.J.K.

Michael J. Kopecky

GRINDING NOTE

G DENOTES ALL TANK INTERNAL WELDS SHALL BE GROUND SMOOTH (BUT NOT FLUSH)

SCALE:

CERTIFIED FOR CONSTRUCTION
WYATT FIELD SERVICE COMPANY
DATE: 11-24-93
BY: [signature]

NO.	REVISION	DATE	BY	CHK'D
B	REV. AS NOTED	12-8-93	ODG	JKH
A	REV. PER CUST. APPROVAL	11-23-93	ODG	JKH

P.O.#: 4247-7-0031

S/O 2579B ITEM: 332T1-2

WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

DESIGN DATA & GENERAL NOTES
FOR
(1) 82'-0" ID x 34'-0" HIGH OPEN TOP FLOAT. ROOF
IWPF WASTE WATER STORAGE TANK

CUSTOMER: MONSANTO CO.

DRAWN: ODG DATE: 11-4-93

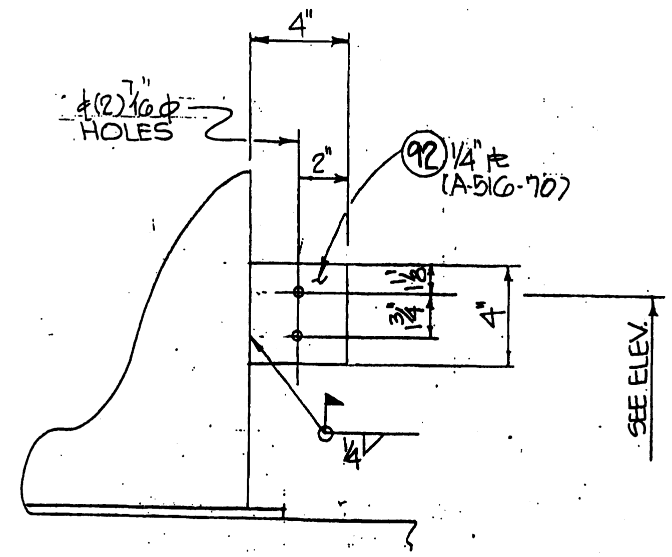
CHECKED: JKH APPROVED:

NO. W-93-2579B-2 REV. B

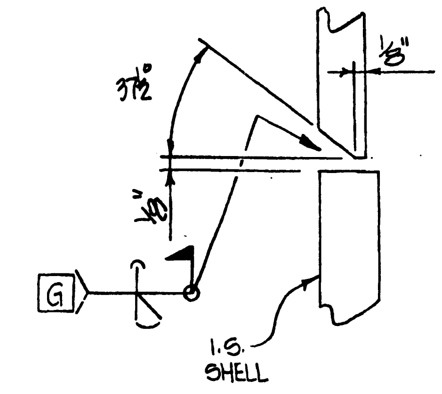
FIELD NOTES

1. THE SHELL TO BOTTOM WELD SHALL BE PERFORMED AS FOLLOWS: (CUST. INSPECTOR TO WITNESS TEST)
   a. Complete the interior shell to bottom weld.
   b. Before making the exterior shell to bottom weld spray the interior shell to bottom weld with dye penetrant developer.
   c. With one inspector on the inside of the tank have someone on the outside of the tank spray the shell to bottom weld with water.
   d. Pinhole leaks will cause the developer to discolor.
   e. Repair any leaks. Recheck repairs for leaks.
   f. Clean up and install exterior shell to bottom weld.

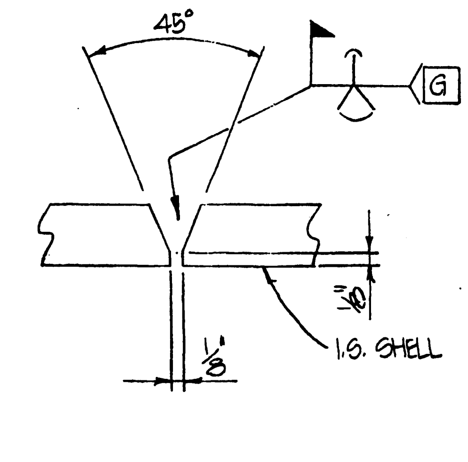
2. G SEE SHT# 2 FOR GRINDING NOTE



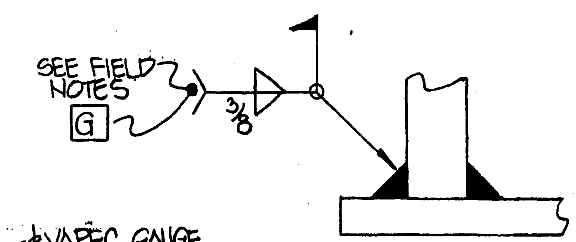
DETAIL OF GROUNDING LUG
(12) REQ'D MK "GL"



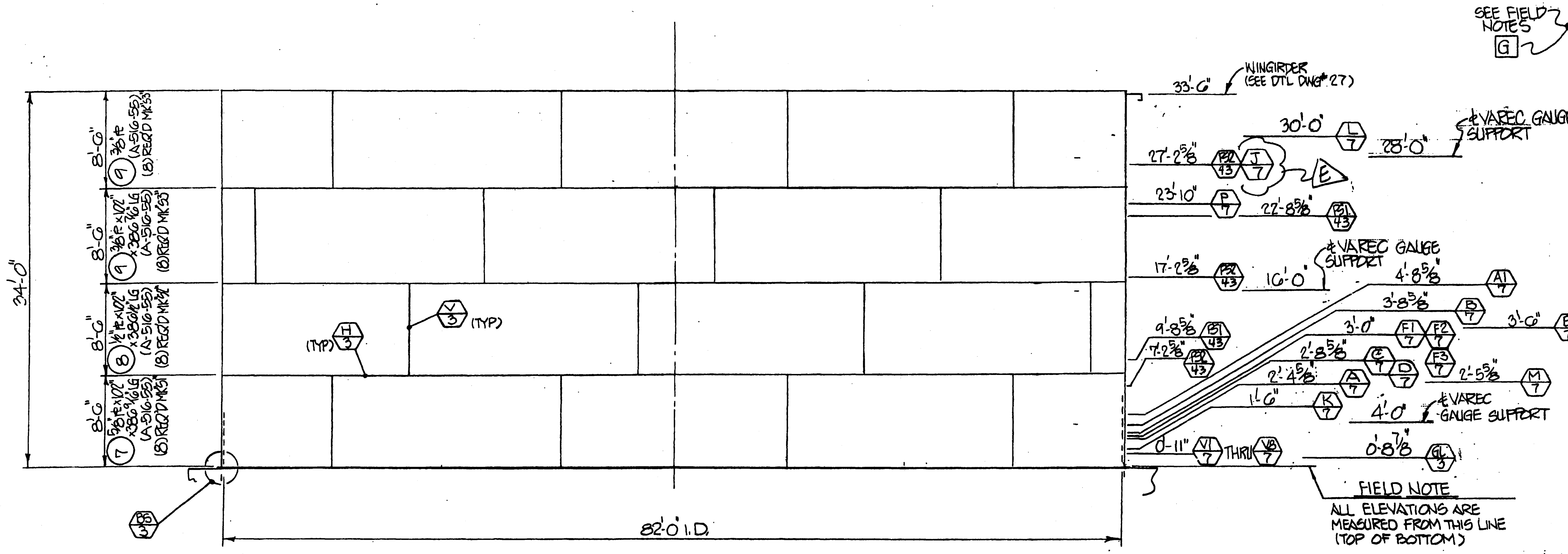
DETAIL "H"



DETAIL "V"



DETAIL "BS"



ELEVATION
(FOR TRUE ORIENT. SEE PLAN DWG# 4)

I CERTIFY THAT THE ATTACHED TANK DRAWING MEETS THE REQUIREMENTS OF THE API-650 CODE, NINTH EDITION, JULY 1993.

REV. E 5/12/94 M.J.K.

STATE OF TEXAS — MICHAEL J. KOPECKY — 46302 — REGISTERED PROFESSIONAL ENGINEER

Michael J. Kopecky

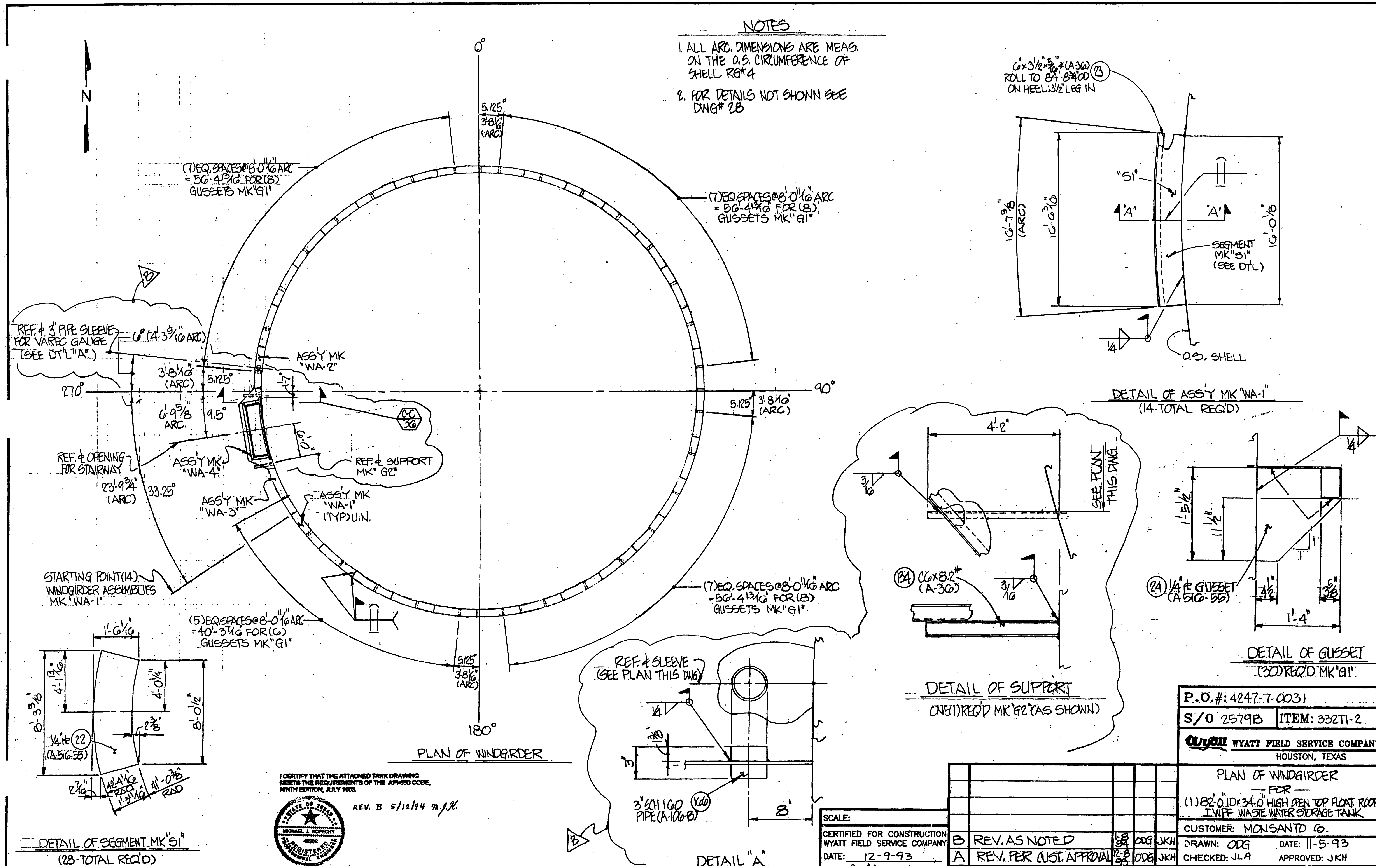
E	REV. AS NOTED	1-27-94	ODG	JKH
D	REV. AS NOTED	1-28-93	ODG	JKH
C	ADD DWG#S FOR "PS1" & "PS2"	12-29-93	~	JKH
B	REV. AS NOTED	11-23-93	ODG	JKH
A	REV. PER CUST. APPROVAL	11-11-93	ODG	JKH
NO.	REVISION	DATE	BY	CHKD

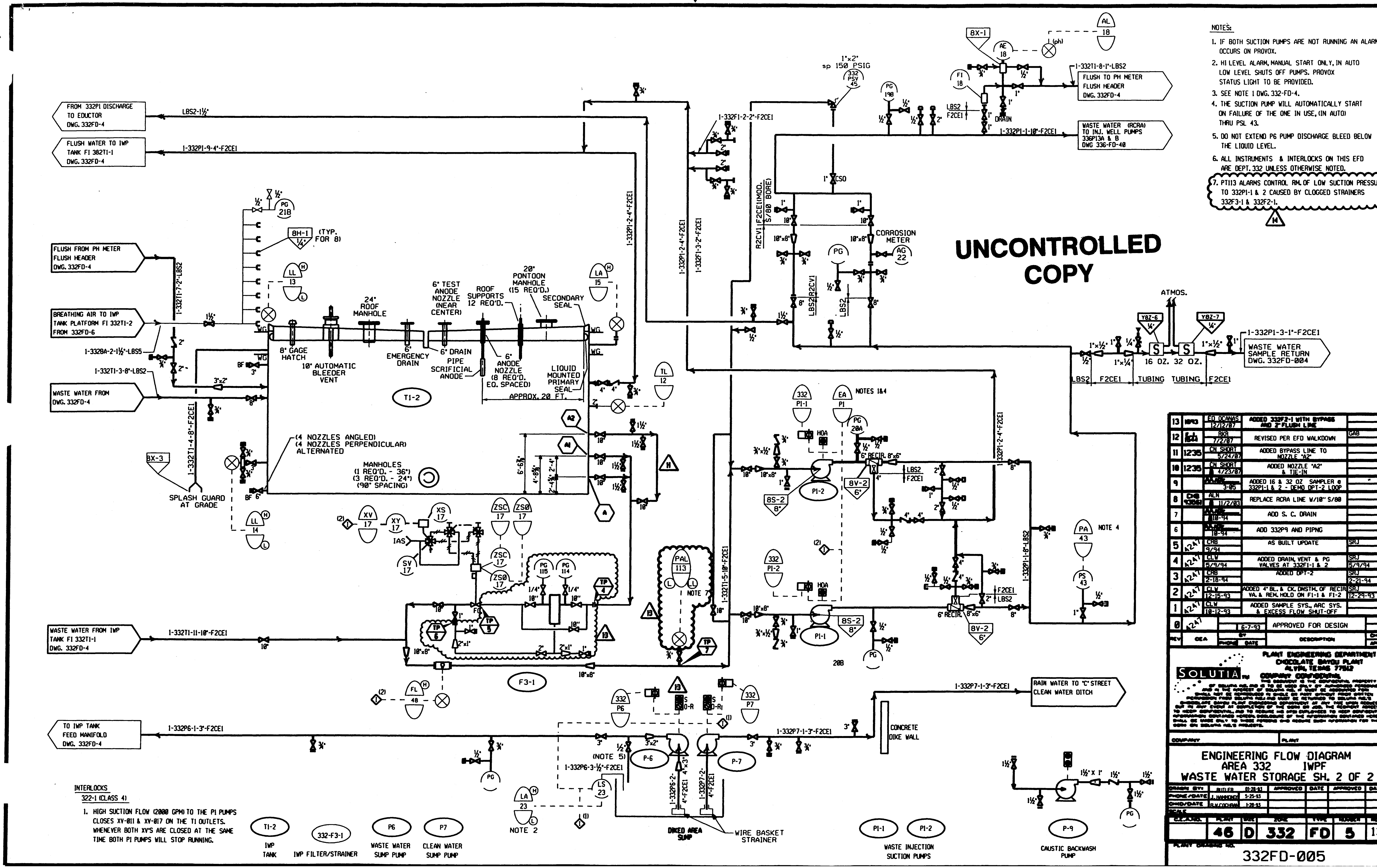
SCALE:
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 11-8-93
BY: [signature]

P.O.#: 4247-7-0031
S/O 25798 ITEM: 332T1-2
WYATT FIELD SERVICE COMPANY
HOUSTON, TEXAS

ELEVATION
— FOR —
(1) 82'-0" ID x 34'-0" HIGH OPEN TOP FLOAT. ROOF IWPF WASTE WATER STORAGE TANK

CUSTOMER: MONSANTO CO.
DRAWN: ODG DATE: 10-5-93
CHECKED: JKH APPROVED:


NOTES
1. ALL ARC. DIMENSIONS ARE MEAS. ON THE O.S. CIRCUMFERENCE OF SHELL RG#4
2. FOR DETAILS NOT SHOWN SEE DWG# 28
N
0°
90°
180°
270°
(7)EQ.SPACES@8'-0 1/16" ARC = 56'-4 13/16" FOR (8) GUSSETS MK"G1"
(5)EQ.SPACES@8'-0 1/16" ARC = 40'-3 1/16" FOR (6) GUSSETS MK "G1"
REF. ¢ 3" PIPE SLEEVE FOR VAREC GAUGE (SEE DT'L "A")
REF. ¢ OPENING FOR STAIRWAY
REF. ¢ SUPPORT MK "G2"
ASS'Y MK "WA-2"
ASS'Y MK "WA-3"
ASS'Y MK "WA-4"
ASS'Y MK "WA-1" (TYP) U.N.
STARTING POINT (14) WINDGIRDER ASSEMBLIES MK "WA-1"
PLAN OF WINDGIRDER
DETAIL OF ASS'Y MK "WA-1"
(14-TOTAL REQ'D)
6"x3 1/2"x5/16" (A-36) ROLL TO 84'-8 3/4" OD ON HEEL; 3 1/2" LEG IN
SEGMENT MK "S1" (SEE DT'L)
O.S. SHELL
DETAIL OF SUPPORT
ONE (1) REQ'D MK "G2" (AS SHOWN)
C6x8.2# (A-36)
SEE PLAN THIS DWG
DETAIL OF GUSSET
(30) REQ'D MK "G1"
1/4" ℞ GUSSET (A-516-55)
DETAIL OF SEGMENT MK "S1"
(28-TOTAL REQ'D)
1/4" ℞ (A-516-55)
DETAIL "A"
REF. ¢ SLEEVE (SEE PLAN THIS DWG)
3" SCH 160 PIPE (A-106-B)
I CERTIFY THAT THE ATTACHED TANK DRAWING MEETS THE REQUIREMENTS OF THE API-650 CODE, NINTH EDITION, JULY 1993.
REV. B 5/12/94
MICHAEL J. KOPECKY 48302 REGISTERED PROFESSIONAL ENGINEER
SCALE:
CERTIFIED FOR CONSTRUCTION WYATT FIELD SERVICE COMPANY
DATE: 12-9-93
B REV. AS NOTED ODG JKH
A REV. PER CUST. APPROVAL ODG JKH
P.O.#: 4247-7-0031
S/O 25798 ITEM: 332T1-2
WYATT FIELD SERVICE COMPANY HOUSTON, TEXAS
PLAN OF WINDGIRDER
— FOR —
(1) 82'-0" ID x 34'-0" HIGH OPEN TOP FLOAT. ROOF IWPF WASTE WATER STORAGE TANK
CUSTOMER: MONSANTO CO.
DRAWN: ODG DATE: 11-5-93
CHECKED: JLA APPROVED: JKH


NOTES:
1. IF BOTH SUCTION PUMPS ARE NOT RUNNING AN ALARM OCCURS ON PROVOX.
2. HI LEVEL ALARM, MANUAL START ONLY, IN AUTO LOW LEVEL SHUTS OFF PUMPS. PROVOX STATUS LIGHT TO BE PROVIDED.
3. SEE NOTE 1 DWG. 332-FD-4.
4. THE SUCTION PUMP WILL AUTOMATICALLY START ON FAILURE OF THE ONE IN USE, (IN AUTO) THRU PSL 43.
5. DO NOT EXTEND P6 PUMP DISCHARGE BLEED BELOW THE LIQUID LEVEL.
6. ALL INSTRUMENTS & INTERLOCKS ON THIS EFD ARE DEPT. 332 UNLESS OTHERWISE NOTED.
7. PT113 ALARMS CONTROL RM. OF LOW SUCTION PRESSURE TO 332P1-1 & 2 CAUSED BY CLOGGED STRAINERS 332F3-1 & 332F2-1.
UNCONTROLLED COPY
FROM 332P1 DISCHARGE TO EDUCTOR DWG. 332FD-4
FLUSH WATER TO IWP TANK FI 332T1-1 DWG. 332FD-4
FLUSH FROM PH METER FLUSH HEADER DWG. 332FD-4
BREATHING AIR TO IWP TANK PLATFORM FI 332T1-2 FROM 332FD-6
WASTE WATER FROM DWG. 332FD-4
WASTE WATER FROM IWP TANK FI 332T1-1 DWG. 332FD-4
TO IWP TANK FEED MANIFOLD DWG. 332FD-4
FLUSH TO PH METER FLUSH HEADER DWG. 332FD-4
WASTE WATER (RCRA) TO INJ. WELL PUMPS 336P13A & B DWG 336-FD-40
WASTE WATER SAMPLE RETURN DWG. 332FD-004
RAIN WATER TO "C" STREET CLEAN WATER DITCH
24" ROOF MANHOLE
6" TEST ANODE NOZZLE (NEAR CENTER)
ROOF SUPPORTS 12 REQ'D.
20" PONTOON MANHOLE (15 REQ'D.)
SECONDARY SEAL
8" GAGE HATCH
10" AUTOMATIC BLEEDER VENT
6" EMERGENCY DRAIN
6" DRAIN PIPE SCRIFICIAL ANODE
6" ANODE NOZZLE (8 REQ'D. EQ. SPACED)
LIQUID MOUNTED PRIMARY SEAL
APPROX. 20 FT.
(4 NOZZLES ANGLED) (4 NOZZLES PERPENDICULAR) ALTERNATED
MANHOLES (1 REQ'D. - 36") (3 REQ'D. - 24") (90° SPACING)
SPLASH GUARD AT GRADE
CORROSION METER
CONCRETE DIKE WALL
DIKED AREA SUMP
WIRE BASKET STRAINER
INTERLOCKS
322-1 (CLASS 4)
1. HIGH SUCTION FLOW (2000 GPM) TO THE P1 PUMPS CLOSES XV-011 & XV-017 ON THE T1 OUTLETS. WHENEVER BOTH XV'S ARE CLOSED AT THE SAME TIME BOTH P1 PUMPS WILL STOP RUNNING.
T1-2 IWP TANK
332-F3-1 IWP FILTER/STRAINER
P6 WASTE WATER SUMP PUMP
P7 CLEAN WATER SUMP PUMP
P1-1 P1-2 WASTE INJECTION SUCTION PUMPS
P-9 CAUSTIC BACKWASH PUMP
13 | ED OCANAS 12/12/07 | ADDED 332F2-1 WITH BYPASS AND 2" FLUSH LINE
12 | RKR 7/2/07 | REVISED PER EFD WALKDOWN | GAB
11 | 1235 | CN SHORT 5/24/07 | ADDED BYPASS LINE TO NOZZLE "A2"
10 | 1235 | CN SHORT 4/23/07 | ADDED NOZZLE "A2" & TIE-IN
9 | 3-05 | ADDED 16 & 32 OZ SAMPLER @ 332P1-1 & 2 - DEMO OPT-2 LOOP
8 | ALN 11/2/03 | REPLACE RCRA LINE W/10" S/80
7 | ADD S. C. DRAIN
6 | ADD 332P9 AND PIPING
5 | CRB 5/94 | AS BUILT UPDATE | SRJ
4 | CLW 5/9/94 | ADDED DRAIN, VENT & PG VALVES AT 332F1-1 & 2 | SRJ 5/9/94
3 | CRB 2-18-94 | ADDED OPT-2 | SRJ 2-21-94
2 | CLW 12-15-93 | ADDED 4" BL. & CK. DNSTM. OF RECIR VA. & REM. HOLD ON F1-1 & F2-2 | SRJ 12-29-93
1 | CLW 10-12-93 | ADDED SAMPLE SYS., ARC SYS. & EXCESS FLOW SHUT-OFF
0 | 6-7-93 | APPROVED FOR DESIGN
PLANT ENGINEERING DEPARTMENT CHOCOLATE BAYOU PLANT ALVIN, TEXAS 77512
SOLUTIA
COMPANY CONFIDENTIAL
ENGINEERING FLOW DIAGRAM
AREA 332 IWPF
WASTE WATER STORAGE SH. 2 OF 2
46 D 332 FD 5 13
332FD-005

SECONDARY CONTAINMENT

CERTIFICATION

Solutia

(From: Name, Location, Phone) Jimmy Lee Means, Engineering, 281-228-4055

Date: July 12, 2000

cc: W. A. Kibikas
E. A. Fiesinger

Subj: Certification of Volume Calculations

Ref: Attached calculations and previous calculations

To: J. T. Moos

Calculations were performed to verify that the modifications made to the existing Injection Well Pretreatment Facility by the Non-Hazardous Deepwell System Project did not exceed the excess volume of the secondary containment as required by the RCRA permit. Based upon the previous calculations performed by Mr. Gerald S. Hagy P.E., the excess volume of the secondary containment before the Non-Hazardous Deepwell System project is 36,747 gallons. Based upon the dimensional data from the project files, the new pump foundations, pumps, and miscellaneous pipe support foundations and new piping within the 4 ft elevation; the total volume of the modification is 3,135 gallons. Therefore the excess volume after the modifications made by the Non-Hazardous Deepwell System Project is 33,612 gallons.

STATE OF TEXAS
JIMMY LEE MEANS
54749
REGISTERED
PROFESSIONAL ENGINEER

Jimmy Lee Means
7/12/2000

332S1-1, 2

PARSONS ENGINEERING SCIENCE, INC.

Client MONSANTO CHOCOLATE BAYOU Job No. ______ Sheet 1 of 5

Subject SECONDARY CONTAINMENT FOR SETTLERS AND 332T1'S AND EQUIPMENT By G. S. HAGY Date 6/9/95

Checked ______ Rev. ______

OBJECT OF CALCULATIONS

DETERMINE EXCESS VOLUME WITHIN PERMITTED 332T1 DIKE AND WHETHER THIS IS ENOUGH TO PLACE NEW SETTLER TANKS (2) WITHIN THE SAME DIKE ENCLOSURE.

BACKGROUND

CALCULATIONS WERE MADE FOR THE RCRA PERMIT APPLICATION FOR 332T1-1&2 AND PUMPS (IN PFL PROJECT) TO DETERMINE THE SECONDARY CONTAINMENT VOLUME FOR ONE T1 TANK AND 10" OF RAINFALL. THESE CALCULATIONS BY COCHRAN DATED 2/2/93, SHOWED THERE WAS 13,933 GALS OF EXCESS VOLUME WITHIN THE 4' DIKE WITH DIMENSION OF 220'x260'. REVIEWING THESE CALCULATIONS IT WAS NOTED THAT THE WEDGE FORMED FROM SLOPING THE DIKED AREA WHILE MAINTAINING A MINIMUM DIKE HEIGHT OF 4', WAS NOT CONSIDERED IN THE ORIGINAL CALCULATIONS, AND THUS WOULD BE AVAILABLE AS SECONDARY CONTAINMENT VOLUME ALLOWANCE.

STATE OF TEXAS
GERALD S. HAGY
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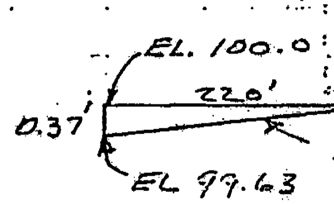
REGISTERED
PROFESSIONAL ENGINEER

6/9/95

CALCULATIONS

1. VOLUME OF WEDGE

DIKED FLOOR AREA 220'x260'



VOL. = $\frac{1}{2} \times 0.37 \times 220' \times 260'$

$= 10582\ ft^3$

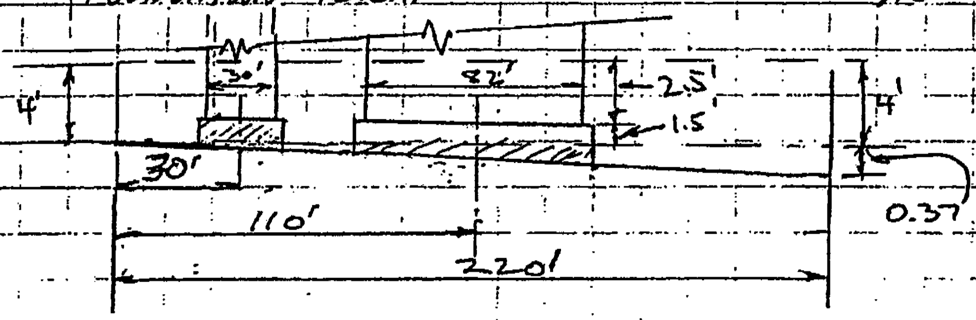
= [illegible] gal

PARSONS ENGINEERING SCIENCE, INC.

Client MONSANTO - CHOCOLATE BAYOU | Job No. | Sheet 2 of 5
Subject SECONDARY CONTAINMENT FOR SETTLERS AND EQUIPMENT | By G.S. HAGH | Date 9/6/95
Checked | Rev.

2. DISPLACED VOLUME OF 2 NEW SETTLER TANKS AND 3 NEW PUMPS PLUS DISPLACEMENT OF 2 EXISTING TANKS IN WEDGE.

	NEW TKS	EXISTING TKS
TANK DIAMETER	30'	82'
FOUNDATION "	31'	83'
FOUNDATION HEIGHT	1.5'	1.5'



VOLUME 2 NEW SETTLER TANKS UP TO 4' HIGH

$$VOL = \frac{\pi}{4} 30'^2 \times 2.5' \times 2 = \underline{3533\ FT^3}$$

VOLUME FOUNDATION SETTER TANKS.

SLOPE OF BOTTOM

$$\frac{0.37}{220} = .00168$$

$$AVE.\ HEIGHT = (45-15)0.00168 + 1.5 = 1.55'$$

$$VOL = 2\left[1.55 \times \frac{31^2}{4}\pi\right] = \underline{2340\ FT^3}$$

VOLUME FOUNDATIONS EXISTING TANKS IN WEDGE

$$AVG\ HEIGHT\ (151-69)0.00168 = .14'$$

$$VOL = 2\left[.14 \times \frac{81^2}{4}\pi\right] = \underline{1443\ FT^3}$$

6/9/95

PARSONS ENGINEERING SCIENCE, INC.

Client MONSANTO - CHOCOLATE BAYOU Job No. ______ Sheet 3 of 5
Subject SECONDARY CONTAINMENT FOR SETTLERS AND EQUIPMENT By GS HAGY Date 9/9/95
Checked ______ Rev. ______

2 - CONT

VOLUME DISPLACED BY PUMPS
SULFATE PUMP 24 FT3, EFFLUENT PUMPS 192 FT3 = 216 FT3

TOTAL DISPLACED VOLUME

2 SETTLER TANKS	3533 FT3
2 SETTLER TANK FOUNDATIONS	2340 FT3
2 EXISTING TANKS (VOL IN WEDGE)	1443 FT3
PUMPS	216 FT3
	7532 FT3
=	56,339 gals

3. TOTAL VOLUME AVAILABLE FROM WEDGES AND ORIGINAL PERMIT EXCESS CALCULATIONS (2/4/93)

VOLUME AVAILABLE 79,153 + 13,933

= 93,086 gals

STATE OF TEXAS
GERALD S. HAGY
76657
REGISTERED PROFESSIONAL ENGINEER

4. EXCESS VOLUME OVER WHATS NEEDED FOR TWO SETTLER TANKS AND 3 NEW PUMPS

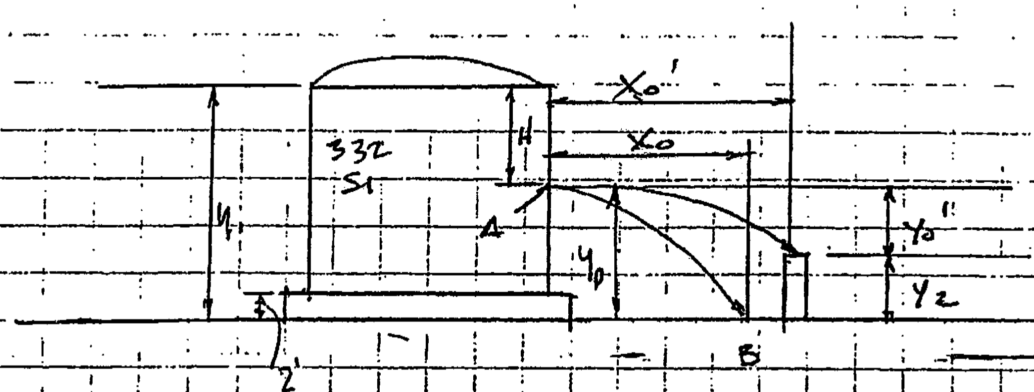
Gerald S. Hagy
6/9/95

EXCESS VOLUME = 93,086 gals - 56,339 gals
= 36,747 gals

CONCLUSION: PRESENT DIKE VOLUME IS ADEQUATE SECONDARY CONTAINMENT FOR ADDITION OF 2 30' DIAMETER TANKS AND 3 NEW PUMPS

PARSONS ENGINEERING SCIENCE, INC.

Client: MONSANTO - CHOCOLATE BAYOU | Job No. | Sheet 4 of 5
Subject: SECONDARY CONTAINMENT EVAL SETTLERS AND 332T1S AND EQUIP | By: G. S. HAGY | Date: 9/9/95
Checked | Rev.



ASSUME A HOLE IS PUNCHED AT LOCATION A. DETERMINE THE DISTANCE THE LEAK WILL TRAVEL (X_0 @ POINT B) ASSUMING THE TANK IS FULL AND THE HOLE IS LOCATED AT $Y_1/2$ WHICH WILL PRODUCE THE DISTANCE OUT FROM THE TANK.

$$V_2 = \sqrt{2gH} = V_0 = X_0 / \sqrt{2Y_0/g}$$

$$\frac{X_0}{\sqrt{2Y_0/g}} = \sqrt{2gH}$$

$$X_0 = \sqrt{2gH(2Y_0/g)} = \sqrt{4HY_0}$$

SINCE $Y_0 = Y_1 - H$, $X_0 = \sqrt{4H(Y_1 - H)}$

$$Y_1 = 17', \quad H = 17/2 = 8.5'$$

$$X_0 = \sqrt{4(8.5)(8.5)} = 17'$$

STATE OF TEXAS
GERALD S. HAGY
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6/9/95

DETERMINE CONDITION WITH RESPECT TO DIKEWALL

$X_0' = \sqrt{4HY_0}$ $\quad Y_0' = \dfrac{X_0'^2}{4H}$

IF $Y_1 - Y_2 = H + Y_0'$ THE LEAK LANDS ON TOP OF DIKE

IF $Y_1 - Y_2 > H + Y_0'$ CONTAINMENT IS INADEQUATE

IF $Y_1 - Y_2 < H + Y_0'$ CONTAINMENT IS ADEQUATE

PARSONS ENGINEERING SCIENCE, INC.

Client MONSANTO – CHOCOLATE BAYOU Job No. Sheet 5 of 5
Subject SECONDARY CONTAINMENT FOR SETTLERS AND 332 T/S AND ED. By G. S. HAGY Date 6/9/95
Checked Rev.

$$Y_0' = Y_0 - Y_2 = 8.5' - 4 = 4.5'$$

$$X_0 = \sqrt{4(8.5)(4.5)} = 12.4'$$

$$Y_1 - Y_2 = 17 - 4 = 13'$$

$$H + Y_0' = 8.5 + 4.5 = 13'$$

LEAK WILL LAND ON TOP OF DIKE ASSUMING NO WIND AFFECTS.

USE 15' FOR DISTANCE BETWEEN TANK AND DIKEWALL

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VOLUME CALCULATIONS FROM PROJECT DWGS. P#1

PUMP & PUMP FOUNDATIONS; 332P15-1&2

$V_P = [(11.5\ FT) \times (4.25\ FT) \times (4.0\ FT)] \times 2$

$V_P = 391\ FT^3$

$V_P = 2{,}925$ GALLONS

MISCELLANEOUS PIPE SUPPORTS; 5 TOTAL

$V_{PS} = [(1.5\ FT) \times (1.5\ FT) \times (1.2$[illegible]$)] \times 5$

$V_{PS} = 14\ FT^3$

$V_{PS} = 105$ GALLONS

STATE OF TEXAS
JIMMY LEE MEANS
54749
REGISTERED PROFESSIONAL ENGINEER

Jimmy Lee Means
7/12/2000

PIPING; BELOW ELEVATION 104'-0"

$V_1 = 6\ FT$ OF $4\ IN = 6\ FT \times 0.0884\ FT^2 = 0.5\ FT^3$
$V_2 = 9\ FT$ OF $6\ IN = 9\ FT \times 0.2006\ FT^2 = 1.8\ FT^3$
$V_3 = 9\ FT$ OF $6\ IN = 9\ FT \times 0.2006\ FT^2 = 1.8\ FT^3$
$V_4 = 10\ FT$ OF $6\ IN = 10\ FT \times 0.2006\ FT^2 = 2.0\ FT^3$
$V_5 = 10\ FT$ OF $6\ IN = 10\ FT \times 0.2006\ FT^2 = 2.0\ FT^3$
$V_6 = 21\ FT$ OF $6\ IN = 21\ FT \times 0.2006\ FT^2 = 4.2\ FT^3$
$V_7 = 8\ FT$ OF $6\ IN = 8\ FT \times 0.2006\ FT^3 = 1.6\ FT^3$
$V_8 = 5\ FT$ OF $2\ IN = 5\ FT \times 0.0233\ FT^3 = \underline{0.1\ FT^3}$
$V_{PP} = 14\ FT^3$
$V_{PP} = 105$ GALLONS

VOLUME CALCULATIONS FROM PROJECT DWGS P#2

TOTAL VOLUME = $V_P + V_{PS} + V_{PP}$
= (2,925 GAL) + (105 GAL) + (105 GAL)
= 3,135 GALLONS

EXCESS VOLUME BEFORE MODIFICATIONS	36,747 GAL
VOLUME OF MODIFICATIONS	(−) 3,135 GAL
EXCESS VOLUME AFTER MODIFICATIONS	33,612 GAL

STATE OF TEXAS
JIMMY LEE MEANS
54749
REGISTERED
PROFESSIONAL ENGINEER

Jimmy Lee Means
7/12/2000

Southern Services, Inc.

Dba. Southern Technical Services
P.O. Box 423 Lake Jackson, Texas 77566
(979) 265-3342 Fax (979) 265-1112

API 653 IN SERVICE TANK INSPECTION

EXTERNAL VISUAL AND ULTRASONIC REPORT

FOR

SOLUTIA, INC.

TANK # 332T1-2

CHOCOLATE BAYOU FACILITY

ALVIN, TX

Feb. 23, 2009

INTRODUCTION

Solutia, Inc. contracted Southern Services to provide inspection services for Tank # ***332T1-2***

This report documents the findings and provides a detailed evaluation of the external visual and ultrasonic inspection results per the applicable criteria of API 653 Standards.

Southern Services Inspection Personnel:

Jason McHam
API 653 AST Inspector Certification 29213
RT II, MTII, PTII, UTII

Neil Wilson
RT II, MTII, PTII, UTII

Jacob Blaylock
UTII

API 653

IN SERVICE

CERTIFICATE OF COMPLIANCE

ON

TANK # 332T1-2

FOR

SOLUTIA, INC

2/23/2009

THIS IS TO CERTIFY THAT THIS TANK HAS BEEN INSPECTED BY SOUTHERN SERVICES IN ACCORDANCE WITH THE APPLICABLE SECTION OF API 653.
ANY DISCREPANCIES FOUND DURING THIS INSPECTION HAVE BEEN ADDRESSED, AND REPAIRS OR MODIFICATIONS HAVE BEEN MADE TO MEET THE API 653 STANDARDS.

AS OF THE DATE INSPECTED, THIS TANK WILL REMAIN WITHIN THE API653 STANDARDS FOR THE NEXT 5 YEARS.

JASON MCHAM	API # 29213
NEIL WILSON	LEVEL II

Compliance

Tank # 332T1-2 needs the following discrepancies addressed to meet the API 653 requirements:

1) none

There are some weld spacing issues with the nozzles on the first shell course that are not acceptable with current API code.

TABLE OF CONTENTS

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

Owner:	Solutia, Inc	Date:	Feb. 23, 2009
Location:	ECU	Page:	1
Tank:	332T1-2	WO#:	12319407

. TANK DESCRIPTION

GENERAL:		
	TANK NUMBER:	332T1-2
	TANK OWNER:	Solutia, Inc.
	DESIGN STD:	API 650
	TANK LOCATION:	ECU
	MANUFACTURER:	Wyatt Field Service Co.
	PRODUCT:	Waste Water
	SPECIFIC GRAVITY:	1.0
	DATA PLATE PRESENT:	Yes
DIMENSIONS:		
	DIAMETER:	82'
	HEIGHT:	34'
	FILL HEIGHT:	34"
	NOMINAL CAPACITY:	27,919 bbls
GEOMETRY:		
	FOUNDATION:	Concrete ring wall
	SHELL:	Butt-welded
	ROOF:	Double deck floating roof
DATES:		
	YEAR BUILT:	1994
	LAST COATED:	N/A
	LAST INSPECTED:	Apr-05
COATINGS:		
	SHELL:	White Paint
	ROOF:	White Paint

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE
Owner: Solutia, Inc		Date: Feb. 23, 2009	
Location: ECU		Page: 2	
Tank: 332T1-2		WO#: 12319407	

2. FOUNDATION INSPECTION

Foundation and the floor plate extension are both sealed. Seal is in good condition. Tank is in service so there was no settlement survey taken at this time.

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

Owner:	Solutia, Inc	Date:	Feb. 23, 2009
Location:	ECU	Page:	3
Tank:	332T1-2	WO#:	12319407

3. SHELL INSPECTION

Shell calculations indicate that a safe fill height of 34 ft. can be utilized with product specific gravities up to 1 (ref API 653, para. 4.3.3.1). These calculations do not take into consideration any restrictions created by internal or external floating roofs, overflow vents, etc. 8 UT B-Scan drops were taken (as requested by customer) and all shell course thickness readings were found to be well above the minimum required thickness as per API 653 para. 4.3.3.1. No significant wall loss was found. A paint factor of .015" was removed for a more accurate representation of the thickness (the paint factor was achieved by comparing echo-to-echo mode and standard mode with both the B-Scan equipment and the 36DL+). Visual inspection found the paint to be in overall good condition with some areas of minor paint failure with light surface corrosion. Paint is also chalky.

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

Owner:	Solutia, Inc	Date:	Feb. 23, 2009
Location:	ECU	Page:	4
Tank:	332T1-2	WO#:	12319407

3.1 SHELL THICKNESS CALCULATIONS

The minimum acceptable shell plate thickness for tanks with a diameter equal to or less than 200 ft. is calculated as follows (API 653, Para. 4.3.3.1):

$$t\ \text{min} = \frac{2.6(H-1)DG}{SE}$$

Where:

S =	See Table	Allowable Stress (psi)
D =	82	Nominal Diameter of Tank (ft.)
G =	1	Highest Specific Gravity of Contents
H =	34	Product Height (ft.)
E =	1	Joint Efficiency

Using the smaller of 0.80Y or 0.429T for the bottom and second shell course
and the smaller of 0.88Y or 0.472T for all other courses
T-Min cannot be less than .100" for any shell course as per API 653 4.3.3.1.

Course	Course Height (ft.)	Product Height (ft.)	Joint Efficiency	Allowable Stress (psi)	Lowest Thickness Found (in.)	Required Thickness (in.)	Nominal Thickness (in.)
1	8.5	34	1	23,600	0.637	0.298	0.625
2	8.5	25.5	1	23,600	0.512	0.221	0.500
3	8.5	17	1	26,000	0.372	0.131	0.375
4	8.5	8.5	1	26,000	0.390	0.062	0.375

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

Owner:	Solutia, Inc	Date:	Feb. 23, 2009
Location:	ECU	Page:	5
Tank:	332T1-2	WO#:	12319407

3.2 SHELL UT READINGS

SHELL ULTRASONIC THICKNESS READINGS

(IN INCHES)

A = NORTH C=EAST E=SOUTH G=WEST

A (0°) Scan

READING NO:	1	2	3	4	Average
COURSE 1	0.643	0.672	0.666	0.638	0.655
COURSE 2	0.512	0.561	0.547	0.553	0.543
COURSE 3	0.388	0.396	0.411	0.402	0.399
COURSE 4	0.392	0.403	0.414	0.421	0.408

B (45°) Scan

READING NO:	1	2	3	4	Average
COURSE 1	0.637	0.648	0.653	0.662	0.650
COURSE 2	0.533	0.542	0.557	0.562	0.549
COURSE 3	0.392	0.402	0.412	0.410	0.404
COURSE 4	0.390	0.396	0.410	0.415	0.403

C (90°) Scan

READING NO:	1	2	3	4	Average
COURSE 1	0.659	0.688	0.690	0.696	0.683
COURSE 2	0.547	0.583	0.579	0.559	0.567
COURSE 3	0.402	0.462	0.454	0.415	0.433
COURSE 4	0.421	0.436	0.449	0.451	0.439

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

Owner:	Solutia, Inc	Date:	Feb. 23, 2009
Location:	ECU	Page:	6
Tank:	332T1-2	WO#:	12319407

3.2 SHELL UT READINGS

SHELL ULTRASONIC THICKNESS READINGS

A = NORTH C=EAST E=SOUTH G=WEST

D (135°) Scan

READING NO:	1	2	3	4	AVERAGE
COURSE 1	0.644	0.669	0.687	0.692	0.673
COURSE 2	0.541	0.553	0.564	0.572	0.558
COURSE 3	0.395	0.418	0.420	0.432	0.416
COURSE 4	0.405	0.432	0.426	0.414	0.419

E (180°) Scan

READING NO:	1	2	3	4	AVERAGE
COURSE 1	0.655	0.702	0.693	0.679	0.682
COURSE 2	0.545	0.556	0.563	0.578	0.561
COURSE 3	0.389	0.414	0.409	0.393	0.401
COURSE 4	0.409	0.433	0.427	0.418	0.422

F (225°) Scan

READING NO:	1	2	3	4	AVERAGE
COURSE 1	0.638	0.706	0.692	0.686	0.681
COURSE 2	0.533	0.555	0.553	0.568	0.552
COURSE 3	0.389	0.399	0.424	0.431	0.411
COURSE 4	0.391	0.410	0.420	0.414	0.409

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

Owner:	Solutia, Inc	Date:	Feb. 23, 2009
Location:	ECU	Page:	7
Tank:	332T1-2	WO#:	12319407

3.2 SHELL UT READINGS

SHELL ULTRASONIC THICKNESS READINGS

A = NORTH C=EAST E=SOUTH G=WEST

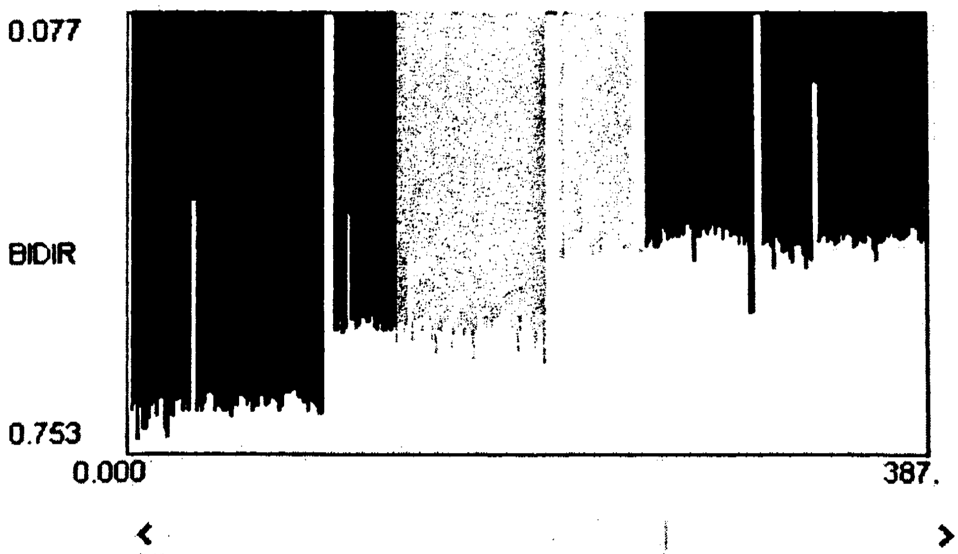
G (270°) Scan

READING NO:	1	2	3	4	AVERAGE
COURSE 1	0.640	0.676	0.669	0.653	0.660
COURSE 2	0.514	0.543	0.536	0.521	0.529
COURSE 3	0.372	0.409	0.399	0.386	0.392
COURSE 4	0.420	0.443	0.440	0.456	0.440

H (315°) Scan

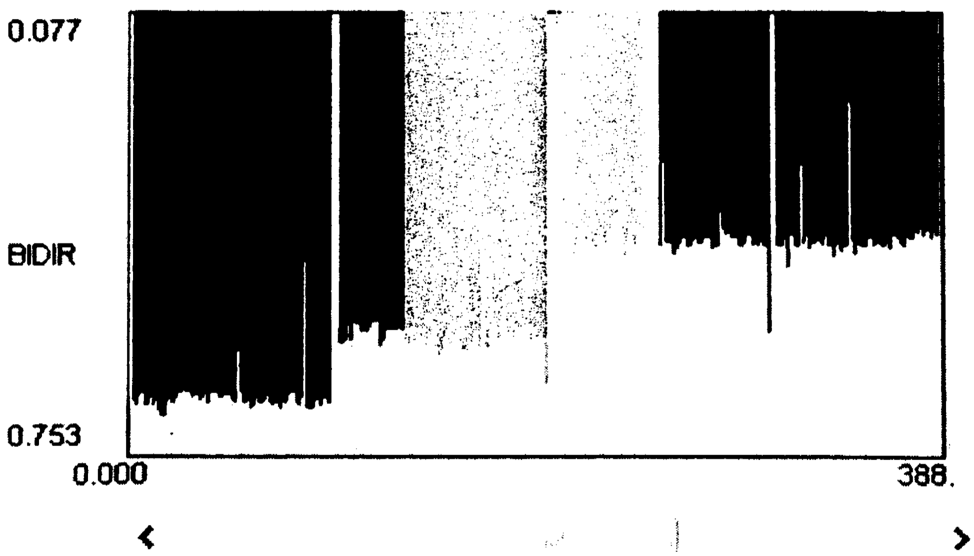
READING NO:	1	2	3	4	AVERAGE
COURSE 1	0.638	0.656	0.662	0.671	0.657
COURSE 2	0.531	0.551	0.546	0.539	0.542
COURSE 3	0.379	0.383	0.398	0.406	0.392
COURSE 4	0.399	0.414	0.424	0.432	0.417

3.3 332T1-2 B-Scan Drop 1 (compressed form) pg. 8



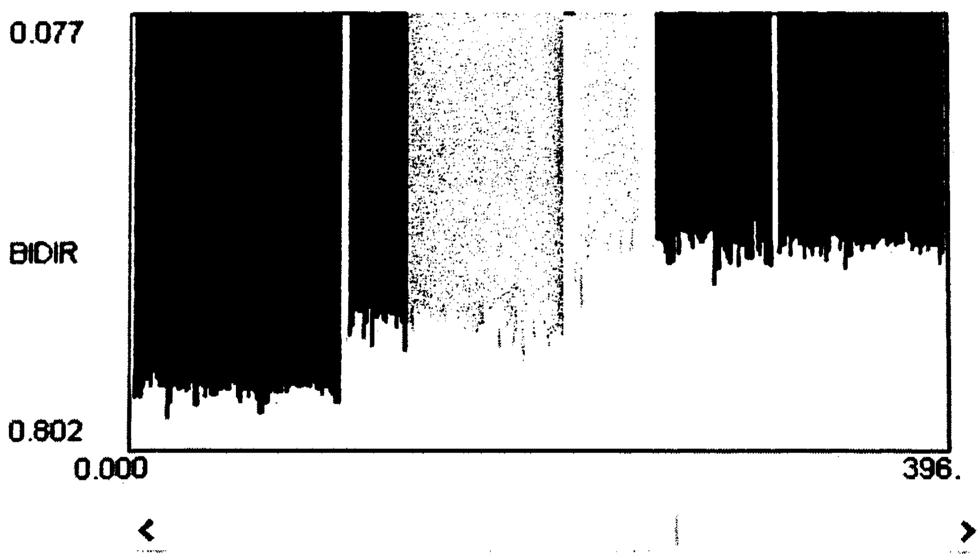
Low for entire course 1:	**0.643**	**Low for entire course 2:**	**0.512**
Average for entire course 1:	**0.666**	**Average for entire course 2:**	**0.547**
Low for entire course 3:	**0.388**	**Low for entire course 4:**	**0.392**
Average for entire course 3:	**0.411**	**Average for entire course 4:**	**0.414**

3.3 332T1-2 B-Scan Drop 2 (compressed form) pg. 9



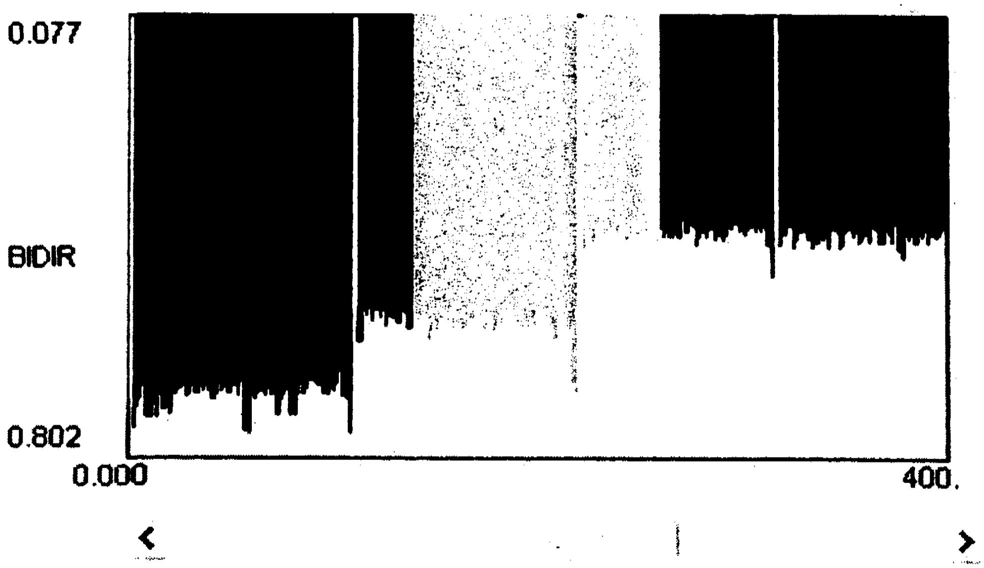
Low for entire course 1:	0.637	Low for entire course 3:	0.533
Average for entire course 1:	0.653	Average for entire course 3:	0.557
Low for entire course 2:	0.392	Low for entire course 4:	0.390
Average for entire course 2:	0.412	Average for entire course 4:	0.410

3.3 332T1-2 B-Scan Drop 3 (compressed form) pg. 10



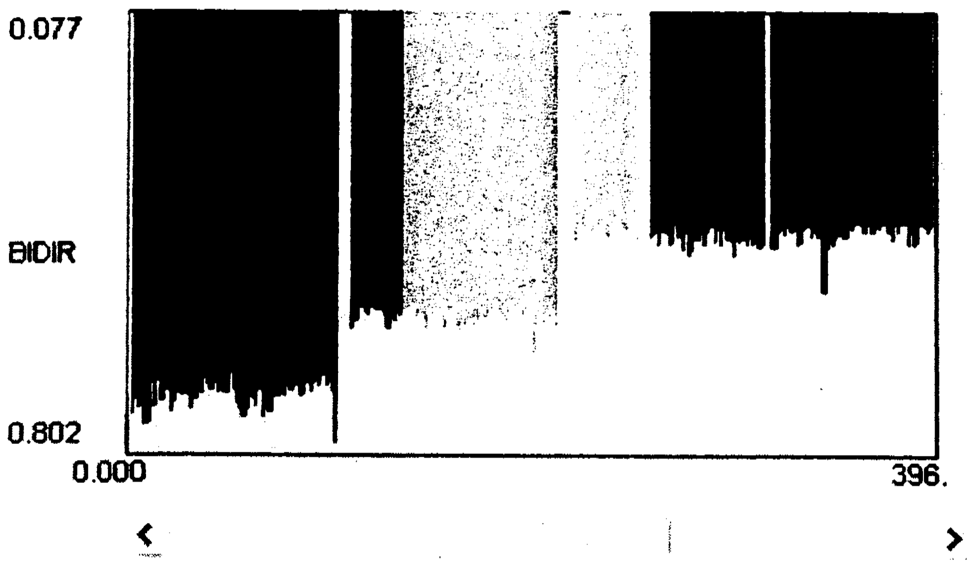
Low for entire course 1:	**0.659**	**Low for entire course 2:**	**0.547**
Average for entire course 1:	**0.690**	**Average for entire course 2:**	**0.579**
Low for entire course 3:	**0.402**	**Low for entire course 4:**	**0.421**
Average for entire course 3:	**0.454**	**Average for entire course 4:**	**0.449**

3.3 332T1-2 B-Scan Drop 4 (compressed form) pg. 11



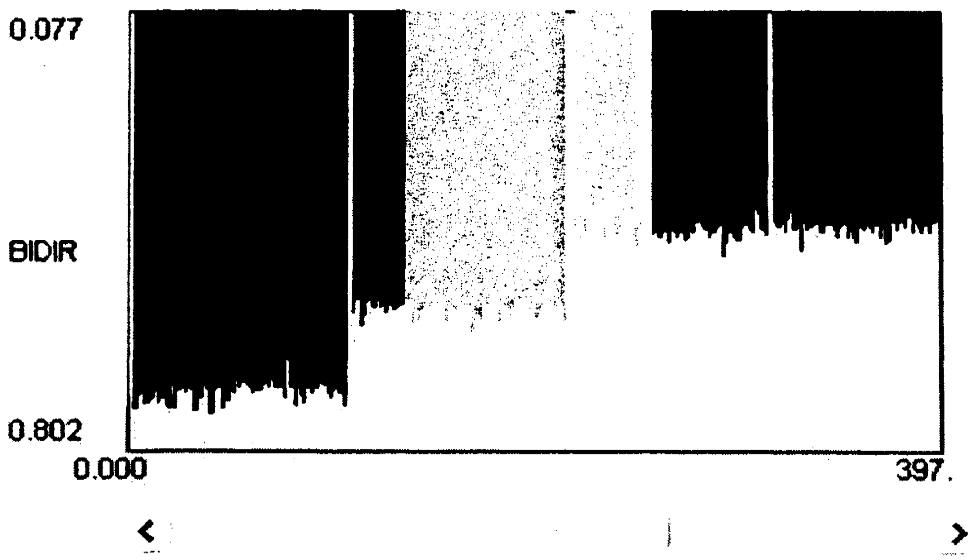
Low for entire course 1:	**0.644**	**Low for entire course 2:**	**0.541**
Average for entire course 1:	**0.687**	**Average for entire course 2:**	**0.564**
Low for entire course 3:	**0.395**	**Low for entire course 4:**	**0.405**
Average for entire course 3:	**0.420**	**Average for entire course 4:**	**0.426**

3.3 332T1-2 B-Scan Drop 5 (compressed form) pg. 12



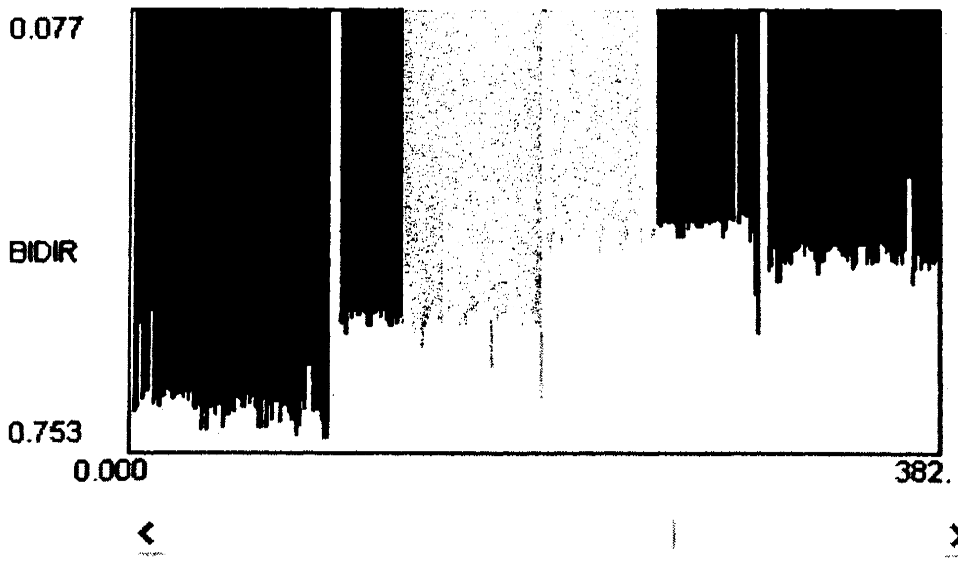
Low for entire course 1:	0.655	Low for entire course 2:	0.545
Average for entire course 1:	0.693	Average for entire course 2:	0.563
Low for entire course 3:	0.389	Low for entire course 4:	0.409
Average for entire course 3:	0.427	Average for entire course 4:	0.427

3.3 332T1-2 B-Scan Drop 6 (compressed form) pg. 13



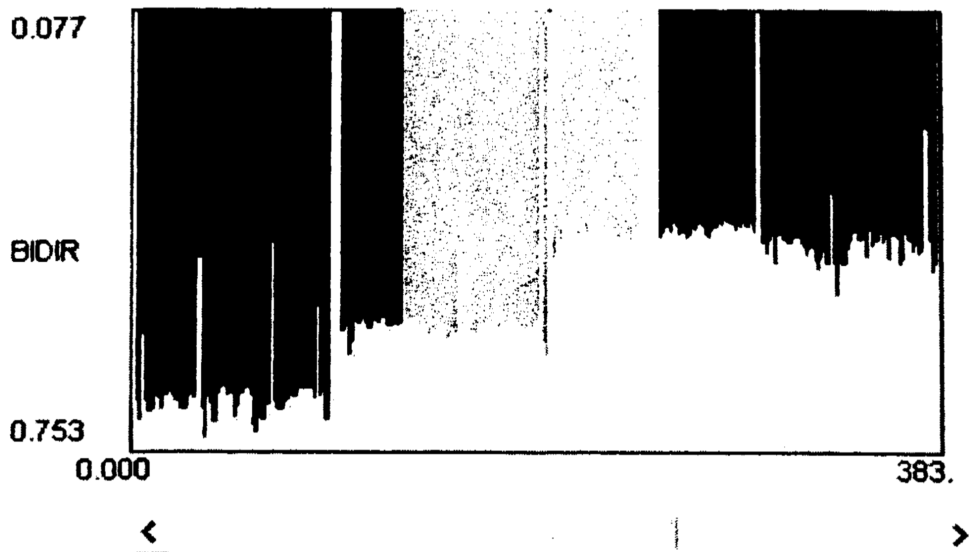
Low for entire course 1:	**0.638**	**Low for entire course 2:**	**0.533**
Average for entire course 1:	**0.692**	**Average for entire course 2:**	**0.553**
Low for entire course 3:	**0.389**	**Low for entire course 4:**	**0.391**
Average for entire course 3:	**0.424**	**Average for entire course 4:**	**0.420**

3.3 332T1-2 B-Scan Drop 7 (compressed form) pg. 14



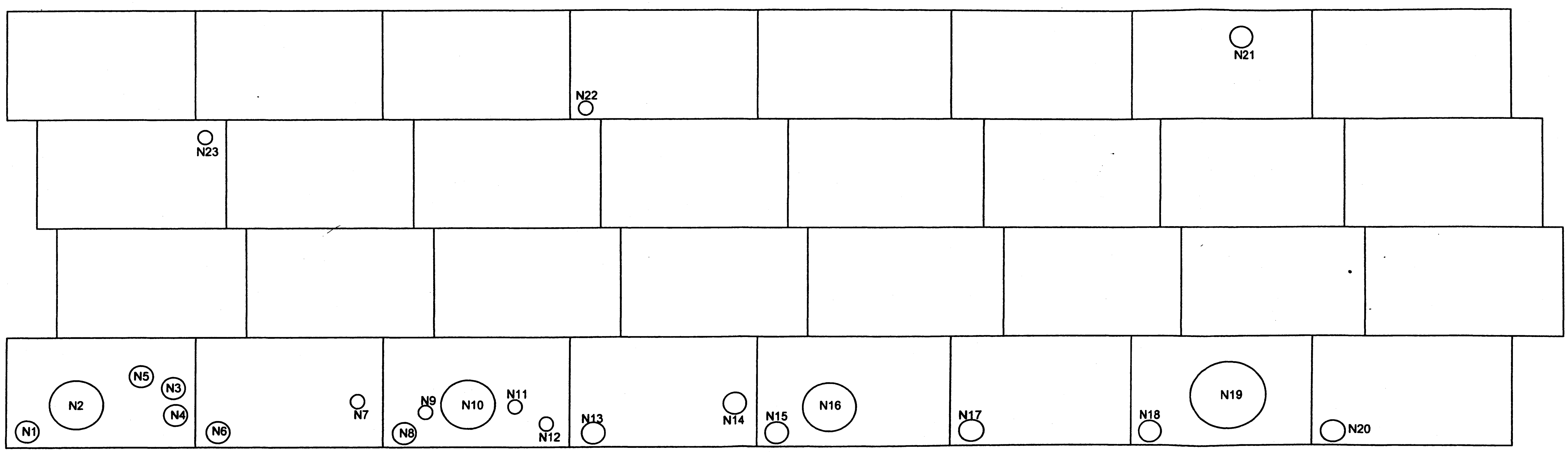
Low for entire course 1:	**0.640**	**Low for entire course 2:**	**0.514**
Average for entire course 1:	**0.669**	**Average for entire course 2:**	**0.536**
Low for entire course 3:	**0.372**	**Low for entire course 4:**	**0.420**
Average for entire course 3:	**0.399**	**Average for entire course 4:**	**0.440**

3.3 332T1-2 B-Scan Drop 8 (compressed form) pg. 15



Low for entire course 1:	**0.638**	**Low for entire course 2:**	**0.531**
Average for entire course 1:	**0.662**	**Average for entire course 2:**	**0.546**
Low for entire course 3:	**0.379**	**Low for entire course 4:**	**0.399**
Average for entire course 3:	**0.398**	**Average for entire course 4:**	**0.424**

4. SHELL LAYOUT



pg 16
Solutia, Inc.
Tank # 332 T1-2
02/23/2009

API 653 INSPECTION REPORT		Southern Services, Inc.	IN SERVICE

Owner:	Solutia, Inc	Date:	Feb. 23, 2009
Location:	ECU	Page:	17
Tank:	332T1-2	WO#:	12319407

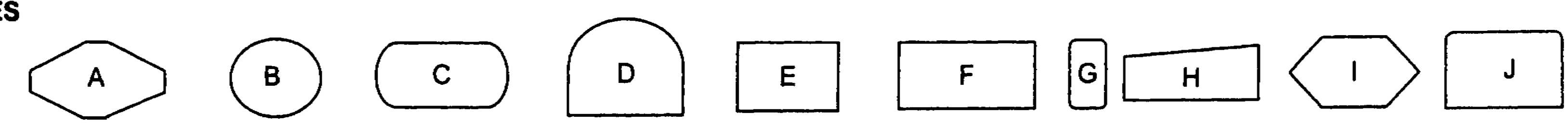
5. NOZZLE AND APPURTENANCES INSPECTION

All nozzles appear to be in good condition. All thickness measurements are above t-min and are near nominal. 4 UT readings were taken on each nozzle with no apparent signs of internal corrosion or pitting. There are areas of light surface corrosion on the carbon steel nuts and bolts. The ladders and platforms were also inspected and found to be in good working condition. All flanges, valves and associated piping appear to be in good condition. Nozzles N1, N6, N7, N9, N12, N13, N15, N17, N19, and N20 all have weld spacing issues that are not acceptable to current API code.

5.1 NOZZLE AND APPURTENANCE TABLE

Item	Description	Size (in)	Reinforcing Plate				Nominal Neck Thickness (in.)	Lowest Thickness (in.)	Telltale Y/N	Comments
			Height (in.)	Width (in.)	Thick (in.)	Shape				
N1	Clean out	6"		18"	0.637	B	0.432	0.423		
N2	Manway	24"		54"	0.636	B	0.375	0.381		
N3	Outlet	10"	52"	23"	0.613	B	0.500	0.477		
N4	Outlet	10"	52"	23"	0.641	G	0.500	0.474		
N5		10"		23"	0.624	G		0.563		
N6	Clean out	6"		15"	0.625	B	0.432	0.426		
N7	Flush water	4"		12"	0.639	B	0.437	0.426		
N8	Clean out	6"		18"	0.637	B	0.432	0.419		
N9	PH sample drain	3"		11"	0.640	B	0.437	0.427		
N10	Manway	24"		54"	0.639	B	0.375	0.381		
N11	Temperature	2"					0.343	0.340		
N12	Level	3"		11"	0.635	B	0.437	0.435		
N13	Clean out	6"		15"	0.649	B	0.432	0.418		
N14	Inlet	8"		18"	0.628	B	0.500	0.494		
N15	Clean out	6"		18"	0.633	B	0.432	0.420		
N16	Manway	24"		54"	0.640	B	0.375	0.382		
N17	Clean out	6"		15"	0.625	B	0.432	0.413		
N18	Clean out	6"		18"	0.636	B	0.432	0.430		
N19	Manway	24"		78"	0.631	B	0.375	0.377		
N20	Clean out	6"		15"	0.620	B	0.432	0.420		
N21	Overflow	8"					0.500			N/A Out Of Reach
N22	High Level Alarm	3"					0.437			N/A Out Of Reach
N23	Spare @ 70% Level	3"					0.437			N/A Out Of Reach

SHAPES



1) Inadequate Weld Spacing	2) Inadequate Repad Thickness	3) Inadequate Repad Dimensions	4) Inadequate Centerline Elevation
5) Less Than 90° Intersection w/ Shell to Bottom Weld		6) No Reinforcing Plate	7) Square Cornered Repad
8) Inadequate Neck Thickness	9) Plugged Telltale Holes	10) No Telltale Holes	

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5.2 SHELL NOZZLE NECK THICKNESS READINGS

READING LOCATION

NOZZLE	A	B	C	D	E	F	G	H	SIZE (in.)
N1		0.457		0.440		0.423		0.430	6"
N2		0.386		0.383		0.381		0.384	24"
N3		0.507		0.477		0.484		0.529	10"
N4		0.539		0.475		0.474		0.520	10"
N5		0.563		0.612		0.581		0.617	10"
N6		0.426		0.432		0.445		0.436	6"
N7		0.435		0.438		0.437		0.426	4"
N8		0.438		0.445		0.419		0.427	6"
N9		0.437		0.434		0.427		0.446	3"
N10		0.384		0.387		0.382		0.381	24"
N11	0.349				0.340				2"
N12		0.448		0.435		0.458		0.458	3"
N13		0.452		0.430		0.418		0.446	6"
N14		0.507		0.514		0.518		0.494	8"
N15		0.420		0.431		0.430		0.420	6"
N16		0.387		0.387		0.382		0.385	24"
N17		0.413		0.430		0.444		0.430	6"
N18		0.457		0.441		0.432		0.430	6"
N19		0.379		0.380		0.378		0.377	24"
N20		0.424		0.444		0.427		0.420	6"
N21	N/A Out Of Reach								8"
N22									3"
N23									3"

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6. ROOF INSPECTION

Roof was inspected from platforms only. There is some light active corrosion on nuts and bolts. Nozzle on west stair deck has moderate to heavy active corrosion and pitting on the repad and flanges. On the east ladder deck there is an area of moderate to heavy active corrosion on the wind girder. These areas should be cleaned evaluated and coated to stop further corrosion. There also appears to be some coating issues on the internal shell wall (difference in color). Pictures of the roof and corrosion can be found at G:drive MTS Photos - ECU -332T1-2_2-25-09.

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7. FLOOR PLATE EXTENSION INSPECTION

2 UT readings were taken on each plate extension, 1 on each side of each weld. The readings started at the North position and went clockwise.

Plate #	READING 1	READING 2
N/A Due to Seal		

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9. EQUIPMENT

ULTRASONIC

MODEL		SERIAL NO.	
36DL+		2201510	
Epoch IV		61502312	
TRANSDUCER	SERIAL NO.	FREQUENCY	SIZE
D790SM	204068	5MHZ	.312"
DHC711	570184	5MHZ	.250"
CALIBRATION BLOCK		SERIAL NO.	
C.S.		8883	

TANKPAC - TANK FLOOR MONITORING REPORT

TANK No: 332 TI-2
SOLUTIA, Chocolate Bayou, TX

Report No: H7174-88353-2

Date: 10/05/2006
Company: Solutia
Location: Chocolate Bayou, TX

By: Mauricio Calva

PAC Level III
(AE-TANKPAC per ASNT-TC-1A)

Approved by: Miguel Marcial

PAC Level III (AE)

CONAM
Inspection & Engineering Services, Inc.

CONAM Inspection and Engineering Services Inc.
3214 Pasadena Freeway
Pasadena, TX 77503
Phone: (713) 473-6111

CONTENTS

1. INTRODUCTION AND BACKGROUND

This report describes work carried out on site and concerns the monitoring of storage tank(s) to evaluate the condition of the tank floor(s) as described by in PAL TANKPAC tank floor test method statement (Doc. 518). A Physical Acoustics TB-2000 testing system was used. Independent published verification of the TANKPAC test procedure by the oil industry, based on 600 tests carried out prior to June 1996, may be found at:
www.ndt.net/article/ecndt98/chemical/095/095.htm
The purpose of the test is to establish tank floor condition in order to help make decisions on tank maintenance timing and priority, the method forms part of a RBI program.

2. TEST PROCEDURES

Following tank isolation and settling, sensors are mounted around the tank circumference, tested in situ, and the tank monitored for a test period of one hour or more following Physical Acoustics TANKPAC test Procedures for Tank Floor testing, current issue (Doc.501).
Following data collection and removal of extraneous noise sources, four types of analysis are carried out:

All activity from the tank recorded above the system threshold, is **graded A-E** (least to most) according to PAL experience and corrected for tank type, size, test threshold and product.

All activity **located** on the tank floor, including corrosion, leakage, over-stress, etc. is shown on the "All Data" tank plot, based on a first-hit location analysis of signal hitting three sensors.

An analysis of data (found by experience) to be more characteristic of severe localized corrosion, "Potential Leakage" sites, is shown on the "Potential Leak" or PLD location plots.

Further evaluation of any highly active sources, for example to improve location accuracy, or to evaluate source activity and characteristics.

All tests are carried out to standard Physical Acoustics Ltd. procedures, the field worksheets (Doc.502) are kept as a quality control record together with the digital test data, with an overall quality plan (Doc.503) for the individual tank, according to PAL ISO 9001:2000 procedures. Engineers are trained and certified specifically in TANKPAC procedures, (training, experience, written, and practical examinations). Engineers are also certified level II-AE per ASNT-TC-1A.

Data and test results for the tank are detailed in the figures and appendix with the location plots.

3. LIMITATIONS

The method is experience-based and is able to determine overall floor condition, i.e. good, intermediate or poor, from the active corrosion, in order to determine if further (internal) inspection and repairs are required; it is therefore a very cost-effective maintenance-planning tool. It does not give information on remaining thickness, although it is able to separate badly corroded tanks from non-corroded tanks. Sources of emissions that are located may represent between 3% and 30% of the data (OAL/PLL %), so this location information must be used with care. Accuracy of source location degrades on large tanks in poor condition due to event "overlap".

The method is not suitable for assessing the internal condition of tanks where corrosion scale is periodically removed, mechanically or chemically, as this "resets" the condition, or whose contents change short-term, hence changing internal corrosion conditions. Corrosion that does not result in any scale formation, for example certain types of MIC may not be detected.

Tank floors that are leaking at the time of test:

Small leaks can be located; these do not have a significant effect on the test result and overall grading of the tank. It must be noted, however, that an actively corroding floor will mask the emissions from small leaks.

Large leaks can also be located but are likely to mask other activity from the floor.

4. RESULTS

4.1 Details of the standard test and analysis graphics are shown in the figures; a summary of the test results is given below:

4.2 Test Observations:
Some wind activity.

4.3 Noise sources identified and removed from the data prior to analysis:
Wind activity

4.4 AE source detail:
None

4.5 Evaluation of overall data and located sources: **TANK I.D.:** 332 TI-2

Overall TANKPAC grade: B　　**ASL:** 25

TANKPAC "potential leak" sources:

1 ("A") grade sources: None

2 ("B") grade sources: None

3 ("C") grade sources: None

4 ("D") grade sources: None

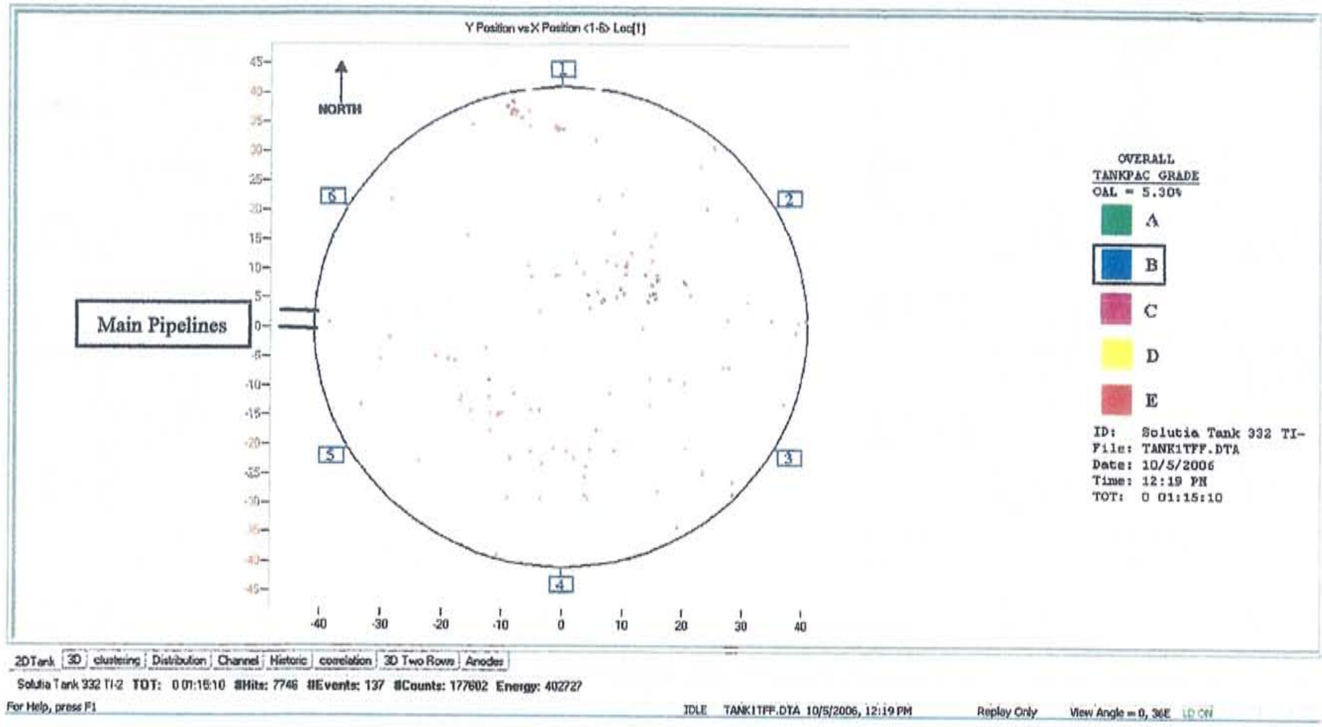
5 ("E") grade sources: None

Notes: Highly active and concentrated sources in the "all" or "potential leak" data may indicate a possible leak; however this can only be positively confirmed with a co-incident increase in ASL, or exceptionally high source event rate. Where this is confirmed it will be clearly stated "probable leak".

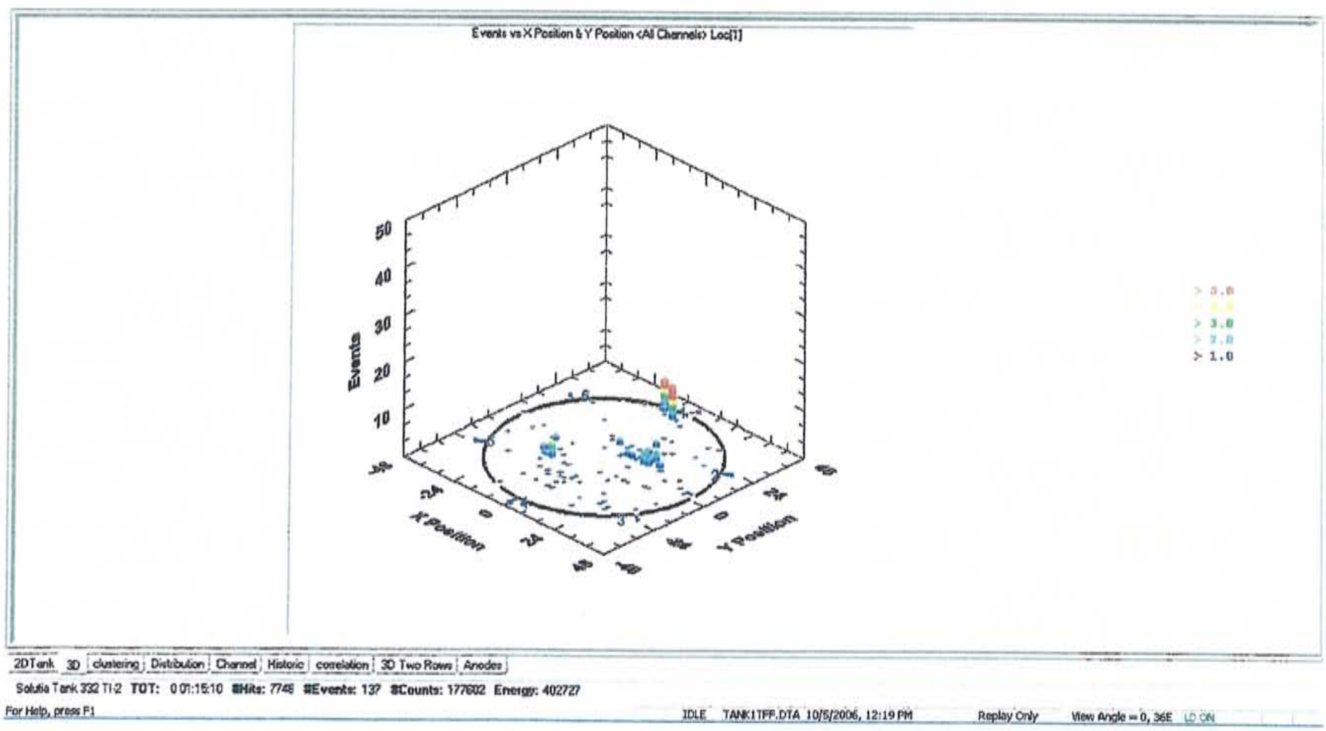
4.6 Composite **Grade I**
Maintenance action taken with a tank is a matter for the owner, taking into account all possible factors. The "composite grade" gives a guide for prioritization and re-test. Typical practice by TANKPAC users is to re-test or schedule for outage as below:

Composite Grade	Typical Re-test Period
I	**4-5 Years**
II	2 Years
III	1 Year*
IV	0.5 Year*

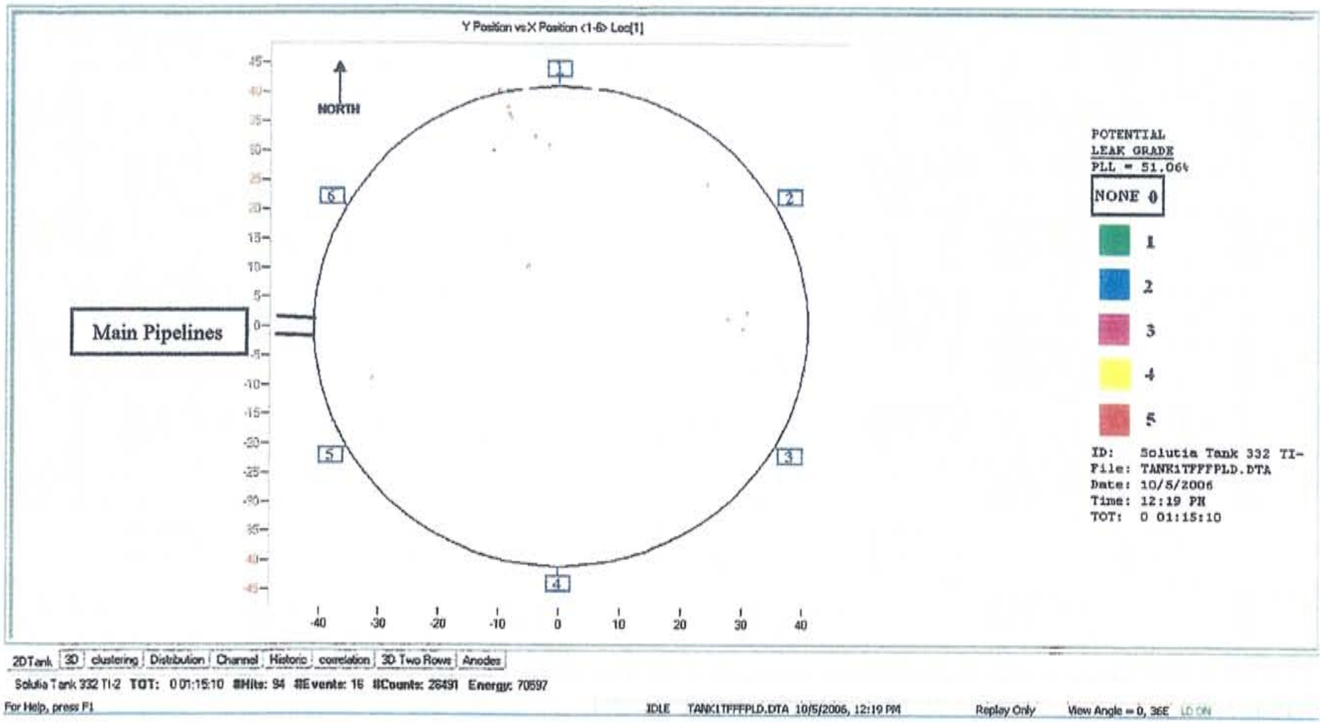
* Schedule for Inspection.



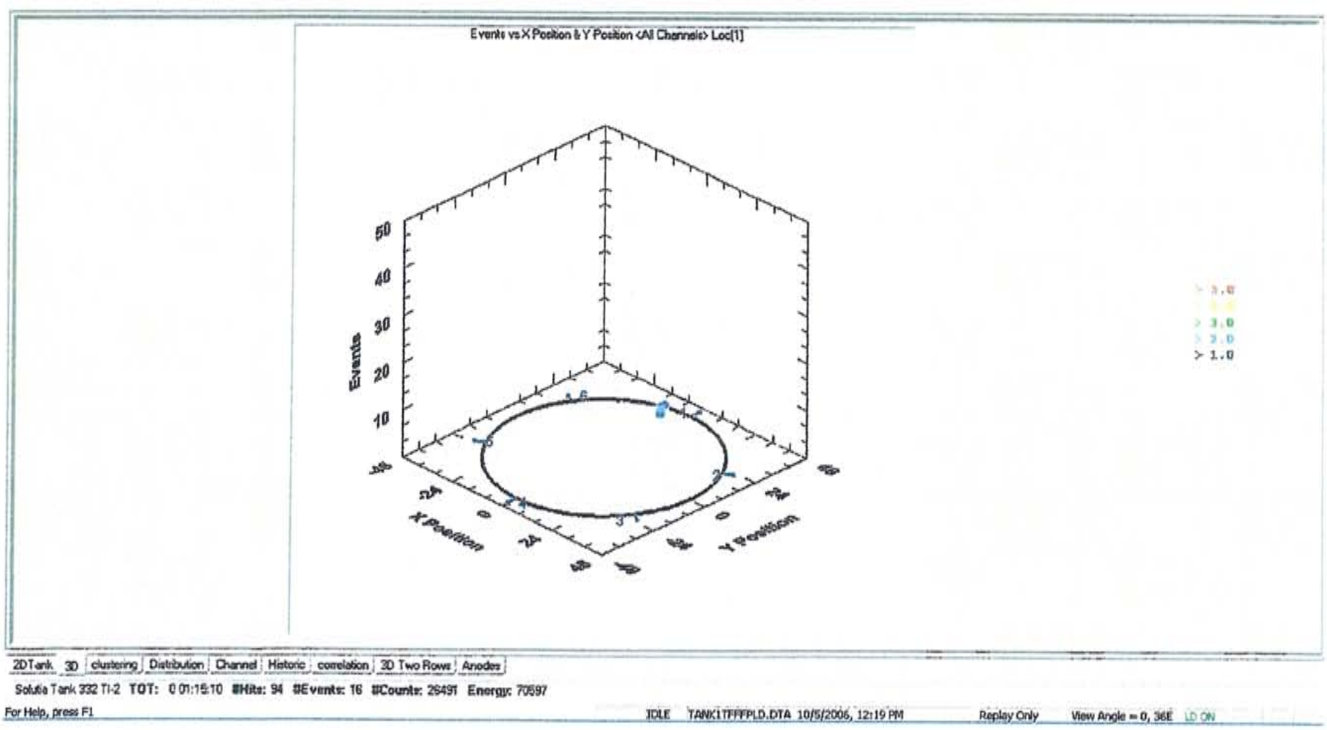
"ALL DATA" FLOOR LOCATION PLOT-PLAN VIEW



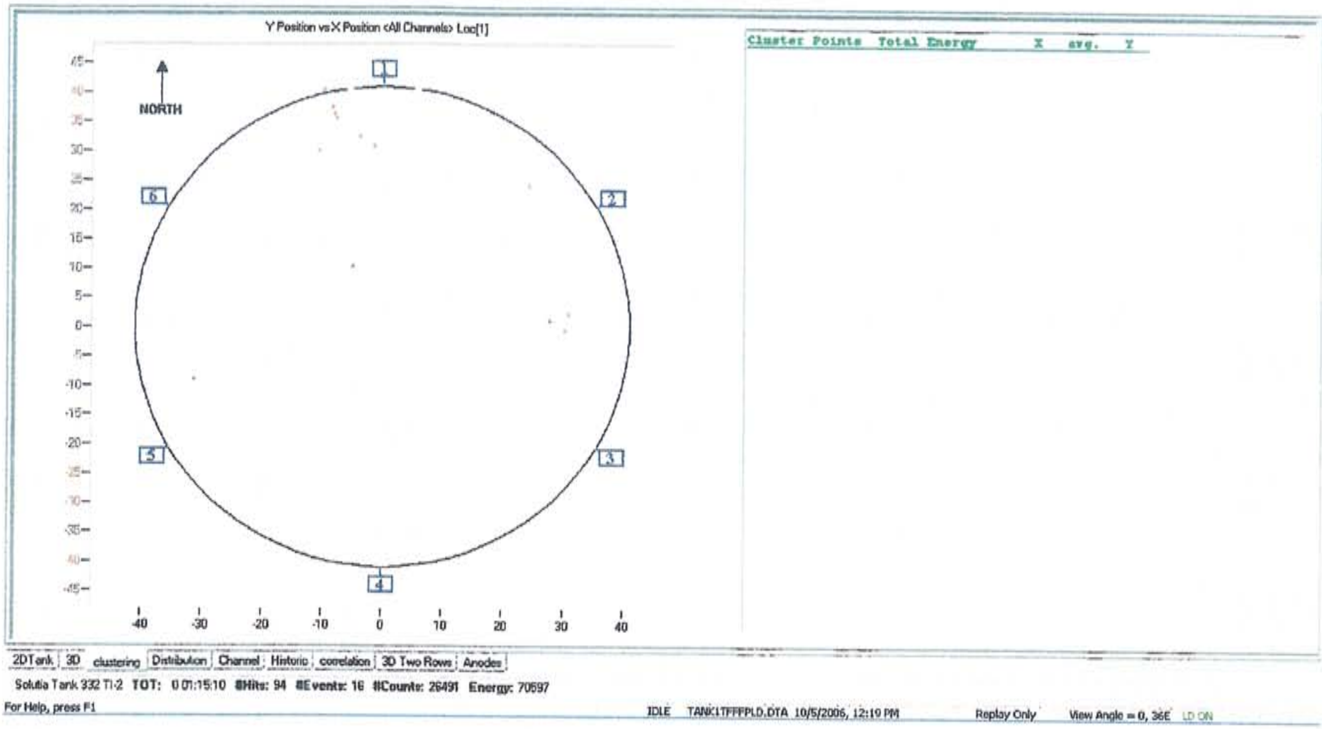
"ALL DATA" FLOOR LOCATION PLOT-3D VIEW.



"POTENTIAL LEAK" DATA---FLOOR LOCATION PLAN VIEW



"POTENTIAL LEAK" DATA---LOCATION-3D VIEW.



CLUSTER ANALYSIS SHOWING "POTENTIAL LEAK" SITES

TANKPAC TEST DATA

October 5, 2006

Customer:	Solutia	**Location:**	Chocolate Bayou, TX
Contact:	Jill Ingle	**Size, ft:**	82 ft
Vessel ID:	332 TI-2	**Operating Temp, F:**	140°F or less
Normal Contents:	Waste water	**Roof Type:**	Floating
Insulation:	None	**Base:**	Ringwall
Columns:	None	**Lining:**	Celicote 222 HT
Mixers:	None	**Heaters:**	None
Year built:	1994	**Anodes/CP:**	Intcrnal/Extcrnal Sacrificial anodcs

Notes+Background: There is 3.5 feet of organic & inorganic sludge at bottom. There may be a thin layer of light organics floating.

AE test date:	10/05/2006	**AE system+calib:**	DiSP 56 (Houston)
Engineers/cert:	M. Calva, J. Sanchez	**AE test temp, F:**	110°F
AE test level, m:	50 %	**Sludge level, m:**	3.5 ft
Weather:	F1/Sunny	**Settling time, hrs:**	>12 hrs.
Sensors/No/Height:	LDS1/13/4.5 ft /8 ft.	**TANKPAC test hits >XdB:**	8269 > 40 dB
ASL:	25		
Noise/filter detail:	Somc wind activity.		

AE hits (TPG) >x dB:	12948 > 40dB	**AE filt/JCL Hits >x dB:**	94 > 40dB
Overall AE grade:	B	**Grade compensation:**	0
Test Observations:	Some wind activity		

AE source detail: None
(All Data >40 events)

Concentrated PLD sources:

1- ("A") grades:	None
2 -("B") grades:	None
3-("C") grades:	None
4-("D") grades:	None
5-("E") grades:	None.

EXPLANATION AND GLOSSARY OF ABBREVIATIONS.

"Overall Data" :- This is the data due to active corrosion of the tank, plus any leak noise. The data may be evenly spread over the tank or localized, see below:

"Potential Leak Data/Sources": - This (PLD or JCL) is data characteristic of severe localized corrosion damage, graded "A" (minor) to "E" (highly active). **Not** actual leakage, but a future "potential leak" location.

"Leak Data": - If we are fairly sure the tank is actually leaking we will make a statement, "probable leak" to this effect, and if the source is located, give the location.

ASL: - This is the Average continuous Signal Level, in the case of very severe leaks being present this will increase (e.g. 1cm hole in Naptha tank ≈ 60dB), typically ASL is in the range of 18 – 30dB.

OAL: - Overall % of data located on the floor. This is a location "quality check", the range is usually between 5 – 30%, meaning that this percentage of emissions detected actually reached three sensors and could be located. For A/B grade tanks it is normal for this to be low as the signals are weak from minor or no corrosion activity. If the % is very low but the Overall tank grade is high this indicates the presence of dense sludge or the possibility of corrosion from the wall instead of the floor.

PLL: - The % of "Potential Leak" data located on the floor. This is the same as OAL but applied to the "Potential Leak" data.

Overall TANKPAC Grade: - This relates to the overall corrosion damage detected during the test.
A – Very Minor/No Damage
B – Minor Damage
C – Intermediate Damage
D – Active Damage
E – Highly Active Damage

Composite Grade: - This combines the Overall TANKPAC corrosion damage grade with the "Potential Leak" or severe localized damage grade, to produce a final grade with an associated recommendation according to the risk matrix below:

"PLD GRADE"	E/5	III	III	IV	IV	IV	I – No active damage, re-test in 4/5 years.
	D/4	II	III	III	IV	IV	II – Minor active damage, re-test in 2 years.
	C/3	II	II	III	III	III	III – Active damage re-test in max.1 year*.
	B/2	I	I	II	II	n/a	IV – Very active damage. Re-test in 0.5 year*.
	A/1	I	I	II	n/a	n/a	* or schedule for internal inspection
"OVERALL GRADE"	→	A	B	C	D	E	n/a should not occur at standard threshold

Note: Should a leak be highly probable this will be stated separately, and may influence the grade. This final Composite Grade has been developed by PAL customers from more than 10 years experience and allows simple prioritization of tanks for internal inspection.

Tankpac test hits >xdB: - The total amount of data (including extraneous noise sources) recorded above the test threshold (xdB) during the test.

AE hits (TPG) >xdB:- TANKPAC Grading Hits. This shows how much data (excluding noise sources) the tank floor has emitted above the standard test threshold for that size and type of tank.

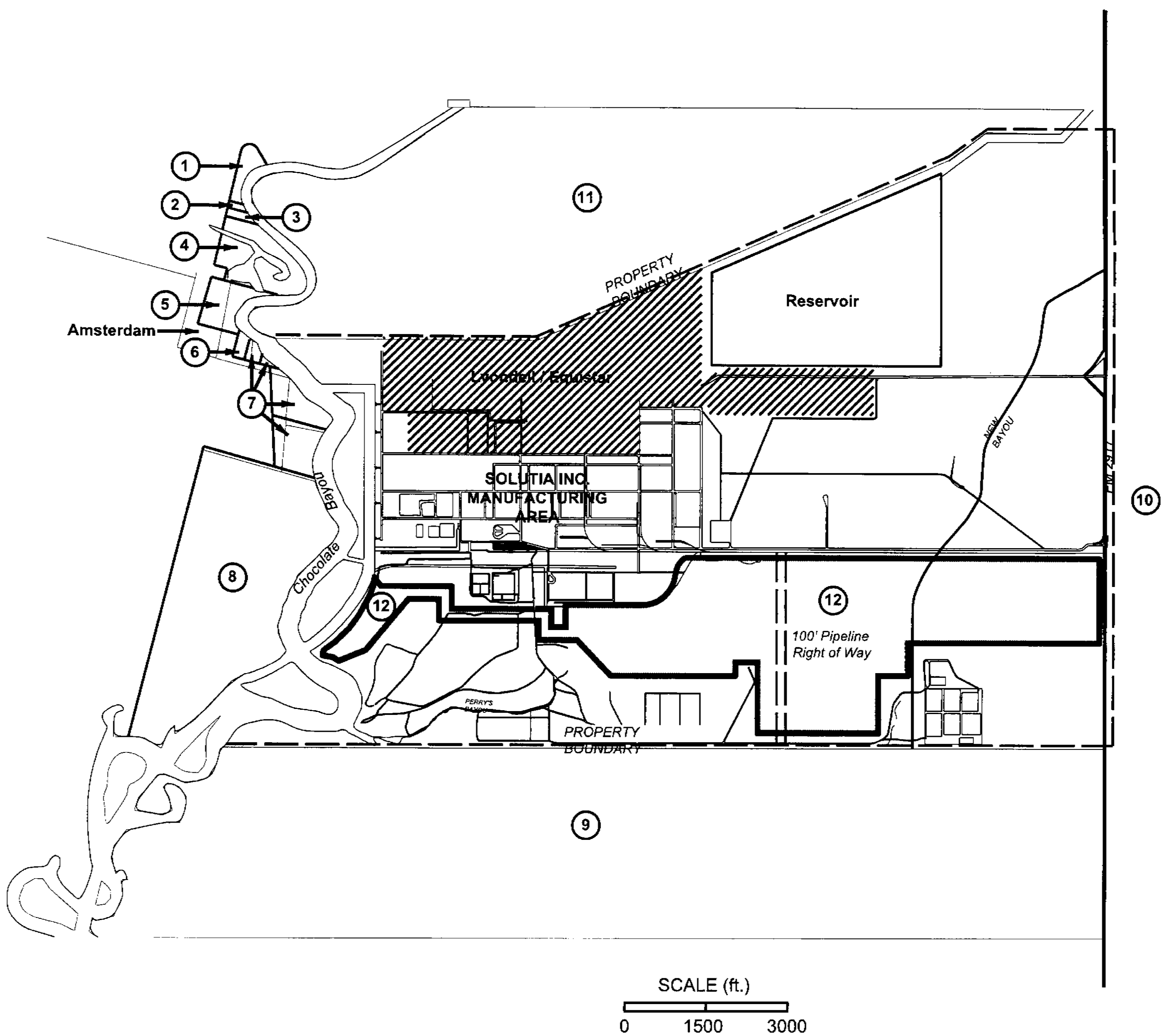
AE filt/JCL Hits >xdB: - "Potential Leak" Hits. This shows the amount of data above the test threshold which is representative of "Potential Leak" data or severe localized damage.

CLASS 2 PERMIT MODIFICATION

RCRA Permit No. HW-51089-000
Solutia, Inc., - Alvin, Texas

FIGURE G-1

ADJACENT LANDOWNERS MAP



LEGEND

1. William & Diane Leeson
P.O. Box 99
Liverpool, Texas 77577-0099
2. French & Michael Jackson
11613 Flaxman St.
Jacinto City, Texas 77029-3014
3. Alvin Boat Club
Clyde & Thomas Herring
10710 County Road 200
Alvin, Texas 77511-1038
4. Harbor View Homestead Section 1
French & Michael Jackson
11613 Flaxman St.
Jacinto City, Texas 77029-3014
6. Henry Jez, Jr.
2008 Jenkins Road, Apt 105
Pasadena, Texas 77506-5057
7. Jerry & Billie McLeod
2222 Ave. J
Danbury, Texas 77534
8. The Texas A&M University System
Real Estate Office
301 Tarrow St., Ste. 519
College Station, Texas 77843-0001
9. INEOS USA LLC
P.O. Box 1488
Alvin, Texas 77512
10. Terrance Hlavinka Cattle Co.
P.O. Box 1188
East Bernard, Texas 77435
11. Lyondell/Equistar
P.O. Box 868
Houston, Texas 77001
12. Shintech Inc.
5618 E. Highway 332
Freeport, Texas 77541

GSI Job No.	G-3379	Drawn By:	DLB
Issued:	17-Feb-09	Chk'd By:	EAH
Revised:	———	Aprv'd By:	JMM
Scale:	As Shown		Figure G-1

ADJACENT LANDOWNERS
RCRA Permit No. HW-50189
Solutia Inc., Alvin, Texas

SOLUTIA

Solutions for a better life.

CLASS 2 PERMIT MODIFICATION

RCRA Permit No. HW-51089-000
Solutia, Inc., - Alvin, Texas

ATTACHEMENT B

CORE DATA FORM

TCEQ Use Only

TCEQ

TCEQ Core Data Form

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission *(If other is checked please describe in space provided)*

☐ New Permit, Registration or Authorization *(Core Data Form should be submitted with the program application)*

☐ Renewal *(Core Data Form should be submitted with the renewal form)*

☒ Other: Application for a Class 2 modification to RCRA Permit No. HW-50189-000

2. Attachments ☒Yes ☐No

Describe Any Attachments: *(ex. Title V Application, Waste Transporter Application, etc.)* Class 2 Permit Modification Application

3. Customer Reference Number ***(if issued)***: CN 600132856

Follow this link to search for CN or RN numbers in Central Registry**

4. Regulated Entity Reference Number ***(if issued)***: RN 100238682

SECTION II: Customer Information

5. Effective Date for Customer Information Updates (mm/dd/yyyy)

6. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check only one of the following:*

☐Owner ☐ Operator ☐ Owner & Operator
☐Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐Other: ____________

7. General Customer Information

☐ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership
☐Change in Legal Name (Verifiable with the Texas Secretary of State) ☐ No Change**

*****If "No Change" and Section I is complete, skip to Section III – Regulated Entity Information.***

8. Type of Customer:	☐ Corporation	☐ Individual	☐ Sole Proprietorship- D.B.A
☐ City Government	☐ County Government	☐ Federal Government	☐ State Government
☐ Other Government	☐ General Partnership	☐ Limited Partnership	☐ Other:

9. Customer Legal Name *(If an individual, print last name first: ex: Doe, John)*	*If new Customer, enter previous Customer below*	*End Date:*

10. Mailing Address:

City		State		ZIP		ZIP + 4	

11. Country Mailing Information *(if outside USA)*

12. E-Mail Address *(if applicable)*

13. Telephone Number ( ) -

14. Extension or Code

15. Fax Number *(if applicable)* ( ) -

16. Federal Tax ID *(9 digits)*

17. TX State Franchise Tax ID *(11 digits)*

18. DUNS Number *(if applicable)*

19. TX SOS Filing Number *(if applicable)*

20. Number of Employees

☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher

21. Independently Owned and Operated? ☐ Yes ☐ No

SECTION III: Regulated Entity Information

22. General Regulated Entity Information *(If 'New Regulated Entity" is selected below this form should be accompanied by a permit application)*

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☐ Update to Regulated Entity Information ☒ No Change** *(See below)*

****If "NO CHANGE" is checked and Section I is complete, skip to Section IV, Preparer Information.**

23. Regulated Entity Name *(name of the site where the regulated action is taking place)*

24. Street Address of the Regulated Entity: (No P.O. Boxes)							
	City		State		ZIP		ZIP + 4
25. Mailing Address:							
	City		State		ZIP		ZIP + 4
26. E-Mail Address:							

27. Telephone Number	28. Extension or Code	29. Fax Number (if applicable)
( ) -		( ) -

30. Primary SIC Code (4 digits)	31. Secondary SIC Code (4 digits)	32. Primary NAICS Code (5 or 6 digits)	33. Secondary NAICS Code (5 or 6 digits)

34. What is the Primary Business of this entity? (Please do not repeat the SIC or NAICS description.)

Questions 34 – 37 address geographic location. Please refer to the instructions for applicability.

35. Description to Physical Location:	

36. Nearest City	County	State	Nearest ZIP Code

37. Latitude (N) In Decimal:			38. Longitude (W) In Decimal:		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form or the updates may not be made. If your Program is not listed, check other and write it in. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Industrial Hazardous Waste	☐ Municipal Solid Waste
☐ New Source Review – Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS	☐ Sludge
☐ Stormwater	☐ Title V – Air	☐ Tires	☐ Used Oil	☐ Utilities
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Gina Bradley	41. Title:	Environmental Specialist
42. Telephone Number	**43. Ext./Code**	**44. Fax Number**	**45. E-Mail Address**
(281) 228-4313		(281) 228-4869	grbrad@solutia.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 9 and/or as required for the updates to the ID numbers identified in field 39.

(See the Core Data Form instructions for more information on who should sign this form.)

Company:	Solutia Inc.	Job Title:	Plant Manager
Name (In Print):	Paul Cartlidge		
Signature:	Pcartlidge	Phone:	(281) 228-4201
		Date:	3/5/09

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CLASS 2 PERMIT MODIFICATION

RCRA Permit No. HW-51089-000
Solutia, Inc., - Alvin, Texas

PROPOSED CHANGES TO THE SOLUTIA RCRA PERMIT AND PERMIT APPLICATION

SOLUTIA Solutions for a better life.

PROPOSED CHANGES TO THE SOLUTIA RCRA PERMIT AND PERMIT APPLICATION

Class 2 Permit Modification
RCRA Permit No. HW-50189-000
Solutia Inc., Alvin, Texas

Change No.	RCRA Permit Provision No.	Permit Page No.	Proposed Changes to the Permit Provision	Revised Permit Application Section
1	Table V.C. (Tanks and Tank Systems)	53	Revised this table to add Waste No. 31 Industrial Process Sludge (TCEQ Waste Code # 3361609H) to Permit Unit No. 08 and 09.	Table V.6.1 (Summary of Design and Construction Information: IWPF Tanks) Figure IV.2 Waste Analysis Plan (Hazardous Waste Flow Diagram) Attachment F Part A (Hazardous Waste Flow Diagram)
2	Table IV.B. (Wastes Managed in Permitted Units)	26, 27	Revised this table to update the EPA Hazardous Waste Codes for Waste Nos. 23, 31, and 36. Waste codes being added to these streams are waste codes that already exist for other similar streams managed at the Chocolate Bayou Plant.	Table IV.2 Waste Analysis Plan (Wastes Managed in Permitted Units) Table III-1 Part A (Hazardous Waste and Management Activities)

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PROPOSED CHANGES TO THE SOLUTIA RCRA PERMIT AND PERMIT APPLICATION

Class 2 Permit Modification
RCRA Permit No. HW-50189-000
Solutia Inc., Alvin, Texas

Change No.	RCRA Permit Provision No.	Permit Page No.	Proposed Changes to the Permit Provision	Revised Permit Application Section
3	Table IV.B. (Wastes Managed in Permitted Units)	26, 27	This table has no reference to EPA Hazardous Waste Code P030 nor does it pertain to any type of waste streams generated at the Chocolate Bayou Plant. Solutia will be modifying the table listed in the Permit Application Section column to delete its reference of EPA Hazardous Waste Code P030.	Table IV.5 Waste Analysis Plan (Land Disposal Restriction (LDR) Treatment Standards for Solutia Chocolate Bayou Wastes) Table III-1 Part A (Hazardous Waste and Management Activities) Table IV.2 Waste Analysis Plan (Wastes Managed in Permitted Units)

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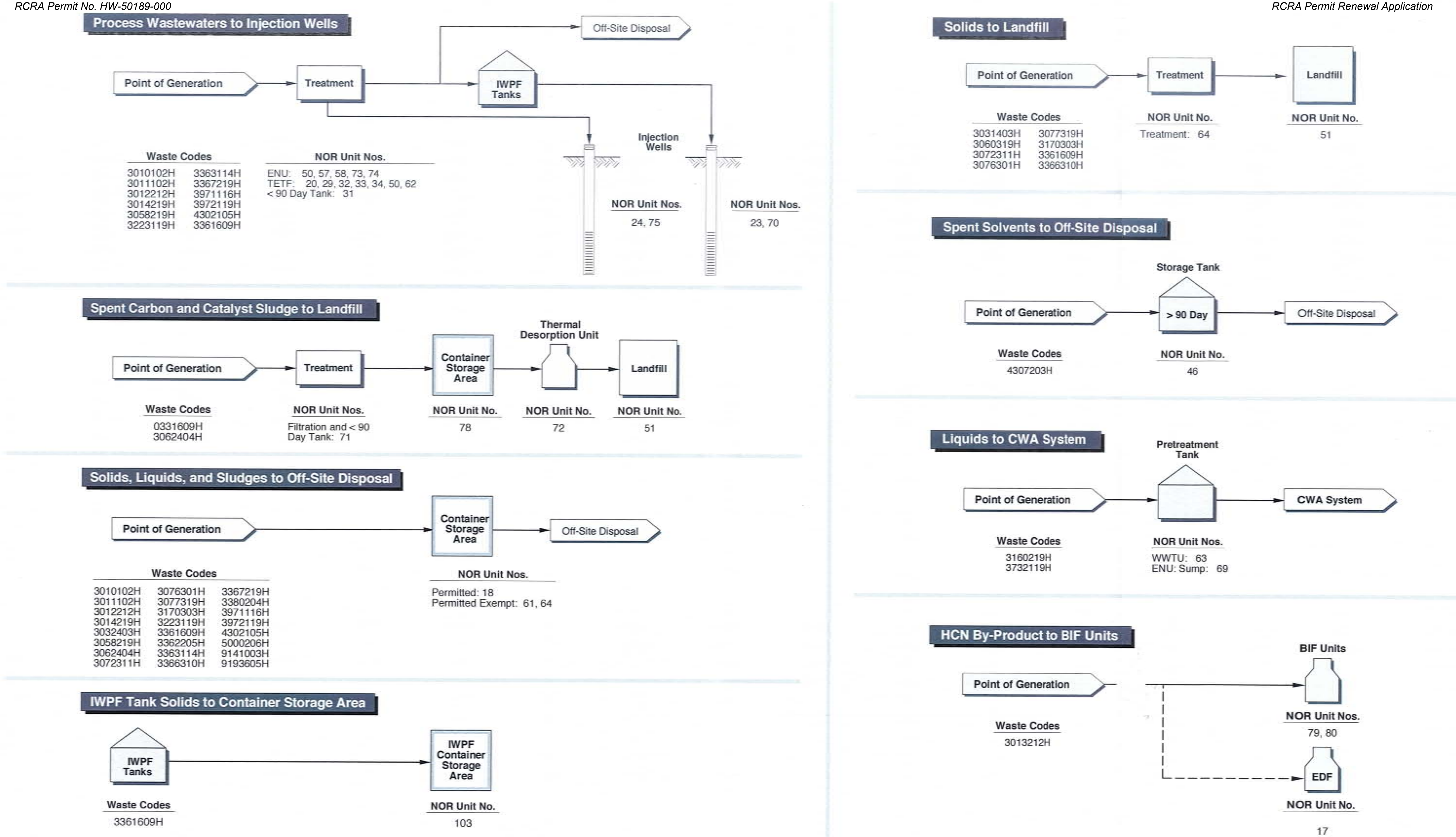
CLASS 2 PERMIT MODIFICATION

RCRA Permit No. HW-51089-000
Solutia, Inc., - Alvin, Texas

REPLACEMENT PAGES FOR THE SOLUTIA RCRA PERMIT RENEWAL APPLICATION ADDENDUM ISSUED 10/01/00



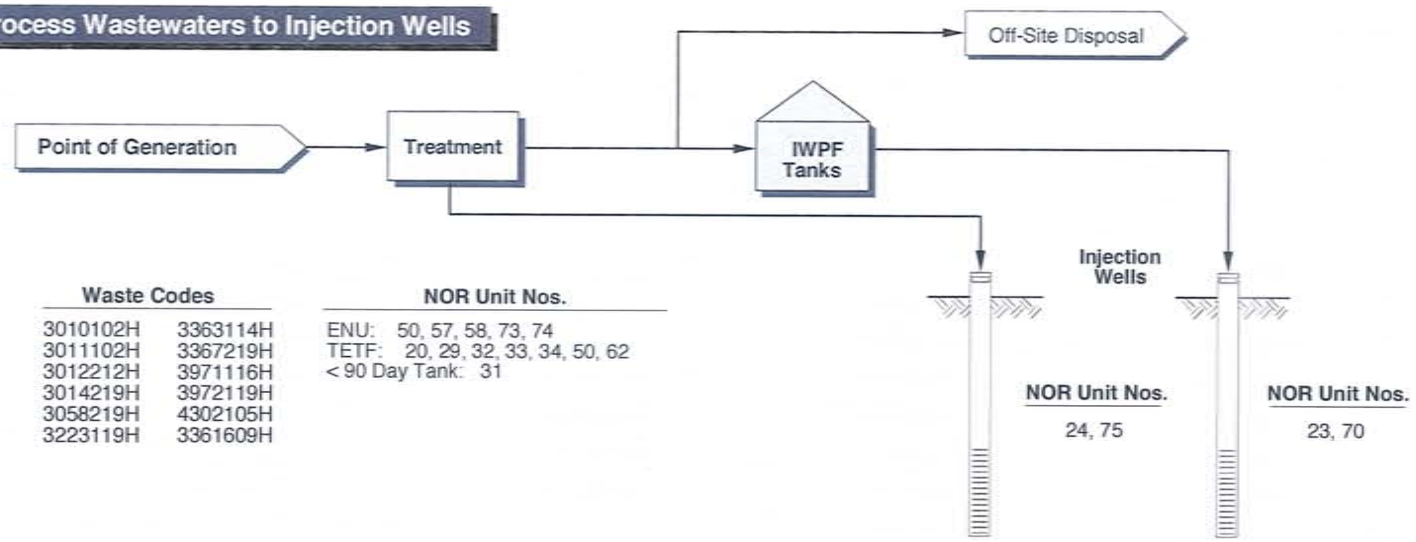
Notes:

1) NOR Unit No. 78 (Outdoor Container Storage Area, Permit Unit 13) only manages waste solids that contain no free liquids.
2) All wastes to be land disposed are treated to meet the requirements of 40 CFR Part 268 and the Paint Filter Liquids Test (SW-846 Method 9095) prior to disposal.
3) Dashed lines for Emergency Destruction Facilty (EDF, NOR Unit 17) indicates this unit may be used on an emergency basis for the disposal of hydrogen cyanide.
4) ENU = Elementary Neutralization Unit; TETF = Totally Enclosed Treatment Facility; NOR = Notice of Registration; BIF = Boiler and Industrial Furnace; WWTU = Wastewater Treatment Unit; CWA = Clean Water Act

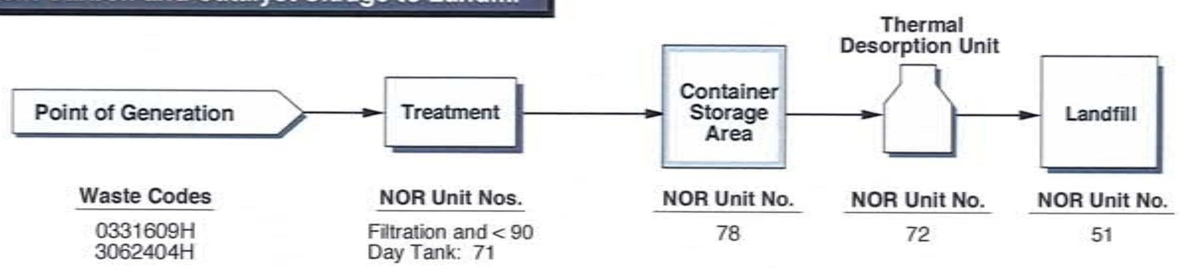
GSI ENVIRONMENTAL

GSI Job No.	G-3379	Drawn By:	DLB	**HAZARDOUS WASTE FLOW DIAGRAM**
Issued:	17-Feb-09	Chk'd By:	JMM	RCRA Permit No. HW-50189
Revised:		Aprv'd By:	JMM	Solutia Inc., Alvin, Texas
Scale:	As Shown	FIGURE IV.2		

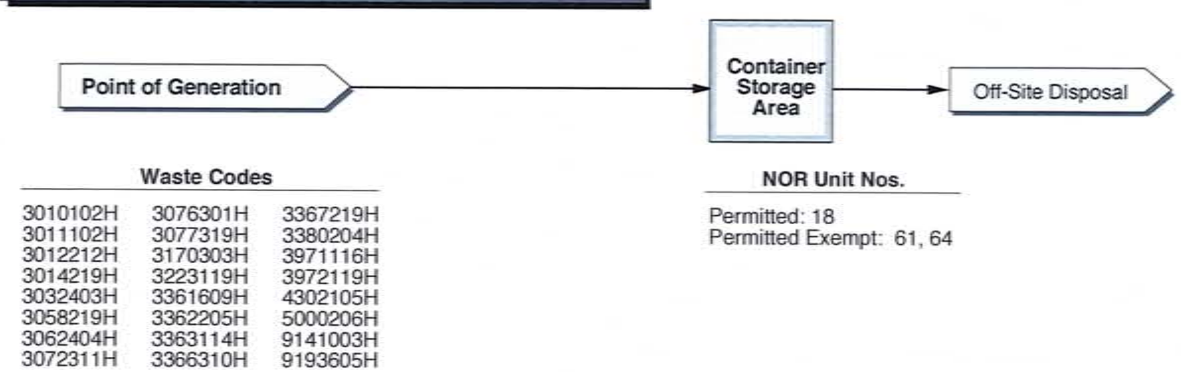
Process Wastewaters to Injection Wells



Spent Carbon and Catalyst Sludge to Landfill

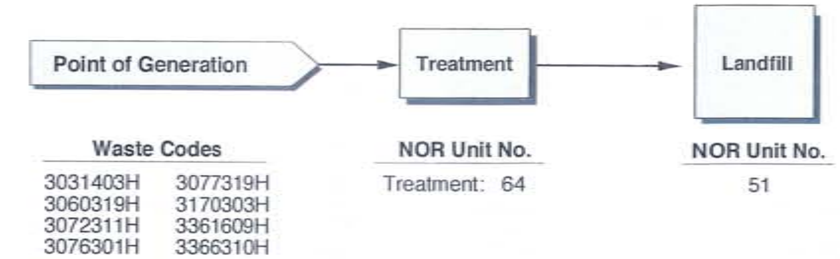


Solids, Liquids, and Sludges to Off-Site Disposal

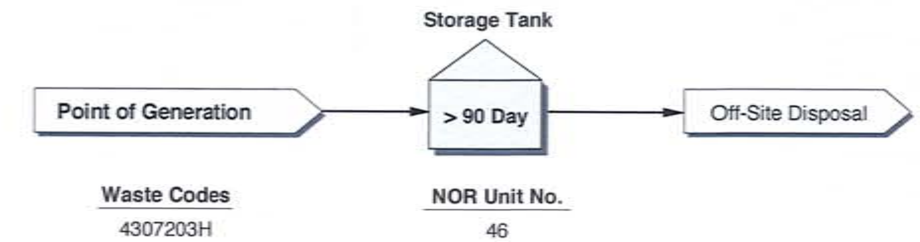


IWPF Tank Solids to Container Storage Area

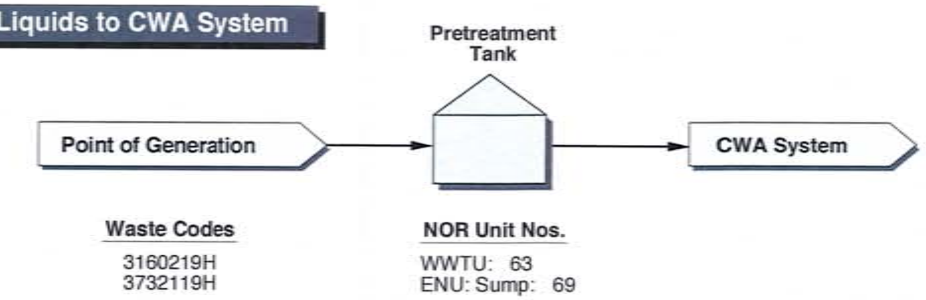
Solids to Landfill



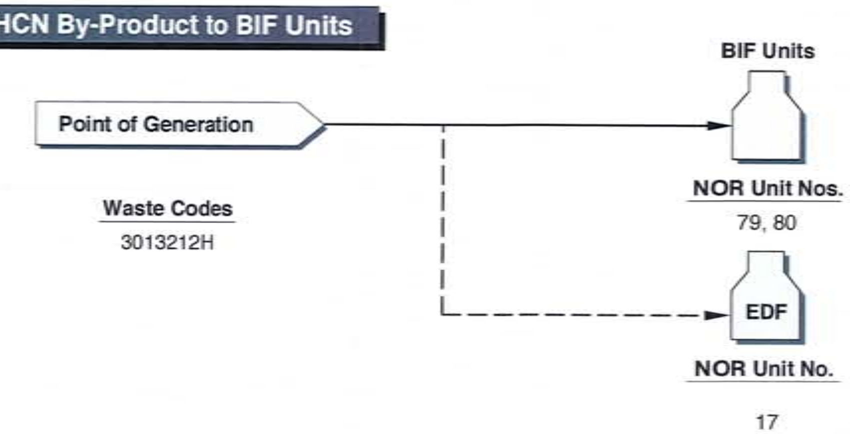
Spent Solvents to Off-Site Disposal



Liquids to CWA System



HCN By-Product to BIF Units



Notes:

1) NOR Unit No. 78 (Outdoor Container Storage Area, Permit Unit 13) only manages waste solids that contain no free liquids.
2) All wastes to be land disposed are treated to meet the requirements of 40 CFR Part 268 and the Paint Filter Liquids Test (SW-846 Method 9095) prior to disposal.
3) Dashed lines for Emergency Destruction Facilty (EDF, NOR Unit 17) indicates this unit may be used on an emergency basis for the disposal of hydrogen cyanide.
4) ENU = Elementary Neutralization Unit; TETF = Totally Enclosed Treatment Facility; NOR = Notice of Registration; BIF = Boiler and Industrial Furnace; WWTU = Wastewater Treatment Unit; CWA = Clean Water Act

GSI ENVIRONMENTAL	GSI Job No. G-3379	Drawn By: DLB		HAZARDOUS WASTE FLOW DIAGRAM
	Issued: 17-Feb-09	Chk'd By: JMM		RCRA Permit No. HW-50189
	Revised:	Aprv'd By: JMM		Solutia Inc., Alvin, Texas
	Scale: As Shown	ATTACHMENT F		

TABLE V.6.1
SUMMARY OF DESIGN AND CONSTRUCTION INFORMATION: IWPF TANKS

Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

Permit Unit No.	Tank	N.O.R. Unit No.	Storage and/or Processing	EPA Waste Codes	Waste Nos.
08	IWPF Tank 332T1-1	59	Storage and Processing	D001, D002, D003, D004, D005, D007, D009, D018, D019, D038, F002, F003, F005, F039, K011, K013, P003, P016, P063, P098, P101, P105, P106, U001, U002, U003, U004, U008, U009, U019, U022, U053, U080, U122, U123, U134, U135, U154, U161, U188, U196, U220	8, 9, 10, 11, 12, 14, 18, 27, 31, 33, 34, 36, 37, 41, 42, 44, 50
09	IWPF Tank 332T1-2	60	Storage and Processing	D001, D002, D003, D004, D005, D007, D009, D018, D019, D038, F002, F003, F005, F039, K011, K013, P003, P016, P063, P098, P101, P105, P106, U001, U002, U003, U004, U008, U009, U019, U022, U053, U080, U122, U123, U134, U135, U154, U161, U188, U196, U220	8, 9, 10, 11, 12, 14, 18, 27, 31, 33, 34, 36, 37, 41, 42, 44, 50

Notes:
1) See Figure V.6.1 for a plan view of IWPF Tanks (Permit Units 08 and 09).
2) Each IWPF Tank (Permit Units 08 and 09) has an approximate 34-ft high outer shell, corresponding to a 30-ft high liquid level.
3) IWPF Tanks 332T1-1 and 332T1-2 are located within the same secondary containment area. The containment volume was calculated as the sum of i) the largest tank volume and ii) the rainfall from a 25-yr, 24-hr storm event.
4) For additional description of wastes managed, see Table IV. 2 and Section IV: Waste Analysis Plan of this application.
5) EPA waste codes shown above apply at the point of generation for each waste stream prior to any treatment. Wastes classified as D001, D002, and D003 are treated prior to entry into the IWPF Tanks and are therefore not ignitable, corrosive, or reactive inside the tanks.
6) N.O.R. = Notice of Registration

TABLE IV.2
WASTES MANAGED IN PERMITTED UNITS

Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

Waste No.	TNRCC Waste Code	Waste Description	EPA Hazard Code	EPA Hazardous Waste Codes	TNRCC Waste Classification
1	00013191	Contaminated Soils	–	–	1
2	00043191	Concrete, Brick, Construction, and Demolition Debris	–	–	1
3	00143191	General Plant Trash	–	–	1
4	00213191	Process Equipment Maintenance Debris	–	–	1
5	00323192	Construction Debris, Concrete, Lumber	–	–	2
6	00343892	Sandblasting Media	–	–	2
7	0331609H	Catalyst Sludge	R,T	K011	H
8	30011191	Process Decon Wastewaters	–	–	1
9	30041191	Nonhazardous Plant Wastewaters	–	–	1
10	3010102H	AN Wastewater Column Bottoms	R,T	K011	H
11	3011102H	AN Stripper Column Bottoms	R,T	K013	H
12	3012212H	AN Stripper Column Overheads	I,R,E	D001, D003, D018	H
13	3013212H	By-Product HCN and HCN Material	I,R,E,H	D001, D003, D018, P063	H
14	3014219H	AN Rerun Column Bottoms	I	D001	H
15	30314031	Process Residues and	–	–	1
16	3032403H	Mfg. Process Residue	I,C,R,E,T,H	D001, D002, D003, D004, D005, D007, D018, D038, F003, F039, P003, P063, P106, U002, U003, U009, U019, U080, U122, U123, U135, U161, U188	H
17	30506971	Spent Organic Catalysts	–	–	1
18	3058219H	Misc. Plant Organic Liquids	I,C,R,E,T,H	D001, D002, D003, D018, D038, F003, P063	H
19	30614041	Spent Carbon	–	–	1
20	3062404H	Spent Carbon	C,E,T,R	D002, D018, D038, F039, K011, K013, U053, U188	H
21	3072311H	Asbestos Solids and Debris	T	U122	H

Note:
I = Ignitable, C = Corrosive, E = Toxicity Characteristic, H = Acute Hazardous, R = Reactive, T= Toxic

TABLE IV.2
WASTES MANAGED IN PERMITTED UNITS

Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

Waste No.	TNRCC Waste Code	Waste Description	EPA Hazard Code	EPA Hazardous Waste Codes	TNRCC Waste Classification
22	3076301H	Contaminated Soils	C,R,E,T	D002, D003, D018, D035, F039, K011, K013, K022, U018, U019, U122, U134, U154, U188, U220	H
23	3077319H	Contaminated Insulation, Concrete, Debris, and Other Solids	I,C,R,E,T	D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D018, D019, D038, F002, F003, F005, F039, K011, K013, P003, P063, P101, P106, U002, U003, U009, U019, U022, U053, U080, U122, U123, U134, U135, U154, U161, U188, U196, U220	H
24	30800021	Lab Packs	–	–	1
25	3170303H	AN BIF Units Refractory Brick	H	P063	H
26	32213191	Spill Cleanup Debris	–	–	1
27	3223119H	Mfg. Unit Wastewaters	I,C,R,E,T,H	D001, D002, D003, D004, D005, D007, D009, D018, D019, D038, F003, F039, P003, P063, P106, U002, U003, U009, U019, U053, U080, U122, U123, U135, U154, U161, U188, U220	H
28	33416091	Misc. Sludges	–	–	1
29	33423912	Biological Waste Treatment Sludge	–	–	2
30	33603192	Soil from Injection Well Drilling	–	–	2
31	3361609H	Industrial Process Sludge	I,C,R,E,T,H	D001, D002, D003, D004, D005, D007, D009, D018, D019, D038, F002, F003, F005, F039, K011, K013, P003, P016, P063, P098, P101, P105, P106, U001, U002, U003, U004, U008, U009, U019, U022, U053, U080, U122, U123, U134, U135, U154, U161, U188, U196, U220	H
32	3362205H	Contaminated Oil/Water Emulsion	I,E,T,R	D001, D018, F039, K011, K013, U053, U122, U154, U158, U188	H

Note:
I = Ignitable, C = Corrosive, E = Toxicity Characteristic, H = Acute Hazardous, R = Reactive, T= Toxic

TABLE IV.2
WASTES MANAGED IN PERMITTED UNITS

Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

Waste No.	TNRCC Waste Code	Waste Description	EPA Hazard Code	EPA Hazardous Waste Codes	TNRCC Waste Classification
33	3363114H	336 Tanks Wastewater	E,T,R,H	D018, F039, K011, K013, P063, U009, U053, U188	H
34	33651141	Wastewater from	–	–	1
35	3366310H	Spent Solid Filters or Absorbents	E,T,R,H	D018, F039, K011, K013, P063, U009, U053, U188	H
36	3367219H	Industrial Process Wastewater	C,E,T,R,H	D001, D002, D003, D004, D005, D007, D009, D018, D019, D038, F002, F003, F005, F039, K011, K013, P003, P063, P101, P106, U002, U003, U009, U019, U022, U053, U080, U122, U123, U134, U135, U154, U161, U188, U196, U220	H
37	33681141	Wastewater from 336 Tanks	–	–	1
38	3380204H	Spent Solvents	I,E,T	D001, D011, D018, F002, F003, U002	H
39	37343192	Absorbent Carbon	–	–	2
40	37905192	Water Treatment Sludge	–	–	2
41	3971116H	Landfill Leachate	T	F039	H
42	3972119H	Recovered Groundwater	E,T,R	D018, F039, K011, K013	H
43	39743111	Asbestos Insulation	–	–	1
44	4302105H	MHBA Raffinate	C,E	D002, D018, D038	H
45	46044041	Spent Carbon	–	–	1
46	46063931	Spent Catalysts	–	–	1
47	49113102	Zinc Filters	–	–	2
48	49123192	Sodium (meta) Bisulfite	–	–	2
49	5000206H	Waste Oil	I,C,E,T,R,H	D001, D002, D018, F039, K011, K013, P063, U009, U019, U053, U188	H
50	50072051	Liquid Organic Compounds	–	–	1
51	9141003H	Lab Packs	I,T	D001, F005, U002, U003, U009, U022, U122, U154, U188, U220, U239, U240	H
52	9193605H	AN Waste Stripper Bottoms	I,R,T	D001, D003, K011, K013	H

Note:
EPA I = Ignitable, C = Corrosive, E = Toxicity Characteristic, H = Acute Hazardous, R = Reactive, T= Toxic

TABLE III-1
HAZARDOUS WASTES AND MANAGEMENT ACTIVITIES

Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

TNRCC Waste Code	Waste Description	EPA Hazard Code	EPA Hazardous Waste Codes	Waste Management Activities				Est. Ann. Qty. Gen.	Process
				Off-Site	On-Site				
				Disposal	Storage	Processing	Disposal		
0002309H	Spent Mercury Batteries	E	D009	x	x			sporadic	genl plant
0003309H	Spent Ni-Cd Batteries	C,E	D002, D006	x	x			2,380 lb	genl plant
0005309H	Spent Lead Acid Batteries	I,C,E	D001, D002, D008	x	x			sporadic	genl plant
0010319H	Spent Fluorescent Bulbs	E	D009	x	x			6,517 lb	genl plant
0015319H	Spent Aerosol Cans with Halogenateds	I	D001	x	x			sporadic	genl plant
0016319H	Spent Aerosol Cans with Non-Halogenateds	I	D001	x	x			sporadic	genl plant
0027211H	Waste Diesel and Debris	I,E	D001, D018	x	x			sporadic	genl plant
0028319H	Mercury Containing Containers	E	D009	x	x			sporadic	genl plant
0035219H	Styrene Monomer, Inhibited	I	D001	x	x			sporadic	genl plant
0092211H	Spent Paint Thinner/Paint	I,T	D001, F003	x	x			2,415 lb	genl plant
0331609H	Catalyst Sludge	R,T	K011		x	x	x	225,120 lb	AN mfg.
3010102H	AN Wastewater Column Bottom	R,T	K011		x	x	x	645,402 tons	AN mfg.
3011102H	AN Stripper Column Bottoms	R,T	K013		x	x	x	649,800 tons	AN mfg.
3012212H	AN Stripper Column Overheads	I,R,E	D001, D003, D018		x	x	x	sporadic	AN mfg.
3013212H	HCN By-Product	I,R,E,H	D001, D003, D018, P063				x	1,062 tons	AN mfg.
3014219H	AN Rerun Column Bottoms	I	D001		x	x	x	2,101 tons	AN mfg.
3032403H	Mfg. Process Residue	I,C,R,E,T,H	D001, D002, D003, D004, D005, D007, D018, D038, F003, F039, P003, P063, P106, U002, U003, U009, U019, U080, U122, U123, U135, U161, U188	x	x	x	x	sporadic	AN, Formalin, MHBA mfg.
3058219H	Misc. Plant Organic Liquids	I,C,R,E,T,H	D001, D002, D003, D018, D038, F003, P063		x	x	x	3,306 tons	AN, MHBA mfg.

See Notes Page 5

TABLE III-1
HAZARDOUS WASTES AND MANAGEMENT ACTIVITIES

Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

TNRCC Waste Code	Waste Description	EPA Hazard Code	EPA Hazardous Waste Codes	Waste Management Activities				Est. Ann. Qty. Gen.	Process
				Off-Site	On-Site				
				Disposal	Storage	Processing	Disposal		
3062404H	Spent Carbon	C,E,T,R	D002, D018, D038, F039, K011, K013, U053, U188		x		x	8,540 tons	ECU, mfg.
3072311H	Asbestos Solids and Debris	T	U122		x		x	sporadic	genl plant
3076301H	Contaminated Soils	C,R,E,T	D002, D003, D018, D035, F039, K011, K013, K022, U018, U019, U122, U134, U154, U188, U220		x		x	4,380 lb	mfg., ECU, DIST
3077319H	Contaminated Insulation, Concrete, Debris, and Other Solids	I,C,R,E,T	D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D018, D019, D038, F002, F003, F005, F039, K011, K013, P003, P063, P101, P106, U002, U003, U009, U019, U022, U053, U080, U122, U123, U134, U135, U154, U161, U188, U196, U220		x		x	178,640 lb	genl plant
3160219H	Benzene Wastewater Stripper System	I,E	D001, D018			x	x	1,526,370 tons	mfg.
3161609H	Organic Separator Sludge	E	D018, D032	x	x			5,623 lb	mfg.
3162310H	Spent Carbon Filters	E	D018	x	x			152,140 lb	mfg.
3165310H	Absorbents Contaminated with Organics	E	D018	x	x			sporadic	mfg.
3168319H	Wastewater Treatment Filter Waste and Debris	E	D018	x	x			sporadic	mfg.
3170303H	Refractory Brick and Fire Debris	H	P063	x			x	sporadic	AN mfg.
3211409H	Piping with Solidified Formalin	T	U122	x	x			sporadic	DIST

See Notes Page 5

TABLE III-1
HAZARDOUS WASTES AND MANAGEMENT ACTIVITIES

Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

TNRCC Waste Code	Waste Description	EPA Hazard Code	EPA Hazardous Waste Codes	Waste Management Activities				Est. Ann. Qty. Gen.	Process
				Off-Site	On-Site				
				Disposal	Storage	Processing	Disposal		
3212409H	Solidified Phenol	T	U188	x	x			sporadic	DIST
3223119H	Mfg. Unit Wastewaters	I,C,R,E,T,H	D001, D002, D003, D004, D005, D007, D009, D018, D019, D038, F003, F039, P003, P063, P106, U002, U003, U009, U019, U053, U080, U122, U123, U135, U154, U161, U188, U220		x	x	x	287,072 tons	mfg., DIST
3350219H	NAPLs	E	D018	x	x			sporadic	ECU
3361609H	Industrial Process Sludge	I,C,R,E,T,H	D001, D002, D003, D004, D005, D007, D009, D018, D019, D038, F002, F003, F005, F039, K011, K013, P003, P016, P063, P098, P101, P105, P106, U001, U002, U003, U004, U008, U009, U019, U022, U053, U080, U122, U123, U134, U135, U154, U161, U188, U196, U220	x	x		x	444,040 lb	DIST, ECU
3362205H	Contaminated Oil/Water Emulsion	I,E,T,R	D001, D018, F039, K011, K013, U053, U122, U154, U158, U188	x	x	x		152,900 lb	ECU, mfg.
3363114H	336 Tanks Wastewater	E,T,R,H	D018, F039, K011, K013, P063, U009, U053, U188		x	x	x	1,512 tons	ECU
3366310H	Spent Filters and Absorbents	E,T,R,H	D018, F039, K011, K013, P063, U009, U053, U188		x		x	360 lb	ECU

See Notes Page 5

TABLE III-1
HAZARDOUS WASTES AND MANAGEMENT ACTIVITIES

Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

TNRCC Waste Code	Waste Description	EPA Hazard Code	EPA Hazardous Waste Codes	Waste Management Activities				Est. Ann. Qty. Gen.	Process
				Off-Site	On-Site				
				Disposal	Storage	Processing	Disposal		
3367219H	Industrial Process Wastewater	C,E,T,R,H	D001, D002, D003, D004, D005, D007, D009, D018, D019, D038, F002, F003, F005, F039, K011, K013, P003, P063, P101, P106, U002, U003, U009, U019, U022, U053, U080, U122, U123, U134, U135, U154, U161, U188, U196, U220		x	x	x	2,089,646 tons	ECU
3380204H	Spent Solvents	I,E,T	D001, D011, D018, F002, F003, U002	x	x			sporadic	MHBA mfg., laboratory
3732119H	Cation/Anion Bed Treatment Waste	C	D002			x		sporadic	ECU
3971116H	Landfill Leachate	T	F039		x	x	x	233 tons	ECU
3972119H	Groundwater	E,T,R	D018, F039, K011, K013		x	x	x	37,173 tons	ECU
3975119H	Unit A Groundwater	E,T	D018, K022	x	x			sporadic	ECU
4302105H	MHBA Raffinate Stripper Bottoms	C,E	D002, D018, D038		x	x	x	205,357 tons	MHBA mfg.
4307203H	Spent Solvent (MIBK)	I,C,R,T	D001, D002, D003, F003	x	x			sporadic	MHBA mfg.
5000206H	Waste Oil	I,C,E,T,R,H	D001, D002, D018, F039, K011, K013, P063, U009, U019, U053, U188	x	x			3,093 tons	LAB mfg., ECU
5514108H	NTA Inorganic Liquids	C,R	D002, D003			x		21,920 tons	NTA mfg.
8312212H	Formalin Inhibitor	I,T	D001, U154	x	x			sporadic	Formalin mfg.
9141003H	Lab Packs	I,T	D001, F005, U002, U003, U009, U022, U122, U154, U188, U220, U239, U240	x	x			980 lb	laboratory

See Notes Page 5

TABLE III-1
HAZARDOUS WASTES AND MANAGEMENT ACTIVITIES

Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

TNRCC Waste Code	Waste Description	EPA Hazard Code	EPA Hazardous Waste Codes	Waste Management Activities				Est. Ann. Qty. Gen.	Process
				Off-Site	On-Site				
				Disposal	Storage	Processing	Disposal		
9143105H	Wastewater with Hg & Cr Salts	C,E	D002, D007, D009	x	x			103 lb	laboratory
9193605H	AN Waste Stripper Bottoms	I,R,T	D001, D003, K011, K013		x	x	x	sporadic	laboratory

Notes:
1) Estimated annual quantity of waste generated based on data provided in Solutia Chocolate Bayou 1995 Annual Waste Summary.
2) EPA Hazardous Waste Codes determined at the point of generation for each waste stream prior to treatment in an Elementary Neutralization Unit (ENU), Totally Enclosed Treatment Facility (TETF), or other treatment unit.
3) AN = Acrylonitrile, DPO = Diphenyl Oxide, IDA = Iminodiacetic Acid, MHBA = Methionine Hydroxy Butanoic Acid, NTA = Nitrilotriacetic Acid, LAB = Linear Alkyl Benzene
4) I = Ignitable, C = Corrosive, R = Reactive, E = Toxicity Characteristic, H = Acute Hazardous, T = Toxic
5) mfg = product manufacturing, genl plant = general plant operations, ECU = Environmental Control Unit, DIST = product distribution

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GROUNDWATER SERVICES, INC.

TABLE IV.5
LAND DISPOSAL RESTRICTION (LDR)
TREATMENT STANDARDS FOR
SOLUTIA CHOCOLATE BAYOU WASTES

Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

EPA Waste Code	Regulated Hazardous Constituent	Wastewater Concentration (mg/L)	NonWastewater Concentration (mg/Kg)
D001	NA	DEACT and meet 268.48 requirements; or RORGS; or CMBST	DEACT and meet 268.48 requirements; or RORGS; or CMBST
D002	NA	DEACT and meet 268.48 requirements	DEACT and meet 268.48 requirements
D003	NA	DEACT and meet 268.48 requirements	DEACT and meet 268.48 requirements
D004	Arsenic	5.0	5.0 mg/L TCLP
D005	Barium	100	100 mg/L TCLP
D006	Cadmium	1.0	1.0 mg/L TCLP
	Cadmium (Batteries)	NA	RTHRM
D007	Chromium (total)	5.0	5.0 mg/L TCLP
D008	Lead	NA	5.0 mg/L TCLP
	Lead (Batteries)	NA	RLEAD
D009	Mercury	NA	IMERC; OR RMERC
	Mercury	NA	0.20 mg/L TCLP
	Mercury	0.20	NA
D010	Selenium	1.0	5.7 mg/L TCLP
D011	Silver	5.0	5.0 mg/L TCLP
D018	Benzene	0.14 and meet 268.48 requirements	10 and meet 268.48 requirements
D019	Carbon Tetrachloride	0.057 and meet 268.48 requirements	6.0 and meet 268.48 requirements
D035	Methyl Ethyl Ketone	0.28 and meet 268.48 requirements	36 and meet 268.48 requirements
D038	Pyridine	0.014 and meet 268.48 requirements	16 and meet 268.48 requirements
F002	Acetone	0.28	160
	Benzene	0.14	10
	Carbon Tetrachloride	0.057	6.0
	Methanol	5.6	NA
	Methylene Chloride	0.089	30
	Methyl Ethyl Ketone	0.28	36
	Methyl Isobutyl Ketone	0.14	33
	Toluene	0.080	10

See Notes Page 4

GSI Job No. G-2009
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Revised: 3/5/99
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GROUNDWATER SERVICES, INC.

TABLE IV.5
LAND DISPOSAL RESTRICTION (LDR)
TREATMENT STANDARDS FOR
SOLUTIA CHOCOLATE BAYOU WASTES

Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

EPA Waste Code	Regulated Hazardous Constituent	Wastewater Concentration (mg/L)	NonWastewater Concentration (mg/Kg)
F003	Acetone	0.28	160
	Benzene	0.14	10
	Carbon Tetrachloride	0.057	6.0
	Methanol	5.6	NA
	Methylene Chloride	0.089	30
	Methyl Ethyl Ketone	0.28	36
	Methyl Isobutyl Ketone	0.14	33
	Toluene	0.080	10
F005	Acetone	0.28	160
	Benzene	0.14	10
	Carbon Tetrachloride	0.057	6.0
	Methanol	5.6	NA
	Methylene Chloride	0.089	30
	Methyl Ethyl Ketone	0.28	36
	Methyl Isobutyl Ketone	0.14	33
	Toluene	0.080	10
F039	various	see Notes	see Notes
K011	Acetonitrile	5.6	38
	Acrylonitrile	0.24	84
	Acrylamide	19	23
	Benzene	0.14	10
	Cyanide (total)	1.2	590
K013	Acetonitrile	5.6	38
	Acrylonitrile	0.24	84
	Acrylamide	19	23
	Benzene	0.14	10
	Cyanide (total)	1.2	590
K022	Toluene	0.080	10
	Acetophenone	0.010	9.7
	Diphenylamine	0.92	13
	Diphenylnitrosamine	0.92	13
	Phenol	0.039	6.2
	Chromium (total)	2.77	0.86 mg/L TCLP
	Nickel	3.98	5.0 mg/L TCLP
P003	Acrolein	0.29	CMBST
P016	Dichloromethyl Ether	(WETOX or CHOXD) fb CARBN; or CBMST	CMBST

See Notes Page 4

TABLE IV.5
LAND DISPOSAL RESTRICTION (LDR)
TREATMENT STANDARDS FOR
SOLUTIA CHOCOLATE BAYOU WASTES

Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

EPA Waste Code	Regulated Hazardous Constituent	Wastewater Concentration (mg/L)	NonWastewater Concentration (mg/Kg)
P063	Cyanide (total)	1.2	590
	Cyanide (amenable)	0.86	30
P098	Cyanide (total)	1.2	590
	Cyanide (amenable)	0.86	30
P101	Ethyl Cyanide	0.24	360
P105	Sodium Azide	CHOXD; CHRED; CARBN; BIODG; or CMBST	CHOXD; CHRED; or CMBST
P106	Cyanide (total)	1.2	590
	Cyanide (amenable)	0.86	30
U001	Acetaldehyde	(WETOX or CHOXD) fb CARBN; or CMBST	CMBST
U002	Acetone	0.28	160
U003	Acetonitrile	5.6	CMBST
	Acetonitrile	NA	1.8
U004	Acetophenone	0.010	9.7
U008	Acrylic Acid	(WETOX or CHOXD) fb CARBN; or CMBST	CMBST
U009	Acrylonitrile	0.24	84
U018	Benz(a)anthracene	0.059	3.4
U019	Benzene	0.14	10
U022	Benzo(a)pyrene	0.061	3.4
U053	Crotonaldehyde	(WETOX or CHOXD) fb CARBN; or CMBST	CMBST
U080	Methylene Chloride	0.089	30
U122	Formaldehyde	(WETOX or CHOXD) fb CARBN; or CMBST	CMBST
U123	Formic Acid	(WETOX or CHOXD) fb CARBN; or CMBST	CMBST

See Notes Page 4

GROUNDWATER SERVICES, INC.

TABLE IV.5
LAND DISPOSAL RESTRICTION (LDR)
TREATMENT STANDARDS FOR
SOLUTIA CHOCOLATE BAYOU WASTES

Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

EPA Waste Code	Regulated Hazardous Constituent	Wastewater Concentration (mg/L)	NonWastewater Concentration (mg/Kg)
U134	Fluoride	35	NA
U135	Hydrogen Sulfide	CHOXD; CHRED; or CMBST	CHOXD; CHRED; or CMBST
U154	Methanol	(WETOX OR CHOXD); fb CARBN; or CMBST	CMBST
	Methanol	5.6	0.75 mg/L TCLP
U158	4,4'-Methylene bis(2-chloroaniline)	0.50	30
U161	Methyl Isobutyl Ketone	0.14	33
U188	Phenol	0.039	6.2
U196	Pyridine	0.014	16
U220	Toluene	0.080	10
U239	Xylenes	0.32	30
U240	2,4-D (2,4-Dichlorophenoxyacetic acid)	0.72	10

Notes:
1) Treatment standards identified above obtained from current 40 CFR 268.40 requirements. These requirements are subject to change over time; therefore, the most current 40 CFR Part 268 provisions will be utilized in any LDR determination made by Solutia.
2) The list of regulated hazardous constituents for the F039 treatment standard will be determined by process knowledge and will consist of a representative subset of the parameters identified in 40 CFR Part 268.40.
3) Treatment standards expressed as specified technologies (CMBST, CHOXD, etc.) are defined in 40 CFR 268.42.
4) NA = Not Applicable. fb = Followed by.

SOLUTIA
Solutions for a better life.

CLASS 2 PERMIT MODIFICATION

RCRA Permit No. HW-51089-000
Solutia, Inc., - Alvin, Texas

REPLACEMENT PAGES FOR THE SOLUTIA RCRA PERMIT ISSUED 01/05/01

TABLE IV.B. WASTES MANAGED IN PERMITTED UNITS

Waste No.	Waste Description	EPA Hazardous Waste Codes	TNRCC Form Code and Hazard Code
1	Contaminated Soils	–	3191
2	Concrete, Brick, Construction, and Other Miscellaneous Debris	–	3191
3	General Plant Trash	–	3191
4	Process Equipment Maintenance Debris	–	3191
5	Miscellaneous Debris	–	3192
6	Sandblasting Media	–	3892
7	Catalyst Sludge	D003, K011	609H
8	Process Decon Wastewaters	–	1191
9	Nonhazardous Plant Wastewaters	–	1191
10	AN Wastewater Column Bottoms	D003, K011	102H
11	AN Stripper Column Bottoms	D003, K013	102H
12	AN Stripper Column Overheads	D001, D003, D018	212H
13	HCN By-Product Stream	D001, D003, D018, P063	212H
14	AN Rerun Column Bottoms (RRCB)	D001, D010, D038	219H
15	Process Residues and Misc. Solids	–	4031
16	Mfg. Process Residue	D001, D002, D003, D004, D005, D007, D018, D038, F003, F039, P063, P101, U002, U009, U019, U122, U161, U188, U220	403H
17	Waste Contaminated with Catalysts	–	6971
18	Misc. Plant Organic Liquids	D001, D002, D003, D018, D038, F003, P063, P101	219H
19	Spent Carbon	–	4041
20	Spent Carbon	D002, D003, D018, D038, F039, K011, K013, U188	404H
21	Asbestos Solids and Debris	U122	311H
22	Contaminated Soils	D002, D003, D018, F039, K011, K013, K022, P101, U019, U122, U134, U154, U161, U188, U220	301H
23	Contaminated Insulation, Concrete, Debris, and Other Solids	D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D018, D019, D038, F002, F003, F005, F039, K011, K013, P003, P063, P101, P106, U002, U003, U009, U019, U022, U053, U080, U122, U123, U134, U135, U154, U161, U188, U196, U220	319H
24	Lab Packs	–	0021
25	AN BIF Units Refractory Brick	P063	303H
26	Spill Cleanup Debris	–	3191
27	Mfg. Unit Wastewaters	D002, D003, D004, D005, D018, D038, F003, F039, K011, K013, P063, P101, U002, U009, U019, U122, U134, U154, U161, U188, U220	119H

TABLE IV.B. WASTES MANAGED IN PERMITTED UNITS (CONT'D)

Waste No.	Waste Description	EPA Hazardous Waste Codes	TNRCC Form Code and Hazard Code
28	Misc. Sludges	–	6091
29	Biological Waste Treatment Sludge	–	3912
30	Soil from Injection Well Drilling	–	3192
31	Industrial Process Sludge	D001, D002, D003, D004, D005, D007, D009, D018, D019, D038, F002, F003, F005, F039, K011, K013, P003, P016, P063, P098, P101, P105, P106, U001, U002, U003, U004, U008, U009, U019, U022, U053, U080, U122, U123, U134, U135, U154, U161, U188, U196, U220	609H
32	Contaminated Oil/Water Emulsion	D001, D003, D018, F039, K011, K013, U122, U154, U188, U220	205H
33	336 Tanks Wastewater	D002, D003, D004, D005, D018, D038, F003, F039, K011, K013, P063, P101, U002, U009, U019, U122, U134, U154, U161, U188, U220	114H
34	Wastewater from Settling Tanks	–	1141
35	Spent Solid Filters or Absorbents	D003, D018, F039, K011, K013, P063, U009, U188	310H
36	Industrial Process Wastewater	D001, D002, D003, D004, D005, D007, D009, D018, D019, D038, F002, F003, F005, F039, K011, K013, P003, P063, P101, P106, U002, U003, U009, U019, U022, U053, U080, U122, U123, U134, U135, U154, U161, U188, U196, U220	102H
37	Wastewater from 336 Tanks	–	1141
38	Spent Solvents	D001, D011, D018, F002, F003, U002	204H
39	Absorbent Carbon	–	3192
40	Water Treatment Sludge	–	5192
41	Landfill Leachate	D003, D018, F039	116H
42	Recovered Groundwater	D003, D018, F039	119H
43	Asbestos Insulation	–	3111
44	MHBA Raffinate Stripper Bottoms	D002, D018, D038	105H
45	Spent Carbon	–	4041
46	Spent Catalysts	–	3931
47	Zinc Filters	–	3102
48	Sodium (meta) Bisulfite	–	3192
49	Waste Oil	D001, D002, D003, D018, F039, K011, K013, P063, P101, U009, U019, U122, U161, U188	206H
50	Liquid Organic Compounds	–	2051
51	Lab Packs	D001, D002, D003, D022, D035, D038, D040, F001, F003, F005, K011, K013, P022, P063, U002, U003, U044, U154	003H
52	AN Waste Stripper Bottoms	D001, D003, K011, K013	605H

TABLE V.B. CONTAINER STORAGE AREAS

Permit Unit No.	Container Storage Area	N.O.R. Unit No.	Approximate Rated Capacity	Approximate Dimensions	Containment Volume	Ignitable, Reactive, or Incompatible Waste
05	Indoor	18	3,960 gal (based on 72 55-gal drums or equivalent volume in other containers)	34 ft x 60 ft	See Note 3	Yes
13	Outdoor	78	1,500 tons	206 ft x 178 ft crushed rock or shell pad	Not required	No
15	Outdoor	103	70,200 cubic feet	180 feet x 180 feet	34,650 cubic feet	Yes – Ignitable No – Reactive No - Incompatible

Notes:

1) Containers managing ignitable or reactive waste should be located at least 15 meters (50 feet) from the facility property line.

2) Incompatible waste shall be separated from other waste or materials stored nearby in other containers, piles, open tanks, or surface impoundments by means of a dike, berm, wall, or other device.

3) Portable secondary containment units will be used for all containers stored in the Indoor Container Storage Area. In general, one secondary containment unit will hold up to four 55-gallon drums. Each secondary containment unit will have a minimum capacity equal to the greater of i) 10% of the total volume of the containers or ii) the volume of the largest container. For example, if a portable secondary containment unit held four 55-gal drums (i.e., a total of 220 gal, largest container 55 gal), a minimum secondary containment volume of 55 gal would be required.

CLASS 2 PERMIT MODIFICATION

RCRA Permit No. HW-51089-000
Solutia, Inc., - Alvin, Texas

EXAMPLE OF PUBLIC NOTICE

NOTICE OF CLASS 2 PERMT MODIFICATION

Solutia Inc., a chemical manufacturing facility located on FM 2917 in Alvin, Texas, has filed an application for a Class 2 modification to the Texas Commission on Environmental Quality (TCEQ) Hazardous Waste Permit No. HW-50189-000. The modification proposes to change the tank management practice for the two RCRA permitted tanks, IWPF Tank 332T1-1 (Permit Unit No. 8, NOR 59) and IWPF Tank 332T1-2 (Permit Unit No. 9, NOR 60) as well as to update EPA waste codes associated with wastes managed in permitted units. The application is subject to the Coastal Management Program (CMP) and must be consistent with the CMP goals and policies. A draft permit has not been prepared as of the date of this notice.

Solutia Inc. will hold a public meeting on this application at [time] on [date] at [room/building name] located at the Solutia Chocolate Bayou plant as required by 30 TAC §305.69(c)(4). The purpose of the public meeting will be to provide information and discuss issues related to the Class 2 modification application. The Solutia contact person for this application is Ms. Gina Bradley, Solutia Inc., P.O. Box 711, Alvin, Texas, 77512, telephone (281) 228-4313. A copy of the modification request can be viewed and copied at the Alvin Public Library, 105 S. Gordon St., Alvin, Texas, 77511.

Public comments on this application must be submitted within 60 days of the newspaper publication of this notice to the TCEQ Chief Clerk's Office, MC 105, TCEQ, P.O. Box 13087, Austin, TX 78711-3087. The TCEQ will hold a public meeting on this application if there is a significant degree of public interest.

The Commission may determine that the modification request must follow the procedures for Class 3 modifications if there is significant public concern about the proposed modification, or the complex nature of the change requires the more extensive procedures of a Class 3 modification. The procedures for Class 3 modifications provide an opportunity for a public meeting.

Individual members of the public who wish to inquire about the information contained in this notice, or to inquire about other agency permit applications or permitting processes, should call the TCEQ Office of Public Assistance, toll free, at 1-800-687-4040. Solutia Chocolate Bayou's compliance history during the life of the permit being modified is available from the Office of Public Assistance.

CLASS 2 PERMIT MODIFICATION

RCRA Permit No. HW-51089-000
Solutia, Inc., - Alvin, Texas

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LAKE JACKSON TX 77566

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CLASS 2 PERMIT MODIFICATION

RCRA Permit No. HW-51089-000
Solutia, Inc., - Alvin, Texas

PHOTOCOPY OF FEE PAYMENT

SOLUTIA
Solutions for a better life.™

Solutia Inc.
F.M. 2917
P.O. Box 711
Alvin, Texas 77512
Tel 281-581-2161

March 3, 2009

CERTIFIED MAIL
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Texas Commission on Environmental Quality
Financial Administration Division – MC 214
P.O. Box 13087
Austin, Texas 78711-3087

Re: Solutia Inc. – Chocolate Bayou Plant
HW Reg. 30138
RCRA Permit HW-50189-000

Please find enclosed a check for $1,550.00 pursuant to a RCRA Class 2 Permit Modification request. Details of the specific permit modification were sent to TCEQ, care of Mr. E.J. Biskup, Permits Division, I&HW Permits Section MC-130 on February 27, 2009.

If you need additional information, please contact me at 281-228-4313 or via e-mail at grbrad@solutia.com.

Sincerely,

Gina Bradley

Gina Bradley
Environmental Specialist

Enclosure

TABLE XII.B. - HAZARDOUS WASTE PERMIT APPLICATION FEE WORKSHEET

Name of Facility: **Solutia Inc.**

Solid Waste Registration Number: **30138**

1.	Process Analysis - $1,000	$ **1,000**
2.	Facility Management Analysis - $500	$ **500**
3.	Unit Analysis[7] - _____ units @ $500 per unit	$ ________
4.	Site Evaluation[7] - _____ acres @ $100 per acre (Maximum of 300 acres)	$ ________
5.	Minor amendment, Class 1, or Class 1[1] modification - $100	$ ________
6.	Cost of Providing Notice - $50 (+ $15 for a renewal)	$ **50**
	PAY THIS AMOUNT Λ TOTAL	$ **1,550**

MAKE CHECKS PAYABLE TO:

Texas Commission on Environmental Quality - **Fund 549**
(your canceled check will be your receipt)

COMPLETE AND RETURN WITH PAYMENT TO:

Texas Commission on Environmental Quality
Financial Administration Division - MC 214
P.O. BOX 13087
Austin, Texas 78711-3087

The applicant's fees are subject to evaluation by the technical staff of the Texas Commission on Environmental Quality (TCEQ). However, the TCEQ reserves the right to assess further fees as may be necessitated.

PAY THIS AMOUNT Λ TOTAL $ ________

MAKE CHECKS PAYABLE TO:

Texas Commission on Environmental Quality - **Fund 549**
(your canceled check will be your receipt)

COMPLETE AND RETURN WITH PAYMENT TO:

Texas Commission on Environmental Quality
Financial Administration Division - MC 214
P.O. BOX 13087
Austin, Texas 78711-3087

The applicant's fees are subject to evaluation by the technical staff of the Texas Commission on Environmental Quality (TCEQ). However, the TCEQ reserves the right to assess further fees as may be necessitated.

[7]For these calculations, enter the totals from Table XII.A.

SOLUTIA INC. NON NEGOTIABLE

5000444881

FOR INQUIRIES CALL:

Solutia Inc. (314) 674-4949

Vendor Number: 304301

Invoice Number	Date	Gross Amount	Discount/Wthld	Net Amt	Comments
BRADLEY02170	02/17/2009	1,550.00	0.00	1,550.00	Class 2 Permit Modification Fee
Sum Total		1,550.00	0.00	1,550.00	

REMITTANCE ADVICE: The attached check is in full payment of invoices or other charges listed.

THIS DOCUMENT IS PRINTED IN TWO COLORS. DO NOT ACCEPT UNLESS BLUE AND BROWN ARE PRESENT.

SOLUTIA INC.

ACCOUNTS PAYABLE DEPARTMENT
575, Maryville Centre Drive, SAINT LOUIS, MO 63141

62-20/311

5000444881

DATE 02/23/2009

VOID IF NOT CASHED WITHIN SIX MONTHS

PAY TO THE ORDER OF
TEXAS COMMISSION ON ENVIRONMENTAL
QUALITY (TCEQ)
PO Box 13087
AUSTIN TX 78711-3087
USA

*********1,550.00*

THIS AMOUNT *ONE THOUSAND FIVE HUNDRED FIFTY** USD

PAYABLE AT CITIBANK

NEWCASTLE, DE 19720

by James A. Tichenor

by Tim Spihler

Authorized Signatures

5000444881 031100209 38562316

ATTACHMENT V.4
ENGINEERING REPORT FOR
IWPF TANKS (PERMIT UNITS 08 AND 09)

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX V.4.6

Appendix V.4.6	Certification of RCRA Tank System Modification: Corrosion Protection System for IWPF Tanks 332T1-1 and 332T1-2

CERTIFICATION OF RCRA TANK SYSTEM MODIFICATION: CORROSION PROTECTION FOR IWPF TANKS 332T1-1 AND 332T1-2

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc.
Alvin, Texas

Issued: 28 June 2019

Prepared for: Ascend Performance Materials Texas Inc.

GSI ENVIRONMENTAL

GSI Environmental Inc.

2211 Norfolk, Suite 1000, Houston, Texas 77098-4054 tel. 713.522.6300

GSI Job No. 5219

GSI ENVIRONMENTAL

CERTIFICATION OF RCRA TANK SYSTEM MODIFICATION: CORROSION PROTECTION SYSTEM FOR IWPF TANKS 332T1-1 AND 332T1-2

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

TABLE OF CONTENTS

GSI Job No. 5219

CERTIFICATION OF RCRA TANK SYSTEM MODIFICATION: CORROSION PROTECTION FOR IWPF TANKS 332T1-1 AND 332T1-2

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

I, Elaine A. Higgins, a registered professional engineer in the State of Texas, certify that modification has been completed to the corrosion protection system for Tanks 331T1-2 and 331T1-2 (Notice of Registration Units 50 and 60; Permit Units 08 and 09) at the Ascend Performance Materials Texas Inc. facility located in Alvin, Texas. This certification is based on the following information:

i) Implementation report for the new corrosion protection system prepared by Zerust Oil & Gas and issued 16 November 2018;
ii) A site visit conducted by GSI Environmental Inc. personnel on 17 June 2019;
iii) The Engineering Report for IWPF Tanks issued as part of the Hazardous Waste Permit Renewal Application issued 6 February 2012; and
iv) The Certification of RCRA Tank Installation for Tanks 332T1-1 and 332T1-2 issued 23 August 1994 and included in the the Hazardous Waste Permit Renewal Application issued 31 December 2009.

I further certify that, based on the information reviewed, modification of said facility component has been performed in accordance and compliance with good engineering practices and the general specifications of Hazardous Waste Permit No. 50189.

STATE OF TEXAS
ELAINE A. HIGGINS
85482
LICENSED
PROFESSIONAL ENGINEER

28 June 2019

Elaine A. Higgins, P.E.
State of Texas Registration No. 85482
GSI Environmental Inc.
Registered Engineering Firm No. F-01198

1.0 BASIS FOR CERTIFICATION

1.1 General Background

GSI Environmental Inc. (GSI) has reviewed available information regarding modification to the corrosion protection system for IWPF Tanks 331T1-1 and 332T1-2 on the Ascend Performance Materials Texas Inc. facility in Alvin, Texas. The original cathodic protection system installed in 1994 has been replaced by the application of a corrosion inhibitor and electrical resistance monitoring in November 2016. Information regarding the modification has been reviewed to confirm compliance with applicable provisions of 40 CFR 264.192(a),(f) as adopted by the TCEQ per 30 TAC 335.152(a)(8).

As attested in this report, assessment of the corrosion protection system installed at the IWPF Tanks has found that the system has been installed in accordance with good engineering practices and consistent with the requirements under 40 CFR 264.192(f) and Provision II.A.6 of Hazardous Waste Permit No. 50189 issued 2 February 2015. This document reviews relevant design and installation procedures and provides certification of compliance with applicable standards.

1.2 Information Reviewed

Evaluation of the tank system design and installation has been based upon information derived from the following sources:

i) Implementation report for the new corrosion protection system prepared by Zerust Oil & Gas and issued 16 November 2018;
ii) A site visit conducted by GSI Environmental Inc. personnel on 17 June 2019;
iii) The Engineering Report for IWPF Tanks issued as part of the Hazardous Waste Permit Renewal Application issued 6 February 2012; and
iv) The Certification of RCRA Tank Installation for Tanks 332T1-1 and 332T1-2 issued 23 August 1994.

2.0 DESIGN AND INSTALLATION OF IWPF TANKS 332T1-1 AND 332T1-2

2.1 Tank System Construction

Injection Well Pretreatment Facility (IWPF) Tanks 332T1-1 and 332T1-2 (Permit Units 08 and 09) are located in the south central portion of the manufacturing area of the Ascend Chocolate Bayou facility (see Figure 1).

IWPF Tanks 332T1-1 and 332T1-2 were constructed in accordance with the plans and specifications provided in the Engineering Report provided in the Hazardous Waste Permit Renewal Application (Ascend, 2012), which included the original construction certification report (GSI, 1994) and a Class 2 Permit Modification Application for the storage of sludge in the tanks (Ascend, 2009).

The tank system consists of two carbon steel, floating-roof tanks and appurtenances, designed for collection and pretreatment of process wastewater and stormwater prior to disposal in the on-site permitted injection well system (see Figure 2). Each of the two tanks measures approximately 82 ft in diameter with an approximate 34-ft high straight-sided shell, corresponding to a total liquid height of 30 ft. Both tanks are located within a single concrete secondary containment area having an approximate 4-ft high, reinforced concrete, secondary containment perimeter dike. Both tanks were designed and field-constructed with external floating roofs, internal and external cathodic protection, internal coating, integral flexible membrane liners for leak detection, reinforced concrete ringwall foundations, and level alarms.

2.2 Wastes Managed in IWPF Tanks 332T1-1 and 332T1-2

The IWPF Tanks are used for management and storage of organic and inorganic liquids such as process wastewaters, stormwater, recovered groundwater, and landfill leachate prior to disposal via the on-site injection well system. The IWPF Tanks are also permitted for the storage of hazardous waste sludge. Thus, liquids managed in the tanks do not meet the definition of ignitable or reactive wastes as defined in 40 CFR 261.21 or 261.23, respectively. In addition, incompatible wastes are not managed in the tanks (Ascend, 2012).

3.0 TANK SYSTEM MODIFICATIONS: CORROSION PROTECTION SYSTEM

3.1 Original Corrosion Protection System

During construction of the tanks in 1993-1994, the IWPF Tanks were equipped with a corrosion protection system as required by (40 CFR 164.192(a)(3)). The system entailed a cathodic protection system which included the following components: i) internally suspended sacrificial anodes to protect the tank interior surfaces, ii) external sacrificial anodes connected to the tank bottom, and iii) electrical isolation of all tank nozzles and flanges. Both the internal and external cathodic protection systems were equipped with appropriate wiring and access nozzles to facilitate periodic testing with reference electrodes (Ascend, 2012).

3.2 Replacement Corrosion Protection System

3.2.1 System Overview

In mid-November 2018, the cathodic protection system was replaced with a two part system consisting of the following: i) application of a vaporized corrosion inhibitor, and ii) on-going electrical resistance monitoring. The design specifications and installation details for the system are described below.

3.2.2 Installation Oversight

Proper installation of the system was supervised by an independent corrosion expert, Alex Roytman, Senior Manager of Field Implementation Services for Zerust Oil & Gas (Zerust), as required by 40 CFR 264.192(f). Work was performed by Matcor, Inc., of Houston, Texas. The Zerust Tank Projects' Field Implementation Report is provided in Appendix A.

3.2.3 Vaporized Corrosion Inhibitor

In order to provide protection against corrosion to the underside of the tanks, a vaporized corrosion inhibitor (VCI) was injected via existing 1.25-in diameter leak detection ports in the concrete ringwall at the edge of each tank. In order to complete the injection, 1-in diameter PVC pipes were fitted through each port and assembled with fittings to facilitate connection to the injection equipment. A photograph of a typical injection port is shown in Appendix B. Connections used for the injection are provided in Appendix C

As the VCI traveled through the sand beneath each tank, the organic fraction of the VCI volatilized and adhered to the base of each tank to form a protective coating. The coating neutralizes anodic and cathodic sites, thereby interrupting the electrochemical reactions that promote corrosion.

The VCI was injected as a slurry composed of water and Zerion® FVS-B15 from batch number 066652-3 (see Appendix D). The slurry was mixed at the ratio of 300 gallons of water to 105 kg of Zerion®. The total volume of slurry for each tank was divided into two portions so that 150 gallons of slurry was injected into each of two ports at each tank (see Appendix A for additional details).

3.2.4 Corrosion Monitoring System

In order to monitor the corrosivity of the soil beneath the tank, and the ongoing potential for corrosion of the tank, electrical resistance (ER) probes were installed. Two model CT20 cylindrical-style probes were installed via existing ports in the ringwall of each tank and terminated in an enclosure mounted on the ringwall (see the photographs in Appendix B). Appendix E provides additional information on the probes and Appendix F depicts the ER probe fittings.

To ensure that probes had not been damaged in transit or installation, initial resistance readings measured after manufacture were compared to measurements in the field. The initial readings are stamped into a metal tag at the end of the probe for future reference. The readings recorded on 16 November 2018 will serve as a baseline for comparison to future readings (see Appendix A).

After installation, Zerust recommends that readings from the ER probes be recorded on a monthly basis and evaluated to determine the corrosivity of the soil beneath the tanks and the associated rate of corrosion that would occur in the absence of the VCI.

4.0 RECORD KEEPING (40 CFR 164.192(g))

This written assessment and certification will be maintained on file at the facility as required under 40 CFR 264.192(g).

5.0 REFERENCES

Ascend, 2009. RCRA Class 2 Permit Modification, Ascend Performance Materials LLC, Alvin, Texas, RCRA Permit No. HW-50189-000, 3 March 2009.

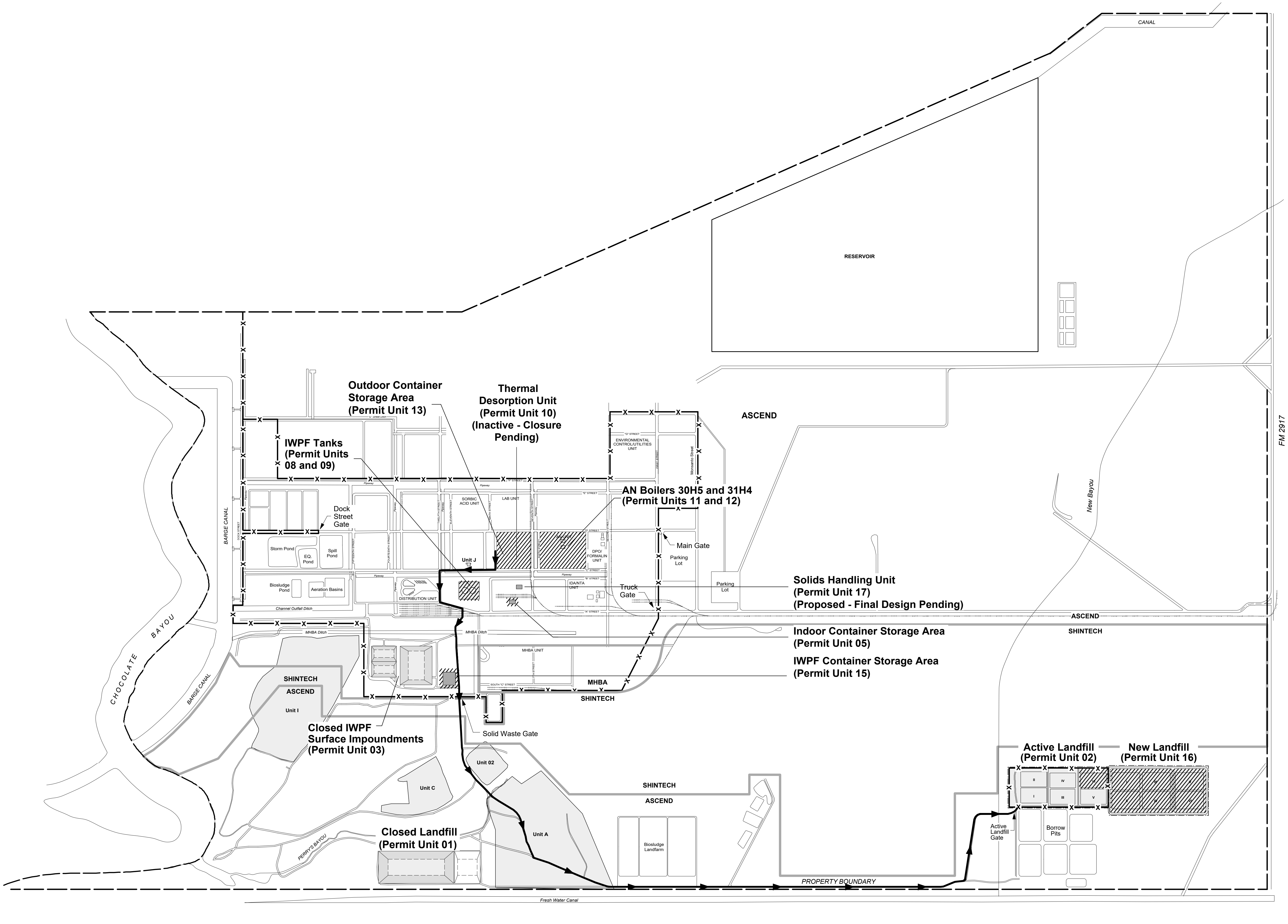
Ascend, 2012. RCRA Permit Renewal Application, Ascend Performance Materials LLC, Alvin, Texas, RCRA Permit No. HW-50189-000, 6 February 2012.

GSI, 1994. Certification of RCRA Tank Installation, Tanks 332T1-1 and 332T1-2, Injection Well Pretreatment Facility, Monsanto Company, Alvin, Texas.

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

FIGURES



LEGEND

- Load/unloading areas
- Road to Active Landfill
- Fence line

Notes:

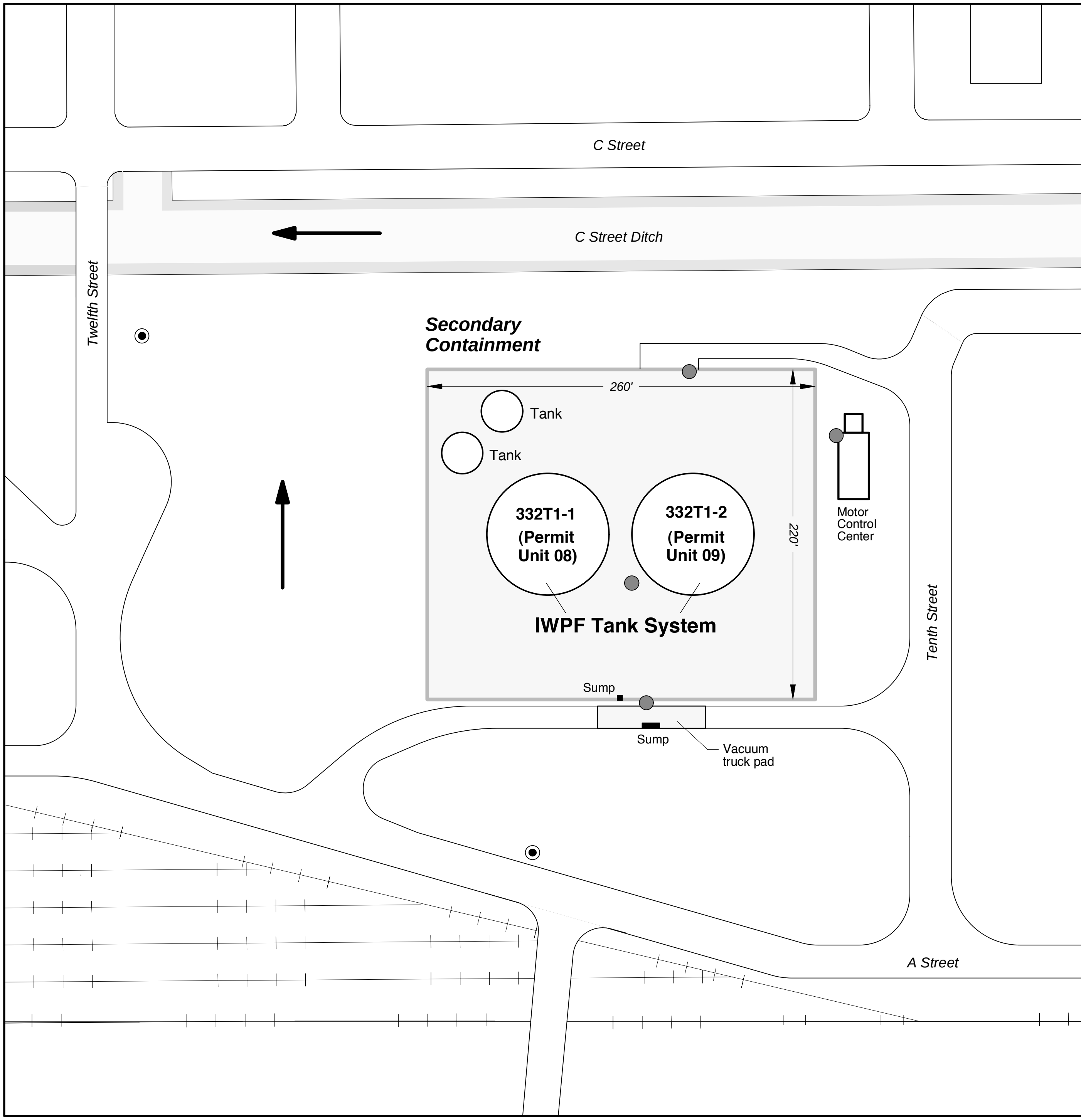
1) Primary roads are 20 ft wide, paved with asphalt or concrete, and designed for a 14,000-lb bearing capacity.
2) Secondary roads are paved with crushed limestone and designed for an 8,000-lb bearing capacity.
3) A 20-mph speed limit applies to all plant roads.
4) Base maps compiled from Solutia drawing No. 340GA2 issued 4-June-1992, and aerial photographs obtained from Aerial Viewpoint, Inc., Negative No. 87B-1922, flight date April-1987, and Negative No. 2, flight date 26-January-1993.

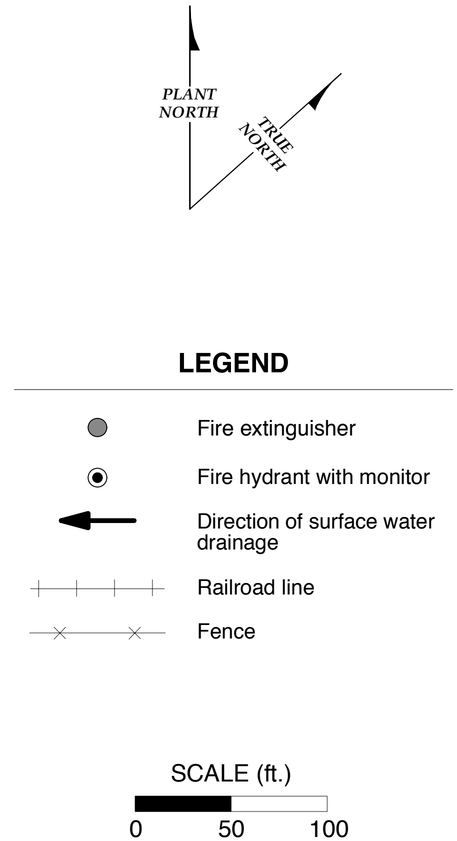
GSI ENVIRONMENTAL
Texas Registration Number: F-1198

LOCATION OF HAZARDOUS WASTE MANAGEMENT UNITS

Certification of RCRA Tank System Modification: Corrosion Protection System for IWPF Tanks 332T1-1 and 332T1-2
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No:	5219	Drawn By:	DLB/CDM
Issued:	28-Jun-2019	Chk'd By:	LMR
Revised:		Appv'd By:	EAH
Scale:	As Shown		Figure 1





GSI ENVIRONMENTAL

Texas Registration Number: F-1198

SITE PLAN: IWPF TANKS

Certification of RCRA Tank System Modification:
Corrosion Protection for IWPF Tanks 332T1-1 and 332T1-2

Hazardous Waste Permit No. 50189
Solutia Inc., Alvin, Texas

GSI Job No:	5129	Drawn By:	DLB/EAH
Issued:	28-June-2019	Chk'd By:	EAH
Revised:	———	Appv'd By:	EAH
Scale:	As Shown	**FIGURE 2**	

GSI Job No. 5219

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDICES

Appendix A	Tank Projects' Field Implementation Report
Appendix B	Photographs of Corrosion System Installation
Appendix C	Injection Port Fittings Kit
Appendix D	Zerion® FVS Specifications
Appendix E	Electrical Resistance Monitoring
Appendix F	ER Probe Enclosure Fittings Kit

GSI Job No. 5219

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX A: ZERUST TANK PROJECTS' FIELD IMPLEMENTATION REPORT

TANK PROJECTS' FIELD IMPLEMENTATION REPORT

ZERUST®[1] OIL & GAS, "NORTHERN TECHNOLOGIES INTERNATIONAL CORPORATION®" (NTIC)

SECTION I – CLIENT & SITE DETAILS	
Client/Customer: Ascend® Contractor: Matcor, Inc.® Site Location: Chocolate Bayou, Texas Vessel ID: TK 332T1-1/TK332T1-2	**SITE VISIT / INSPECTION DATES** Date of Site Arrival: 11/13/2018 Date of Site Departure: 11/16/2018 Date of Report: 11/16/2018

WEATHER & ENVIRONMENTAL CONDITIONS

Temperature	Humidity	Precipitation
34°-56° F	70%	Clouds with Occasional Light Showers

Safety Req.s: Basic Plus®, Ascend Site Specific (07ASCSO), ECU Site Orientation (07APMECU)

SECTION II – PROJECT CONTACTS

NAME	POSITION	COMPANY	CONTACT
Jason Merchant	Project Manager	Ascend	832.492.5460
Jeff Dornak	Sr. Project Manager	Matcor	[redacted] 281.793.9327
Mike Harris	Field Engineer	Matcor	[redacted] 281.902.6700
Atreyu Stratula	Field Engineer	Matcor	[redacted] 346.201.8330
Alex Roytman	Manager, Field Impl. Services	Zerust Oil & Gas	[redacted]

SECTION III – VESSEL INFORMATION

Ensure to note locations of all defects, anchor bolts and other obstructions, locations of all temperature readings, and locations of all leak detection ports, sumps, etc. on the vessel schematic diagram provided on the last page of this report.

Vessel Construction: Carbon Steel On-Grade

What is the foundation media? ☐ Sand/Soil ☐ Concrete/Limestone ☒ Other: Pea Gravel

Level of Foundation Saturation: ☐ None or N/A ☒ Low ☐ High

Is there a concrete ring wall present? ☒ Yes ☐ No

Ringwall Dimensions: 6” Concrete Ring

Is the ring wall in a suitable condition for this application? ☒ Yes ☐ No

Is there a chime seal present? ☒ Yes ☐ No

Is the chime seal in suitable condition for this application? ☒ Yes ☐ No

Is there an HDPE (or Similar) Liner? ☒ Yes ☐ No

Is the liner in suitable condition for this application? ☒ Yes ☐ No

Other Notes on the Tank Chime Area: The chime was sealed by the client prior to project.

Tank Operation & Temperature Readings: 90° F

What is the operation of the tank? ☒ In-Service ☐ Out-of-Service

Are there LD ports available through the tank ring wall? ☒ Yes ☐ No

Quantity of LD Ports Available: (5 ea) on Tank 332T1-1 and (6 ea) on Tank 332T1-2

Construction Medium of LD Port(s): HDPE

Size of LD Port(s): 1.25”

LD Port Depths Under Tank Floor Plates: 1” PVC pipes were installed through exsisting LD ports up to 4 feet.

Are there any sumps present? ☐ Yes ☐ No ☒ Unknown

Is there a CP system present? ☐ Yes ☒ No

Is the CP system active? ☐ Yes ☒ No

SECTION IV – IDS DESIGN DETAILS

“INHIBITOR DELIVERY SYSTEM” (IDS)

Ensure to note all locations of floor ports, LD injection ports, IDS PVC pipe segments, etc. on the vessel schematic diagram provided on the last page of this report.

☐ Chime Ring Dry IDS ☐ Chime Ring Injection IDS ☐ Drip Tube IDS

☐ Dry Tube IDS ☐ Internal Flood IDS ☒ Underside Injection IDS ☐ Other:

IDS MONITORING SYSTEM

Ensure to note all locations of installed ER probes and/or corrosion monitoring coupon assemblies on the vessel schematic diagram provided on the last page of this report.

☒ "Electrical Resistance" (ER) Probes ☐ Corrosion Monitoring Coupon Assemblies

☒ ER Probe Data Logger ☐ Other:

Manufacturer	Equipment Type	Model Name	Serial/ID #
Metal Samples®	Data Logger	0500	N/A
Metal Samples	ER Probe	CT-20	39339
Metal Samples	ER Probe	CT-20	39336
Metal Samples	ER Probe	CT-20	39359
Metal Samples	ER Probe	CT-20	39361

SECTION V – INSTALLATION DETAILS

IDS SOLUTION INSTALLATION

Ensure to note all locations of leak detection ports, totes, hoses, manifolds, etc. on the vessel schematic diagram provided on the last page of this report.

Equipment Used in the Installation of the IDS Solution:

☒ Totes/Drums ☒ Low-Pressure Pump ☒ Garden Hoses w/Fittings ☐ Scaffolding
☒ Steel Fish Tape ☐ Core Drilling Equipment ☐ PVC Cement & Primer ☐ Other:

Corrosion Inhibitor Batch Information:

Corrosion Inhibitor Product	Batch #
Zerion® FVS-B15	066652-3

Location of Leak Detection Ports Used for Slurry Injection: Reference Drawing

Were LD ports confirmed useable for slurry injection? ☒ Yes ☐ No

Were PVC pipes fitted through existing LD ports for slurry injection? ☒ Yes ☐ No

Lengths of IDS PVC Pipe System Segments Installed per LD Port: 5 feet

Corrosion Inhibitor Slurry Injection Information:

Tank	Port #/ID	Injection #	Zerion FVS Quantity	Water Volume
TK 332T1-1	Northwest	1	~52.5-kg (3.5 Pails)	~150-gallons
TK 332T1-1	South	2	~52.5-kg (3.5 Pails)	~150-gallons
	TOTALS:	**2 Injections**	**~105-kg (7 Pails)**	**~300-gallons**
TK 332T1-2	Southwest	1	~52.5-kg (3.5 Pails)	~150-gallons
TK 332T1-2	South	2	~52.5-kg (3.5 Pails)	~150-gallons
	TOTALS:	**2 Injections**	**~105-kg (7 Pails)**	**~300-gallons**

IDS MONITORING SYSTEM INSTALLATION

Equipment Used in the Installation of the IDS Monitoring System: ☐ Trowels/Shovels ☐ Core Drilling Equipment ☒ PVC Cement & Primer ☒ Other: Drill, Saw, Generator

ER Probes Details (Reference Drawing for Locations):

Tank	ER Probe Serial/ID #	Port #/ID	Installation Depth
TK 332T1-1	39336	Southeast	~3-Feet
TK 332T1-1	39339	Southwest	~3-Feet
TK 332T1-2	39361	East Port	~3-Feet
TK 332T1-2	39359	West Port	~3-Feet

Were ER probes installed directly into the tank foundation? ☒ Yes ☐ No

Were ER probes verified in acceptable/working condition? ☒ Yes ☐ No

Was ER probe data logger verified in acceptable/working condition? ☒ Yes ☐ No

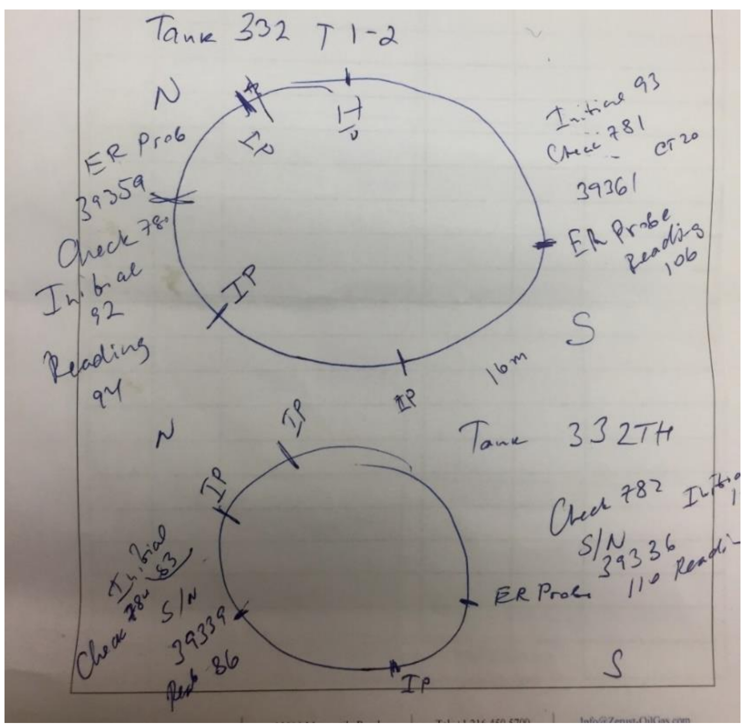
Were ER probe enclosures used to secure cables/isolate system? ☒ Yes ☐ No

ER Probe Serial/ID #	Check Value (From Tag)	Initial Reading (From Tag)	Recorded Reading
39336	782	109	110
39339	784	83	86
39359	780	92	94
39361	781	106	93

SECTION VI – CONCLUSION & RECOMMENDATIONS

Both storage tanks are located inside of a concrete pit. The HDPE membrane is fused throughout the entire pit. There were some leaks noticed from under the HDPE membrane during the injection process. Zerust needed to confirm that this membrane is present under the tank as well as under the dike area. After reviewing the drawings and discussing with project managers, the decision was made to proceed with injection as planned. A total of about 300-gallons of inhibitor slurry was injected under each tank for an average slurry concentration of ~9%. PVC pipes for ER probe installation were perforated on-site and installed into the gravel through 1.25” leak detection pipes. The ends of these pipes were fitted with enclosures to secure the cables. The project went smooth according to on-site personnel and the slurry injection and ER probe installation was completed in one (1) day. All ER probe readings were taken on-site and data has been provided in this report. It is recommended that monthly ER probe readings be recorded and sent to Zerust Oil & Gas for further analysis. Contact a Zerust Oil & Gas representative with any questions regarding this report.

SECTION VII – VESSEL SCHEMATIC



Zerust Oil & Gas Representative **PRINTED NAME**: Alex Roytman
Zerust Oil & Gas Representative **SIGNATURE**: *AR*
Submission **DATE**: 11/19/2018

GSI Job No. 5219

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX B: PHOTOGRAPHS OF CORROSION SYSTEM INSTALLATION

GSI Job No. 5219
Issued: 28 June 2019

APPENDIX B
PHOTOGRAPHS OF CORROSION SYSTEM INSTALLATION

Certification of RCRA Tank System Modification:
Corrosion Protection for IWPF Tanks 332T1-1 and 332T1-2
Ascend Performance Materials Texas Inc., Alvin, Texas

Southwest port through ringwall foundation of IWPF Tank 332T1-2 used for injection of vaporized corrosion inhibitor (typical of all injection ports).

Electrical Resistance Probes on IWPF Tank 332T1-1.

Serial/ID # 39336 Southeast Port

Serial/ID # 39339 Southwest Port

Note: Photographs taken by GSI personnel on 17 June 2019.

APPENDIX B
PHOTOGRAPHS OF CORROSION SYSTEM INSTALLATION

Certification of RCRA Tank System Modification:
Corrosion Protection for IWPF Tanks 332T1-1 and 332T1-2
Ascend Performance Materials Texas Inc., Alvin, Texas

Electrical Resistance Probes on IWPF Tank 332T1-2.

Serial/ID # 39361 East Port

Serial/ID # 39359 West Port

Electrical Resistance Probes on IWPF Tank 332T1-2.

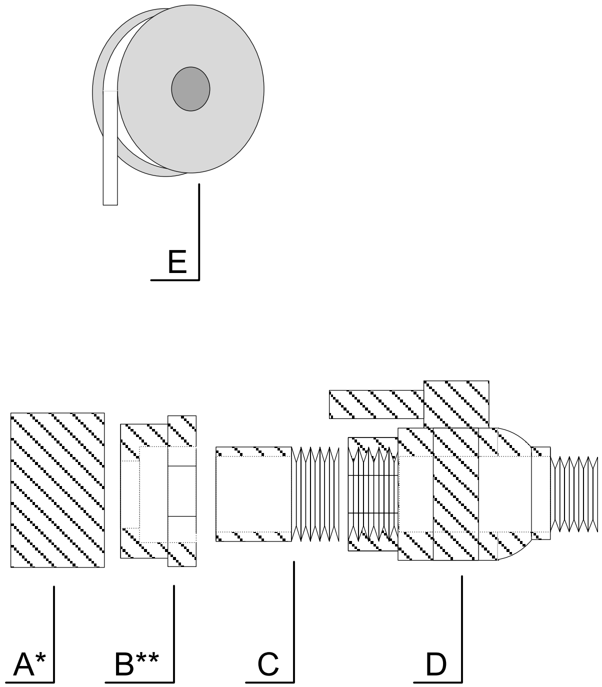
Close-up showing probe information.

Note: Photographs taken by GSI personnel on 17 June 2019.

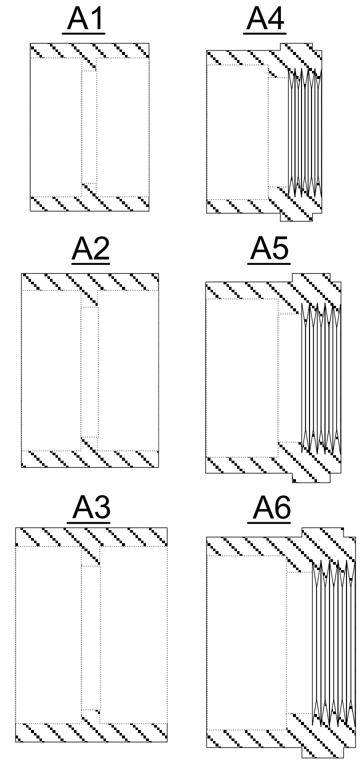
CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

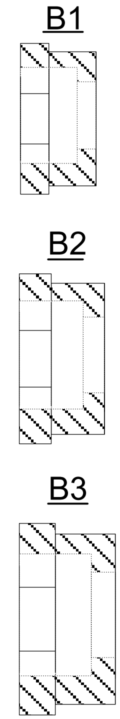
APPENDIX C: INJECTION PORT FITTINGS KIT



*OPTIONS FOR PART "A" INCLUDE THE FOLLOWING ITEMS:



**OPTIONS FOR PART "B" INCLUDE THE FOLLOWING ITEMS:



ITEM	McMASTER-CARR ITEM #	NTIC ITEM #	ITEM DESCRIPTION
A1	4880K73	1020-0060	PVC Straight Connector, 1 Socket-Connect Female (1 EA)
A2	4880K75	1020-0061	PVC Straight Connector, 1-½ Socket-Connect Female (1 EA)
A3	4880K76	1020-0062	PVC Straight Connector, 2 Socket-Connect Female (1 EA)
A4	4880K83	1020-0063	PVC Hex Adapter, 1 Socket Female x 1 NPT Female (1 EA)
A5	4880K85	1020-0064	PVC Hex Adapter, 1-½ Socket Female x 1-½ NPT Female (1 EA)
A6	4880K86	1020-0060	PVC Hex Adapter, 2 Socket Female x 2 NPT Female (1 EA)
B1	4880K315	1020-0061	PVC Hex Bushing Adapter, 1 Socket Male x ¾ Socket Female (1 EA)
B2	4880K333	1020-0062	PVC Hex Bushing Adapter, 1-½ Socket Male x ¾ Socket Female (1 EA)
B3	4880K337	1020-0063	PVC Hex Bushing Adapter, 2 Socket Male x ¾ Socket Female (1 EA)
C	9173K34	1020-0064	PVC Pipe Nipple, Threaded on One End, 3/4 NPT, 2" Length (1 EA)
D	9848K24	1020-0070	PVC Ball Valve, ¾ NPT Female x ¾" GHT Male (1 EA)
E	4591K12	1020-0071	Pipe Thread Sealant Tape, 1/2" Wide x 16 Yard Length (1 EA)

NORTHERN TECHNOLOGIES INTERNATIONAL CORPORATION

INJECTION PORT FITTINGS KIT

ALL DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED).
***MEASUREMENTS ARE FOR REFERENCE

DRAWING NOT TO SCALE

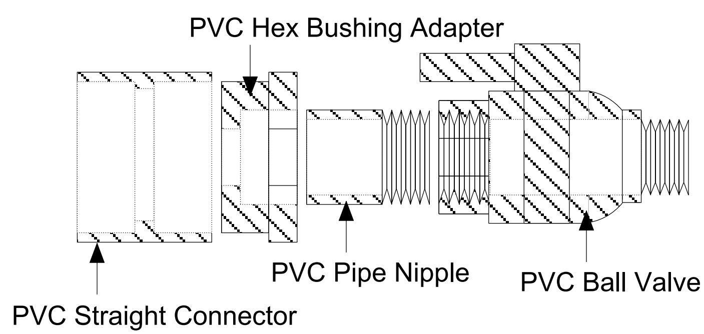
NTIC PART No. 1040-0101

DRAWING No. ZP043.02.02

AUTHOR: AJP

REVISION No. 0

REVISION DATE 08.21.2017


PVC Hex Bushing Adapter
PVC Straight Connector
PVC Pipe Nipple
PVC Ball Valve

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX D: ZERION® FVS SPECIFICATIONS

Zerust® OIL & GAS

WORLDWIDE CORROSION SOLUTIONS

CREDENTIALS

40+ years of experience in corrosion prevention.

Client support in 50+ countries.

Chair key task group at NACE International.

MEMBERSHIPS

NACE API ILTA NISTM

Zerust Flange Saver®
Zerust ReCAST-R™
2012: Winner of the MP Readers' Choice NACE Corrosion Innovation of the Year award

Zerion FVS Powder Protects Ferrous Metals.

Zerion® FVS

MULTI-PHASE CORROSION INHIBITOR FOR INDUSTRIAL APPLICATIONS

The Zerust Solution

Zerust Zerion FVS is a versatile new corrosion inhibitor specifically designed to protect ferrous metals in aggressive corrosion environments where there is the possibility of the accumulation of water, moisture and/or water ingress. FVS provides unique dual action corrosion protection. This new dimension of effectiveness makes FVS the best in class in the market today.

Zerion FVS's two forms of protection:

1. Vapor Corrosion Inhibitors (VCIs) to protect the interiors of "air space" voids and exposed metal surfaces on welded joints, in crevices, at coating holidays, etc.
2. Soluble Corrosion Inhibitors (SCIs) that mitigate corrosion from moisture accumulation or the ingress of water.

This combination penetrates gaps and interstices inside of enclosed voids to provide comprehensive coverage.

Applications

Zerion FVS is a highly cost-effective corrosion mitigation solution for difficult to protect spaces. Some key applications include the following:

Aboveground Storage Tank (AST) Soil Side Bottoms (SSB):
Zerion FVS has been used in multiple tank soil side bottom installations. It provides superior protection to exposed steel in vapor spaces and crevices under the tank bottoms and in situations when there is ingress of water into the tank foundation space. FVS can be diluted with water and injected into sand/soil base or introduced as a powder during tank construction or bottom plate refurbishment. Even for tanks with concrete pad foundations, FVS in slurry form can be introduced into the spaces between the plates and the concrete to provide corrosion protection. Zerust has also pioneered a VCI Ring system using FVS if there is no liquid injection. This VCI Ring system is recommended for all SSB installations.

Protection of Voids/Enclosures:
The Zerion FVS VCI chemistry actively protects exposed steel from corrosion in large volume voids and enclosures. There are multiple delivery mechanisms and product packages that can be adapted to the geometry of the structure being protected. When it is possible for the void to be hermetically sealed, a one-time introduction of FVS can provide protection for up to 2 years.

Hydrostatic Testing:
Add Zerion FVS to hydrostatic testing water to provide excellent protection to exposed steel surfaces. In addition to the SCI protection, the VCI evolves to protect any air pockets or hidden voids. FVS is versatile and compatible with a variety of water profiles and works best with DI, RO or potable water with less than 150 ppm of chlorine.

Benefits

Easy-to-use and versatile system.

Corrosion protection for voids and interstices that are impossible to protect with other methods.

VCIs offer non-permanent corrosion protection at the molecular level that is a more cost-effective and eco-friendly alternative to replacing corroded parts.

May be combined with simple monitoring procedures to ensure effectiveness of the solution.

Protection for tank bottom plates and welds with little to no surface preparation.

For tank SSB application, it may be used independently or in conjunction with cathodic protection.

Vapor action ensures uniform distribution within the tank bottom.

Product Properties

Appearance: Off-white powder

Packaging: Mesh Sleeve, pail or drum

Safety & Handling

Avoid contact with eyes and skin through use of safety glasses and gloves

If dust is generated ensure adequate ventilation or use dust mask to prevent inhalation

See Safety Data Sheet (SDS) for more information

Storage

Shelf life is 36 months

Store in a sealed container in a dry, ventilated warehouse at temperatures below 70oC

Product Use

The ready-to-use mesh sleeves are primarily meant for dry VCI application where there is also a risk of water ingress. The vapor space protection volume is provided in the table below. For aggressive environments with 1 ppm or higher level of acidic gases, Zerion FVS should be used in combination with Zerion AutoFog®. In the event of water ingress/accumulation, FVS will dissolve out of the packaging and neutralize the threat up to the volume of water indicated in the usage table.

For use of Zerion FVS as a water diluted solution for hydro static testing or for tank SSB protection, it is recommended you contact Zerust Oil & Gas for technical support and sizing recommendations.

FVS does not contain phosphates and is readily compatible with most industrial water treatment processes. Dispose of in accordance with local and national regulations.

Product Sizes & Specifications

Product Name	Description	Application Guide
Zerion FVS-S10	Mesh Sleeve 1 m (3ft.) long x 20 mm (0.75 in) diameter	Place in center of void and seal tightly. Provides approximately 3.1m^3 volume* of protection.
Zerion FVS-S15	Mesh Sleeve 1.5 m (5ft.) long x 20 mm (0.75 in) diameter	Designed for use with Inhibitor Delivery System solutions. Contact your sales representative for details.
Zerion FVS-B15	Bulk powder in pails 15 kg/pail	Dilute with water** to use as slurry. Mixing ration of 0.5% to 15% (w/v) depending on application.
Zerion FVS0B165	Bulk powder in drums 165 kg/drum	
Zerion PGH Gel 300	Swellable polymer. Bulk powder in pails.	Fills annular space of pipe casing.
Zerion PGH Gel 400	Swellable polymer. Bulk powder in pails.	Fills annular space of pipe casing. Larger granular size and increased swell time than PGH 300.

* Volume of protection is limited to 1 m radius from the mesh sleeve.

** Best performance is obtained with DI, RO or potable water with a chloride level less than 150 ppm

Duration of Protection

Zerust® Zerion® FVS ready-to-use mesh sleeves typically provide 1-2 years of corrosion protection depending on how well the enclosure is sealed.

FVS mesh sleeves used in tank chime ring seals typically provide 1-2 years of corrosion protection depending on the integrity of the chime seal. Longer protection is possible with replenishment of the inhibitor.

When FVS is introduced into a tank SSB environment, either mixed in as a powder in the sand/soil or injected as concentrated slurry, the typical duration of protection is 5-10 years before inhibitor replenishment is required. The replenishment can be tied into periodic monitoring and maintenance of the effectiveness of the solution.

Order Specifications

Please contact your sales representative for the correct product for your application.

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX E: ELECTRICAL RESISTANCE MONITORING

Electrical Resistance Monitoring

(ER) Introduction

The electrical resistance (ER) technique is an "on-line" method of monitoring the rate of corrosion and the extent of total metal loss for any metallic equipment or structure. The ER technique measures the effects of both the electrochemical and the mechanical components of corrosion such as erosion or cavitation. It is the only on-line, instrumented technique applicable to virtually all types of corrosive environments.

Although universally applicable, the ER method is uniquely suited to corrosive environments having either poor or non-continuous electrolytes such as vapors, gases, soils, "wet" hydro-carbons, and nonaqueous liquids. Examples of situations where the ER approach is useful are:

- Oil/gas production and transmission systems
- Refinery/petrochemical process streams
- External surfaces of buried pipelines
- Feedwater systems
- Flue gas stacks
- Architectural structures

An ER monitoring system consists of an instrument connected to a probe. The instrument may be permanently installed to provide continuous information, or may be portable to gather periodic data from a number of locations. The probe is equipped with a sensing element having a composition similar to that of the process equipment of interest.

Principles of Operation

The electrical resistance of a metal or alloy element is given by:

$$R = r \bullet \frac{L}{A}$$

where:

L = Element length
A = Cross sectional area
r = Specific resistance

Reduction (metal loss) in the element's cross section due to corrosion will be accompanied by a proportionate increase in the element's electrical resistance.

Practical measurement is achieved using ER probes equipped with an element that is freely "exposed" to the corrosive fluid, and a "reference" element sealed within the probe body. Measurement of the resistance ratio of the exposed to reference element is made as shown in Figure 1.

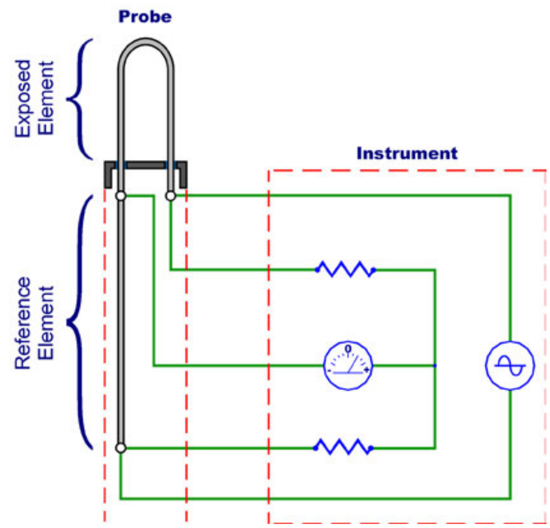


Figure 1: Probe / Instrument

Since temperature changes effect the resistance of both the exposed and reference element equally, measuring the resistance ratio minimizes the influence of changes in the ambient temperature. Therefore, any net change in the resistance ratio is solely attributable to metal loss from the exposed element once temperature equilibrium is established.

All standard Metal Samples ER probes incorporate a third element called the "check" element. Because the check element is also sealed within the probe body, the ratio of its resistance to that of the reference element should remain unchanged. Any significant change in this ratio indicates a loss of probe integrity.

Measurement of the ER probe may either be taken periodically using a portable instrument, or on a continuous basis using a permanently installed unit. In either case, Metal Samples ER instruments will produce a linearized signal which is proportional to the metal loss of the exposed element. The rate of change in the instrument output is a measure of the corrosion rate. Continuously monitored data is usually transmitted to a computer/data-logger and treated to give direct corrosion rate information. Manual graphing techniques are usually used to derive corrosion rate from periodically obtained data as illustrated in Figure 2.

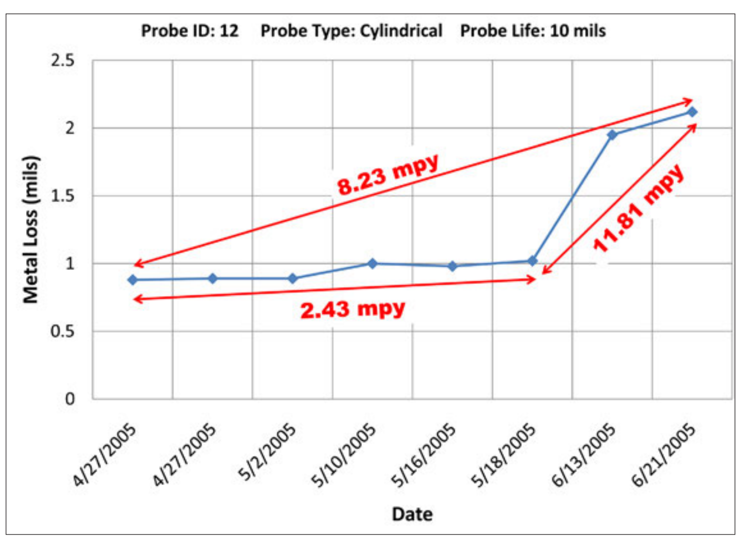


Figure 2. Graph plotting measurement versus time to derive corrosion rate.

ER Sensing Elements

Sensing elements are available in a variety of geometric configurations, thicknesses, and alloy materials. Available element types are shown in Figure 3.

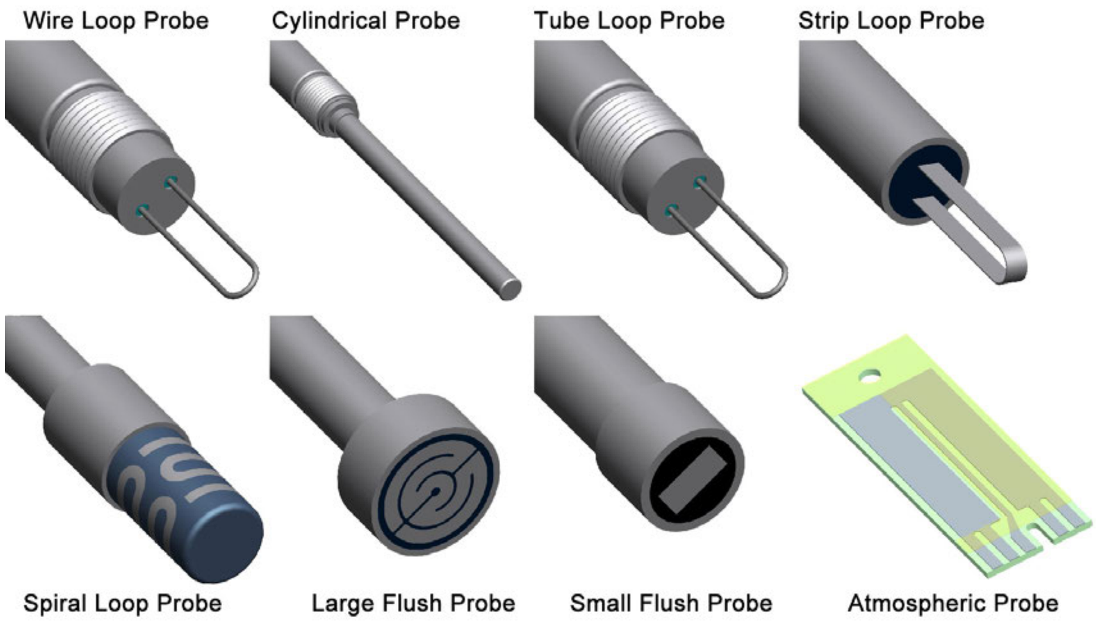


Figure 3: ER Sensing Elements

Wire loop elements are the most common element available. This type of element has high sensitivity and low susceptibility to system noise, making it a good choice for most monitoring installations. Wire loops are generally glass-sealed into an endcap which is then welded to the probe body. The glass seal, which is chemically inert in most environments and has a good pressure and temperature rating, makes a good choice for most applications. Alloys commonly glass sealed are Carbon Steel, AISI 304 and 316 stainless steels. Where glass may be susceptible to corrosion problems, Tefon®-sealed elements are also available. Probes with wire loop elements are normally equipped with a flow deflector (or velocity shield) to protect the element from floating debris in the piping system.

Tube loop elements are recommended where high sensitivity is required to rapidly detect low corrosion rates. Tube loop elements are manufactured from a small bore, hollow tube formed into the above loop configuration. Carbon Steel is the alloy most commonly used. Tube loops sealed into the probe by a Teflon® pressure seal are also available. Probes using the tubular loop element can be equipped with a flow deflector to minimize possible distortion in fast flowing systems.

Strip loop elements are similar to the wire and tube loop configurations. The strip loop is a flat element formed in a loop geometry. The strip loop may be glass or epoxy sealed into the endcap depending on the required application. The strip loop is a very sensitive element. Strip loops are very fragile and should only be considered for very low flow applications.

Cylindrical elements are manufactured by welding a reference tube inside of a tube element. This element has an all welded construction which is then welded to the probe body. Because of this element's all welded construction, exotic alloy elements can be produced relatively easily. This probe is ideally suited to harsh environments including high velocity and high temperature systems, or anywhere a glass-sealed element is not an option.

Spiral loop elements consist of a thin strip of metal formed on an inert base. The element is particularly rugged and ideal for high-flow regimens. Its comparatively high resistance produces a high signal-to-noise ratio, which makes the element very sensitive.

Flush mount elements are designed to be mounted flush with the vessel wall. This element is very effective at simulating the true corrosion condition along the interior surfaces of the vessel wall. Being flush, this element is not prone to damage in high velocity systems and can be used in pipeline systems that are subject to pigging operations.

Surface strip elements for **atmospheric probes** are thin rectangular elements with a comparatively large surface area to allow more representative results in non-homogeneous corrosive environments. Strip elements are commonly used in underground probes to monitor the effectiveness of cathodic protection currents applied to the external surfaces of buried structures.

Corrosion Rate Calculation

When measuring the ER probe, the instrument produces a linearized signal (S) that is proportional to the exposed element's total metal loss (M). The true numerical value being a function of the element thickness and geometry. In calculating metal loss (M), these geometric and dimensional factors are incorporated into the "probe life" (P) (see Table 1), and the metal loss is given by:

$$M = \frac{S \times P}{1000}$$

Metal loss is conventionally expressed in mils (0.001 inches), as is element thickness.

Corrosion rate (C) is derived by:

$$C = \frac{P \times 365\,(S_2 - S_1)}{\Delta T \times 1000}$$

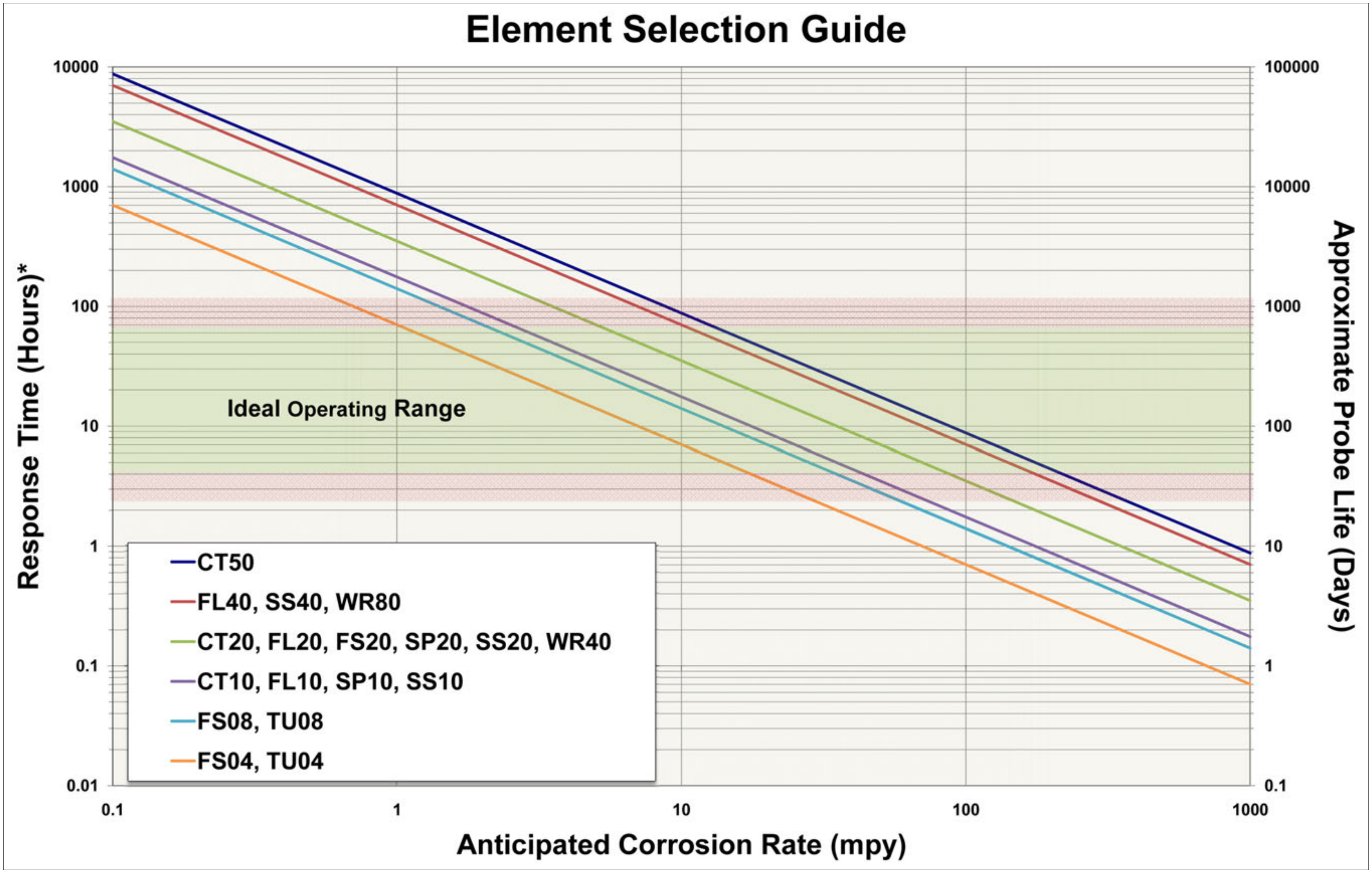
ΔT being the lapse time in days between instrument readings S_1 and S_2.

Table 1 lists element types, thicknesses, probe life, and identification numbers. For temperature and pressure ratings see respective probe data sheets. When selecting an element type for a given application, the key parameters (apart from the fundamental constraints of temperature and pressure) in obtaining optimum results are response time and required probe life. Element thickness, geometry, and anticipated corrosion rate determine both response time and probe life. Response time, defined as the minimum time in which a measurable change takes place, governs the speed with which useful results can be obtained. Probe life, or the time required for the effective thickness of the exposed element to be consumed, governs the probe replacement schedule.

Element Type	Thickness	Probe Life	Element ID
Wire loop	40 mil 80 mil	10 mil 20 mil	WR40 WR80
Tube loop	4 mil 8 mil	2 mil 4 mil	TU04 TU08
Strip loop	5 mil 10 mil	1.25 mil 2.5 mil	SL05 SL10
Cylindrical	10 mil 20 mil 50 mil	5 mil 10 mil 25 mil	CT10 CT20 CT50
Spiral loop	10 mil 20 mil	5 mil 10 mil	SP10 SP20
Flush (small)	4 mil 8 mil 20 mil	2 mil 4 mil 10 mil	FS04 FS08 FS20
Flush (large)	5 mil 10 mil 20 mil 40 mil	2.5 mil 5 mil 10 mil 20 mil	FL05 FL10 FL20 FL40
Surface Strip	10 mil 20 mil 40 mil	5 mil 10 mil 20 mil	SS10 SS20 SS40

Table 1. Probe Life and Element ID

Since probe life and response time are directly proportional, element selection is a compromise between data frequency and probe replacement frequency. The graphical relationship between corrosion rate, probe life, and response time for all elements normally available from Metal Samples is shown in Figure 4.



* Response Time is the minimum time required for a 0.4% (4 probe division) change.

Figure 4. Element Selection Guide

Probe Features

Metal Samples ER probes are available in a variety of configurations and are discussed in detail in later pages of this catalog. The brief summary provided here, gives only a broad overview of probe construction.

The standard material of construction for all Metal Samples probe bodies is AISI 316L stainless steel which conforms with the ANSI/NACE MR0175/ISO 15156 standard for sour service conditions. Other materials may be available for extremely aggressive environments. Contact our sales department to discuss alternative options.

The primary pressure sealing mechanism for Metal Samples ER probes is the element seal, which varies with the precise element specification. However, all Metal Samples process probes incorporate, at the instrument end, a glass-sealed, pressure-rated, electrical connector. The connector provides a backup seal should leakage develop in the element seal.

The simplest of all probe body configurations is the **fixed** version, shown in Figure 5. Typically equipped with an NPT pipe plug or flange connection, the fixed probe is screwed or bolted into place. Probe installation or removal can only be performed during shut-down, unless the probe is installed in a side-stream which may be isolated and depressurized. The frequency of shut-down should be a factor in the selection of probe life criteria.

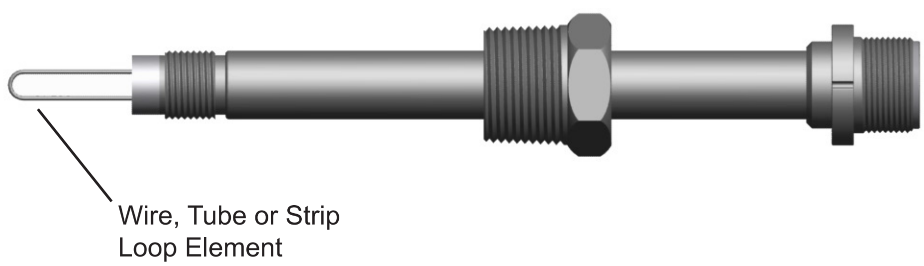


Figure 5. Fixed Probe

Retractable probes are supplied with a 1-inch FNPT packing gland to allow probe insertion and removal through a customer-supplied ball valve, in systems with pressures not exceeding 1500 psi. The locking ferrule and an adjustable safety chain prevent the probe from “backing out” in systems with high vibration. Metal Samples requires the Easy Tool for probe insertion or retraction in systems with pressure over 150 pounds.

Retractable probes find wide applications in refinery and petrochemical industries. A typical probe is shown in Figure 6.

Retrievable probes are employed in process systems operating at pressures up to 3600 psi. These probes must be used in conjunction with specially designed fittings, retrieval tools and service valves, all of which are described in the High Pressure Access Systems section. The retrievable design is the industry standard for oil production systems. A typical installation is shown in Figure 7.

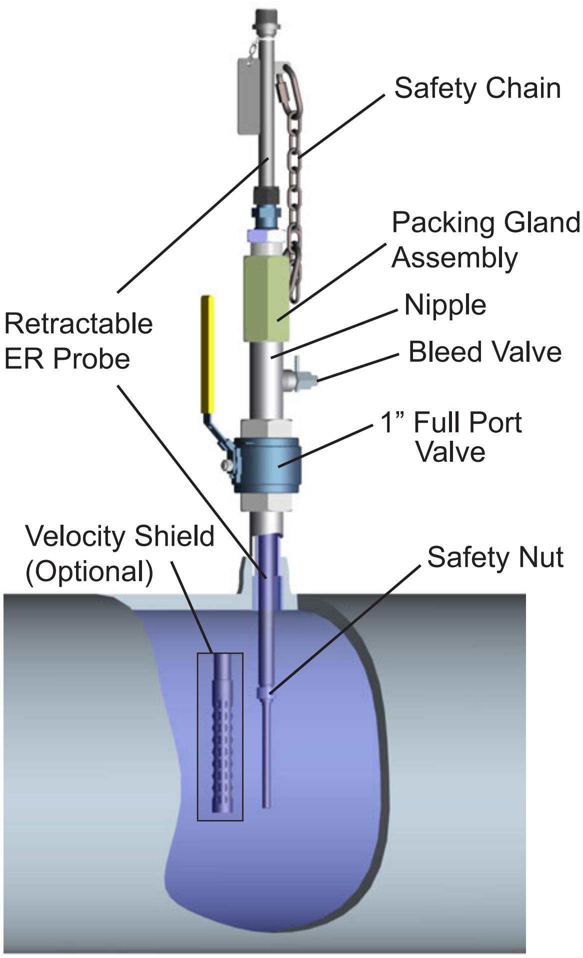


Figure 6. Retractable Probe

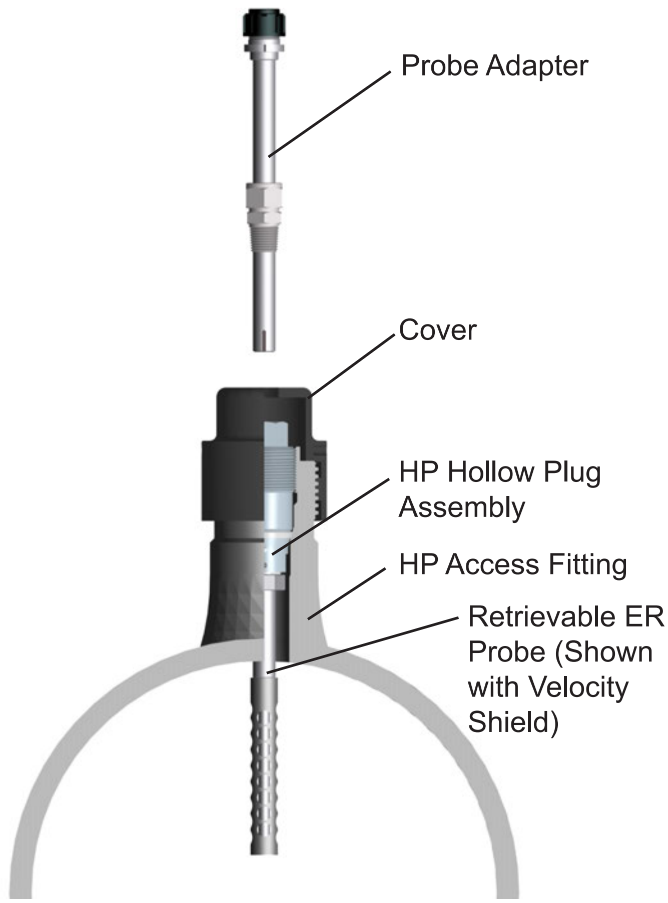
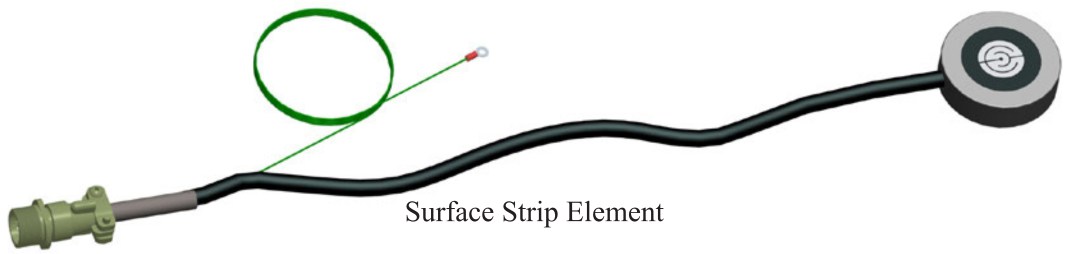


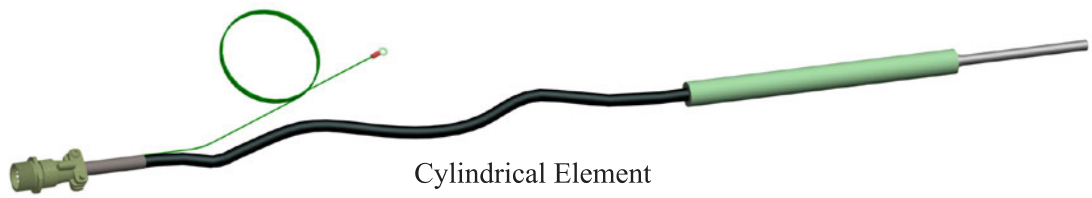
Figure 7. Retrievable Probe

Model ER0500

Electrical Resistance Probe
Surface Strip Element and Cylindrical Element Types



Surface Strip Element



Cylindrical Element

Model ER0500 corrosion probes are designed for heavy duty service conditions such as underground and structural monitoring of pipelines, vessels, above and below ground storage tanks and structures - whether cathodically protected or not. The surface strip element assembly is suited to the "construction site" environment. The cylindrical element is economical and durable. Its slim profile is convenient for locations with restricted access such as concrete bridge structures and other infrastructure applications. Both probes provide good sealing of the reference element and the check element provides confidence in the continued performance of the corrosion sensor. Either probe may be connected to a cathodically protected structure using the attached grounding lead. This allows the probe to measure the effectiveness of the Cathodic Protection (C.P.) System under operating conditions. If left unconnected from the structure, the probe monitors the direct corrosivity of the soil or environment. The grounding lead is installed at the connector end, unless otherwise specified. This enables connection to the C.P. System to be made as required even after probe installation.

Specifications:

	Surface Strip	Cylindrical (Standard)	Cylindrical (High-Temp)
Probe Body	PVC / Epoxy	FRP / Epoxy	Stainless Steel
Cable	High-Density Polyethylene Jacket Rated for Direct Burial		Teflon® FEP
Temperature Rating	176°F (80°C)		392°F (200°C)

Metal Samples Corrosion Monitoring Systems
A Division of Alabama Specialty Products, Inc.
152 Metal Samples Rd., Munford, AL 36268 Phone: (256) 358-4202 Fax: (256) 358-4515
E-mail: [redacted] Internet: www.metalsamples.com
Houston Office: 6327 Teal Mist Lane, Fulshear, TX 77441 Phone: (832) 451-6825

ER0500 Ordering Information

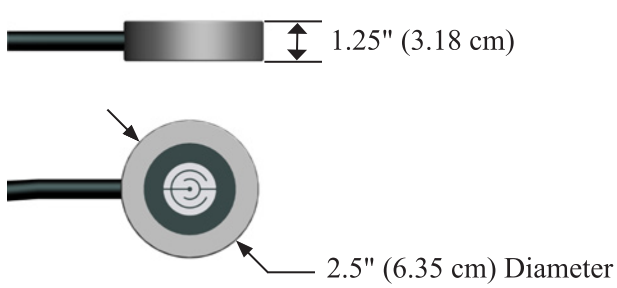
<table>
<tr><th colspan="6">Model</th></tr>
<tr><td rowspan="9">AP</td><td colspan="5">Electrical Resistance Probe</td></tr>
<tr><th colspan="5">Type</th></tr>
<tr><td rowspan="7">40
61
A0</td><td colspan="4">Under ground cylindrical with ground strap
Under ground surface strip with ground strap
High-temperature underground cylindrical with ground strap</td></tr>
<tr><th colspan="4">Element Thickness</th></tr>
<tr><td rowspan="5">10
20
40
50</td><td colspan="3">10 mil thickness (5 mil useful probe life) - cylindrical or surface strip
20 mil thickness (10 mil useful probe life) - cylindrical or surface strip
40 mil thickness (20 mil useful probe life) - surface strip only
50 mil thickness (25 mil useful probe life) - cylindrical only</td></tr>
<tr><th colspan="3">Element Alloy</th></tr>
<tr><td rowspan="3">XXX</td><td colspan="2">Use Code in Alloy Chart</td></tr>
<tr><th colspan="2">Cable Length</th></tr>
<tr><td>10
20</td><td>10 ft. cable
20 ft. cable</td></tr>
<tr><th>AP</th><th>61</th><th>40</th><th>375</th><th>20</th><th>Example of Probe Ordering #</th></tr>
</table>

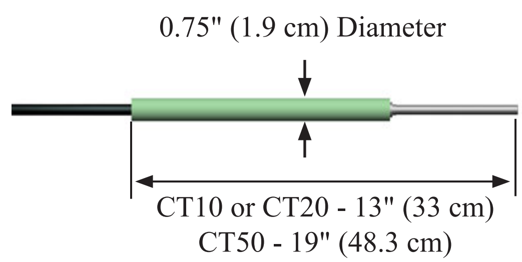
For alloys, sizes, cable lengths, or other special requirements not listed, contact our sales department.

Alloy Chart					
Code	**Description**	**UNS #**	**Code**	**Description**	**UNS #**
375*	Carbon Steel **	G10100	159	316L SS	S31603
538	5Cr 1/2Mo	K42544	A12	C276	N10276
541	9Cr 1Mo	K90941	602	Alloy 625	N06625
186	410 SS	S41000	419	CDA110	C11000
141	304 SS	S30400	434	CDA443	C44300

Note: Not all alloys are available with all element types and seals.
* For CT50 cylindrical elements use alloy code 378 instead of 375.
** Chemically equivalent to standard pipe-grade carbon steels.

Installation/Clearance Dimenions:

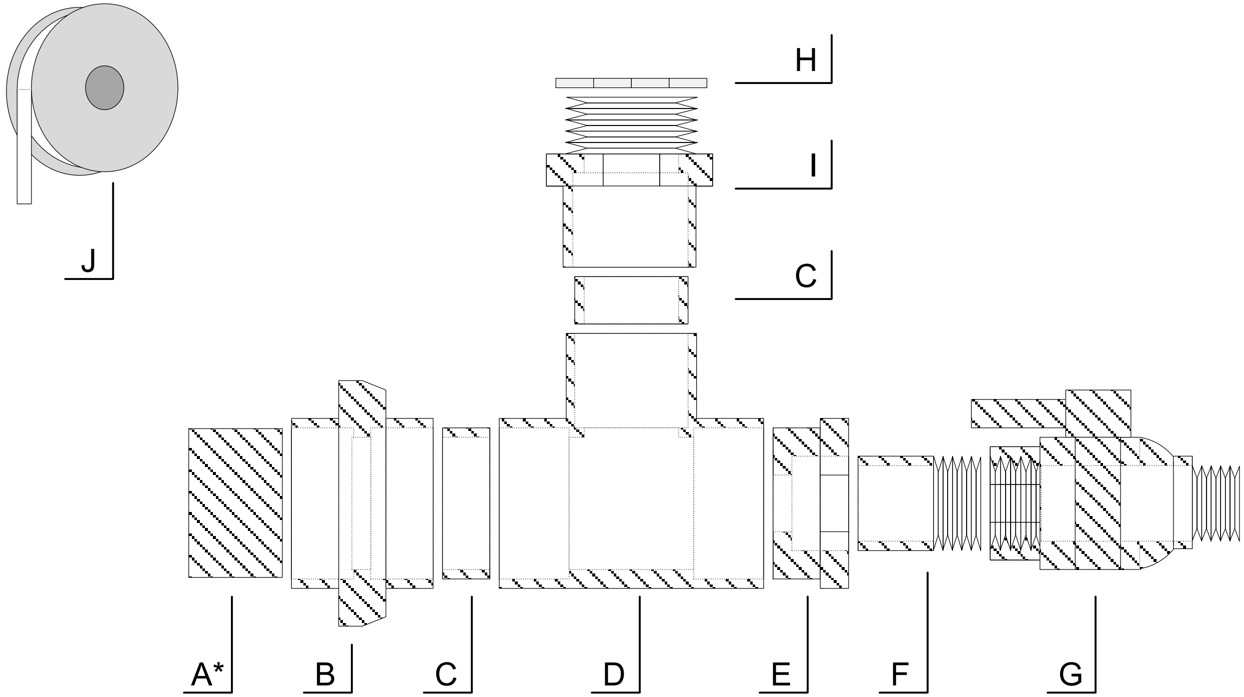




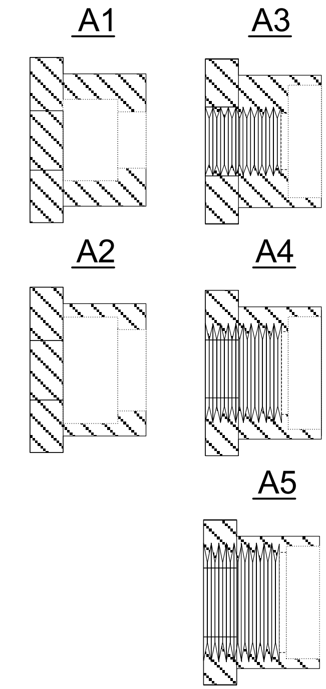
CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX F: ER PROBE ENCLOSURE FITTINGS KIT



*OPTIONS FOR PART "A" INCLUDE THE FOLLOWING ITEMS:



ITEM	McMASTER-CARR ITEM #	NTIC ITEM #	ITEM DESCRIPTION
A1	4880K338	1020-0073	PVC Hex Bushing Adapter, 2 Socket Male x 1 Socket Female (1 EA)
A2	4880K512	1020-0074	PVC Hex Bushing Adapter, 2 Socket Male x 1-½ Socket Female (1 EA)
A3	4880K214	1020-0075	PVC Hex Bushing Adapter, 2 Socket Male x 1 NPT Female (1 EA)
A4	4880K216	1020-0076	PVC Hex Bushing Adapter, 2 Socket Male x 1-½ NPT Female (1 EA)
A5	4880K86	1020-0065	PVC Hex Bushing Adapter, 2 Socket Female x 2 NPT Female (1 EA)

ITEM	McMASTER-CARR ITEM #	NTIC ITEM #	ITEM DESCRIPTION
B	4880K306	1020-0077	PVC Union Connector, 2 Pipe Size Socket-Connect Female (1 EA)
C	48925K96	1020-0081	PVC Schedule 40, 2 Pipe Size (1 EA)
D	4880K46	1020-0078	PVC Tee Connector, 2 Size Socket Connect Female (1 EA)
E	4880K337	1020-0068	PVC Hex Bushing Adapter, 2 Socket Male x ¾ Socket Female (1 EA)
F	9173K34	1020-0069	PVC Pipe Nipple, Threaded on One End, 3/4 NPT, 2" Length (1 EA)

ITEM	McMASTER-CARR ITEM #	NTIC ITEM #	ITEM DESCRIPTION
G	9848K24	1020-0070	PVC Ball Valve, ¾ NPT Female x ¾" GHT Male (1 EA)
H	7513K246	1020-0080	Conduit Fitting Locknut (1 EA)
I	4880K66	1020-0079	PVC Hex Adapter, 2 Socket Female x 2 NPT Male (1 EA)
J	4591K12	1020-0071	Pipe Thread Sealant Tape, ½" Wide x 16 Yard Length (1 ROLL)

Zerust®

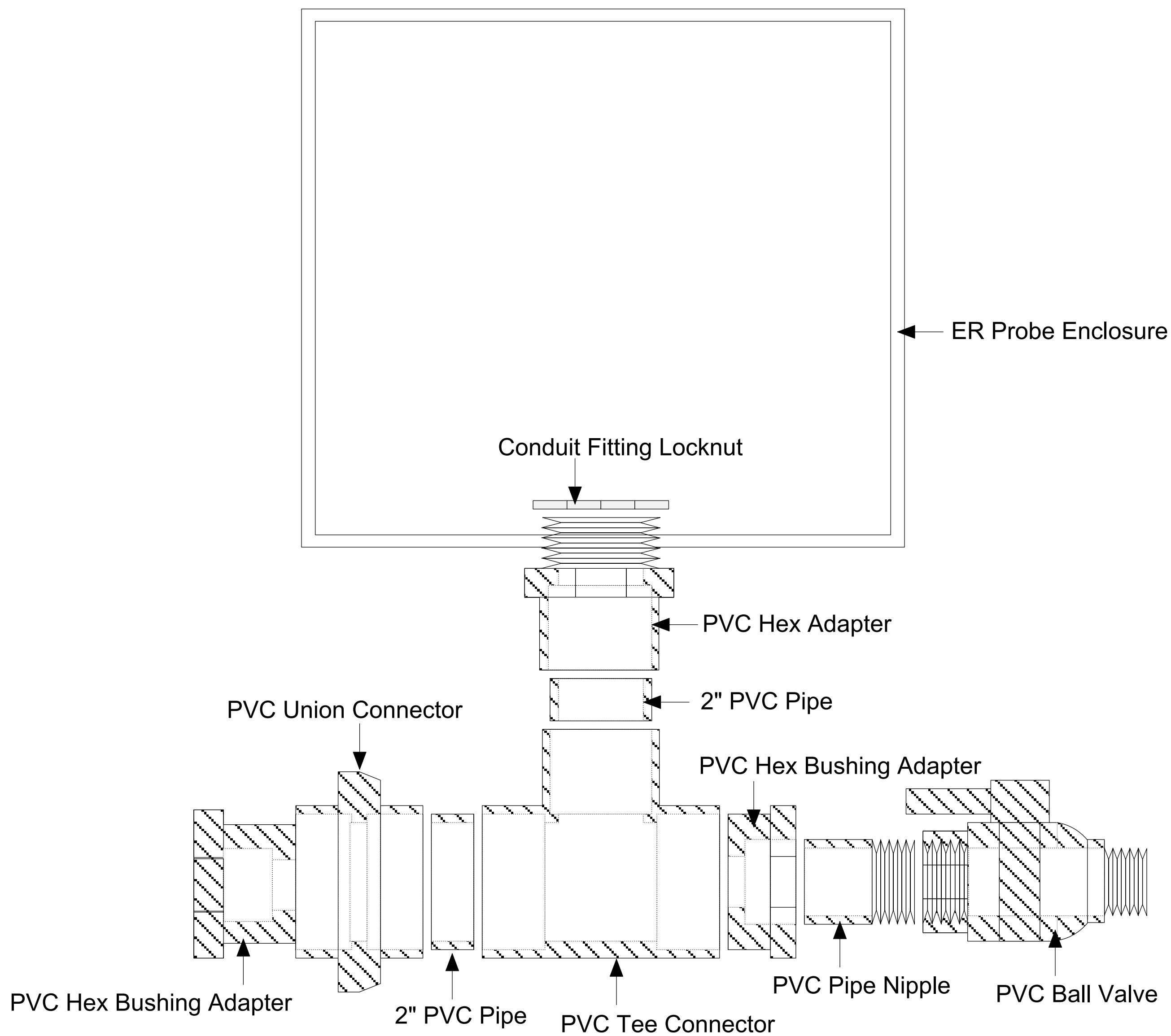
NORTHERN TECHNOLOGIES INTERNATIONAL CORPORATION

ER PROBE ENCLOSURE FITTINGS KIT

ALL DIMENSIONS IN INCHES (UNLESS OTHERWISE SPECIFIED).
**MEASUREMENTS ARE FOR REFERENCE

DRAWING NOT TO SCALE

NTIC PART No. 1040-0102	DRAWING No. ZP043.02.01
AUTHOR: AJP	REVISION No. 0
REVISION DATE 08.21.2017	


ER Probe Enclosure
Conduit Fitting Locknut
PVC Hex Adapter
2" PVC Pipe
PVC Union Connector
PVC Hex Bushing Adapter
PVC Hex Bushing Adapter
2" PVC Pipe
PVC Tee Connector
PVC Pipe Nipple
PVC Ball Valve

GSI Job No. 5219

ATTACHMENT V.4
ENGINEERING REPORT FOR
IWPF TANKS (PERMIT UNITS 08 AND 09)

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX V.4.7

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc.
Alvin, Texas

Issued: 28 June 2019

Prepared for: Ascend Performance Materials Texas Inc.

GSI ENVIRONMENTAL

GSI Environmental Inc.

2211 Norfolk, Suite 1000, Houston, Texas 77098-4054 tel. 713.522.6300

GSI Job No. 5109

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

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GSI Job No. 5109

GSI ENVIRONMENTAL

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

This is to certify that the replacement and removal the valves described in this report has been completed on the Ascend Performance Materials Texas Inc. facility in Alvin, Texas, in accordance with applicable provisions of 40 CFR 264.192(d),(g) and 40 CFR 264.193(f)(2),(3). Replacement and removal of the valves has been performed in accordance with and in compliance with good engineering practices.

28 June 2019

Elaine A. Higgins, P.E.
State of Texas Registration No. 85482
GSI Environmental Inc.
Registered Engineering Firm No. F-01198

1.0 BASIS FOR CERTIFICATION

GSI Environmental Inc. (GSI) has prepared this certification for the replacement and removal of valves in hazardous waste service at the Ascend Performance Materials Texas Inc. (Ascend). The valves are installed on piping employed to convey hazardous waste within the Environmental Control block and pipeway located to the east of Twelfth Street (see Figure 1). As attested in this assessment, the valves have been found to have sufficient structural integrity and are acceptable for piping conveying hazardous waste.

For the purposes of this report, available documentation has been reviewed and a site visit conducted by GSI on 19 June 2019 to confirm compliance with applicable provisions of 40 CFR 264.192(d),(g) and 40 CFR 264.193(f)(2),(3). As required under RCRA, proper design and installation of piping must be certified in accordance with the specifications of 40 CFR 264.192(g), as adopted by the TCEQ per 30 TAC 335.152(a)(8). This document reviews relevant design and installation procedures and provides certification of compliance with RCRA standards.

Evaluation of the design and installation of the valves has been based upon information derived from the following sources: i) piping and instrumentation diagrams, ii) installation reports; iii) photographs of completed work; iv) interviews with Ascend personnel, and v) a site visit by GSI.

2.0 DESCRIPTION OF HAZARDOUS WASTE PIPING

2.1 Piping Description

The valves reviewed in this report are located on one of two lines. A 6-in diameter line designated 3-336P13 takes the discharge from pressure safety valve PSV-112 to the inlet of pump 336P13A (see Figure 2). An 8-in diameter line designated 1-332T1 runs from the Waste EC Cooler to the WP Tanks (see Figure 3).

2.2 Wastes Description

The lines carry wastewater associated with the manufacture of acrylonitrile; therefore, the waste has been assigned EPA waste codes K011 and K013.

3.0 DESIGN AND INSTALLATION OF RCRA VALVES

3.1 Specifications for Valve Removal and Installation

Modifications consisting of removal or replacement have been made to the valves addressed in this report on the two piping lines described above and in accordance with Ascend piping material specifications. Each piping material specification has been prepared to provide a standard by which design and installation of piping systems may be designed and installed. For identified applications and particular materials to be conveyed, each piping material specification details the acceptable procedures to be employed for installation and inspection as well as standards for the system components (i.e., piping, fittings, flanges, gaskets, bolts, and valves). The piping material specifications applicable to the valves addressed in this report are provided in Appendix A. The replacement valve specification is provided in Appendix B.

3.2 Description of Valve Modifications

Based on future needs for flow control as identified by Ascend, valves were either i) removed or ii) replaced with a bellows sealed valve. Valves designated for removal located in the main run of piping were replaced with a welded spool. Smaller valves designated for removal and formerly used to bleed or vent the main line were removed and a blind flange was installed. Valves to remain in service were removed and replaced with bellows sealed valves. To facilitate the removal and/or replacement, a temporary bypass line was installed so that plant operations could continue relatively uninterrupted. A summary of changes to the valves is provided below:

Exhibit 1: Summary of Valve Modifications

Tie-In Point(s)	Line	Diameter (inch)	Action	Piping Material Specification	Figure Reference
1 and 2	3-336P13	6	Replaced with spool	F2CE1	2
1 and 2	3-336P13	3/4	Removed and blind flange installed	F2CE1	2
5 and 6	1-332T1	8	Replaced with spool	R2CV1	3
7	1-332T1	3/4	Removed and blind flange installed	R2CV1	3
8	1-332T1	3/4	Replaced with bellows sealed valve	R2CV1	3
9	1-332T1	3/4	Replaced with bellows sealed valve	R2CV1	3

Photographs comparing the valve locations before and after the modifications summarized above are provided in Appendix C.

3.3 Quality Control

Available documentation and testing has demonstrated that no leaks are present and the piping is suitable for conveying the hazardous wastes to be managed. Qualifications for welders and craft persons are provided in in Appendix D, and inspection reports are provided in Appendix E.

3.3.1 Personnel Qualification

Welding was performed by welders qualified in accordance with ASME Section IX as documented on the Welder Performance Qualification Reports. Other associated work was performed by craft verified personnel in pipefitting and bull rigging (i.e., using chain hoists and other similar devices to drift, upright, and turn loads into and out of engineered structures).

3.3.2 Inspection

The welded spools and valve replacements were installed in accordance with the requirements of 40 CFR 264.193(d). In order to verify the leak-free condition of the installation, welds were testing using radiographic inspection, liquid penetrant, and dye penetrant procedures in accordance with procedures specified in ASME Code for Pressure Piping B31.1 for Chemical Plant and Petroleum Refinery Piping.

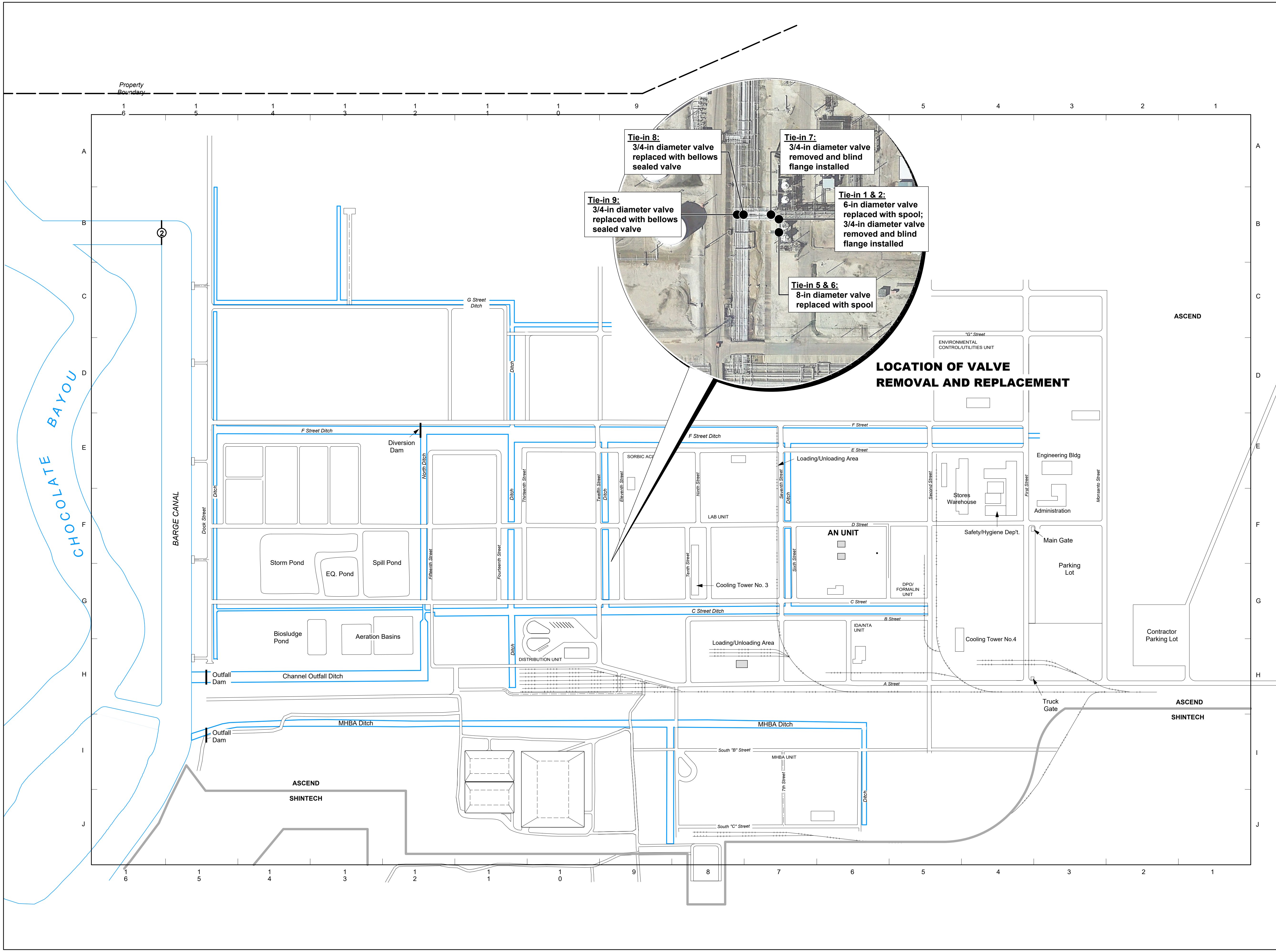
4.0 RECORD KEEPING

This written assessment and certification will be maintained on file at the facility as required under 40 CFR 264.192(g).

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

FIGURES



LEGEND

● Location of removed or replaced valve

NOTE:

1) Base maps compiled from Solutia drawing No. 340GA2 issued June 4, 1992, and aerial photographs obtained from Aerial Viewpoint, Inc., Negative No. 87B-1922, flight date April 1987, and Negative No. 2, flight date January 26, 1993.
2) Locations of valve upgrades and modifications takes from drawing prepared from Hargrove Engineers and Constructors issued 17 January 2019.
3) Valve locations are approximate.

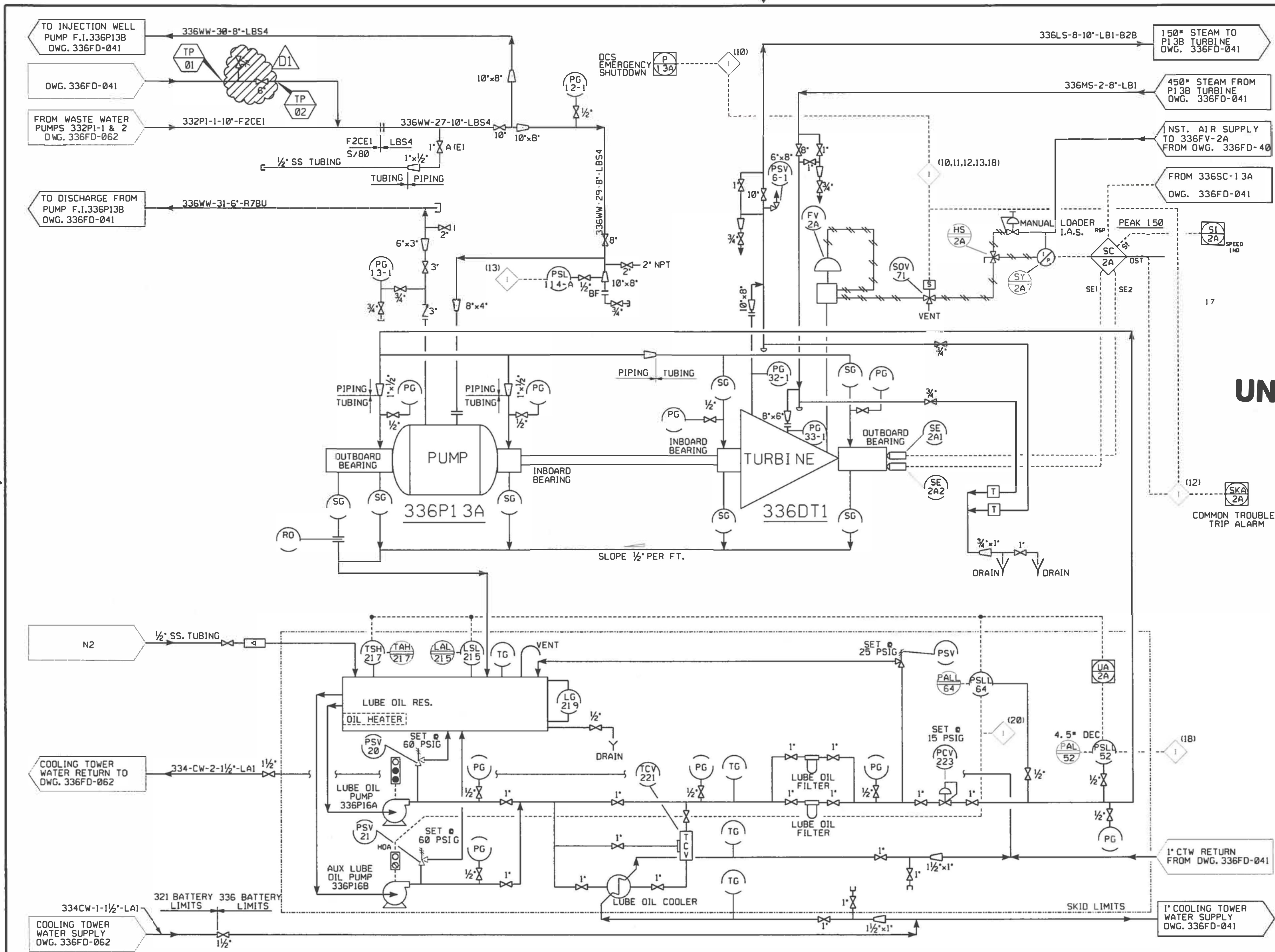
SCALE (ft.)
0 300 600

GSI ENVIRONMENTAL
Texas Registration Number: F-1198

LOCATION OF VALVE REMOVAL AND REPLACEMENT

Certification of RCRA Valve Installation
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No:	5109	Drawn By:	DLB/CDM
Issued:	28-Jun-2019	Chk'd By:	EAH
Revised:		Appv'd By:	EAH
Scale:	As Shown		**FIGURE 1**



LEGEND

START/STOP STATION W/RUN LIGHT

HOA HAND-OFF-AUTO W/RUN LIGHT

1. ALL INSTUMENT & INTERLOCK NUMBERS TO BE PRECEDED BY DEPARTMENT NUMBER 336 UNLESS OTHERWISE NOTED.

PA INTERLOCKS

REPRESENTS AN INTERLOCK TO CLOSE SOV-71, WHICH WILL SHUT OFF THE AIR TO TURBINE 336DT-1 ACTUATOR IN THE EVENT OF THE FOLLOWING:

(12) TURBINE OVERSPEED
(18) LOW LUBE OIL PRESSURE
(13) LOW INLET PRESSURE
(11) HIGH DISCHARGE PRESSURE (O.O.S)
(10) DCS ESD

UNCONTROLLED COPY

ISSUE FOR JAN 17 2019 REVIEW

FOR DEMO ONLY

REV		BY	DATE	DESCRIPTION	CHKD APPD
D1	TX 88575	T. LEE	1/2014	ISSUED FOR DEMO	

ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
P.O. BOX 711
FM 2917
ALVIN, TEXAS 77512

COMPANY CONFIDENTIAL

COMPANY CHEMICALS PLANT CHOC. BAYOU

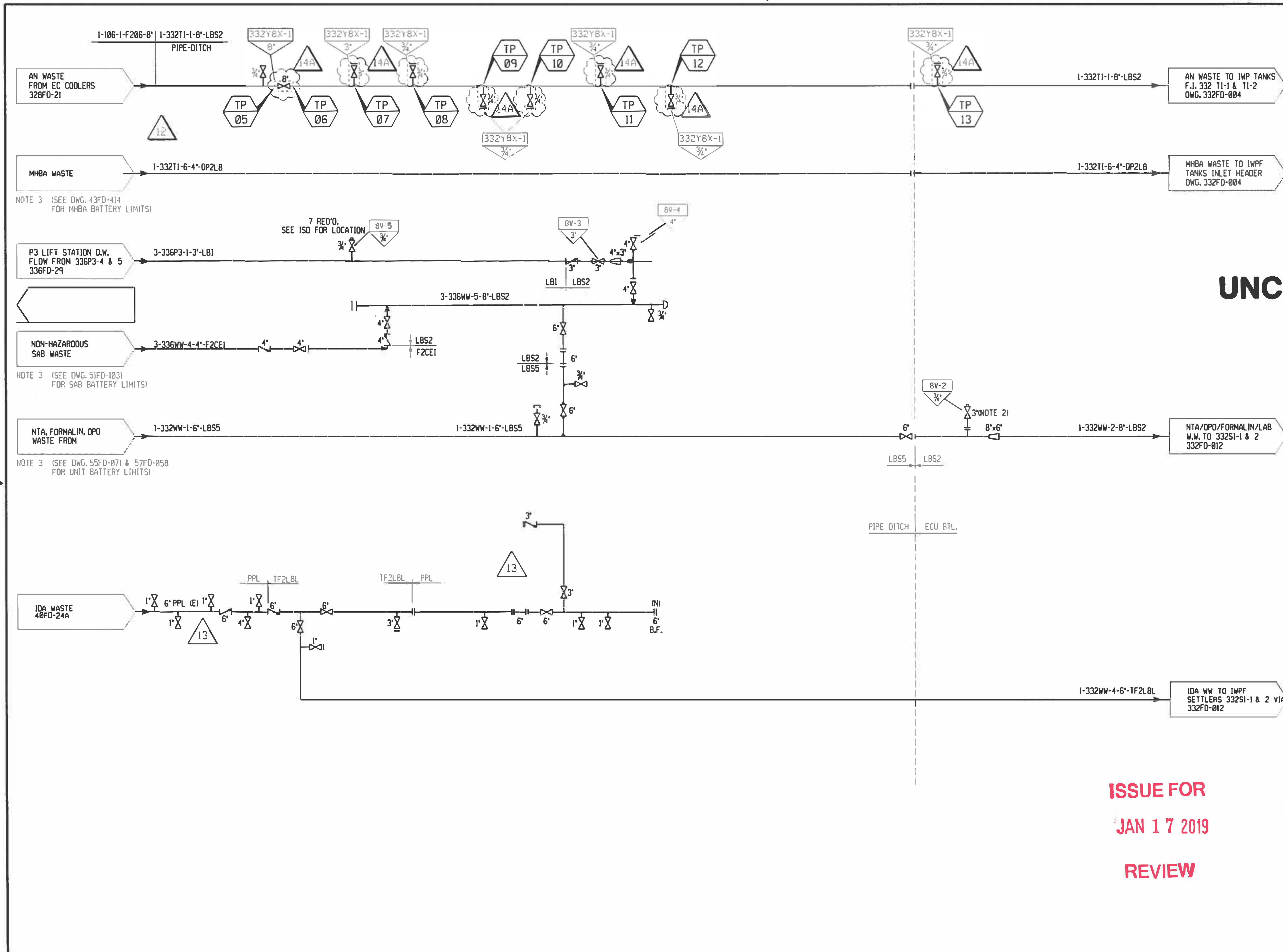
INJECTION WELL SYSTEM
336P13A
FLOW DIAGRAM

C.E.A.NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	REV
4247	46	D	336.00	D	40	D1

PLANT DRAWING NO. 336FD-040

PLOTTED ON AND AT: $$$$DATE&TIME$$$$ PLOTTED BY: $USER$

FILE: ::\332fd7.dgn
DATE: 3-Oct-96 15:03



NOTES:

1. REPLACE EXISTING CHECK VALVE WITH SPOOL PIECE.
2. 3" TEE WITH 3" B.F. ¾" BELLOWS SEAL VALVE.
3. REFERENCE TO WHAT P&ID THESE LINES ENTER THE PIPE DITCH.

GENERAL NOTES:

ALL OPEN ENDED VALVES TO BE PLUGGED OR BLINDED.

LEGEND:

VALVE ENCASEMENT

UNCONTROLLED COPY

ISSUE FOR
JAN 17 2019
REVIEW

REV	CEA	BY	DATE	DESCRIPTION	CHKD / APPD
14A	ENGR* TX88575	T.LEE	1/15/19	ADDED RCRA VALVE ENCASEMENT	TLN
13	ENGR* 2355	D.PHELPS	7/2012	REMOVED SORBIC W.W. TO 332SI-1 & 2 & ADDED VALVES PER UNIT RED LINES	
12	ENGR* 2171	ED OCANAS 4238	6/20/11	NaHCN PROJECT	
11	EJ 1544	J. MORRIS	7/3/07	AS BUILT PER EFD WALK DOWN	GAB
10	CHB 93561	TOM C.	11/03/03	AS BUILT	
9	15045	BLB	10/01/96	AS BUILT	EFK
8	15045	DFC	1/31/96	APPROVED FOR DESIGN	RT
7	15045	JTM	7/17/95	RELOCATED UTILITIES TO D 332-FD-13 ADDED TIE-INS FOR IWPF - PHASE II	EFK
6	4247	CLW	6-23-94	ADD I.A. LINE TO INJ. WELLS	
5	4247	CLW	5-9-94	ADDED NITROGEN TO HOSE STATION NO. 1	SRJ 5-94
4	4247	CRB	2- -94	REROUT 3-336WW-4-F2CEI-4"	SRJ 2-94
3	4247	CLW	12-22-93	ADD SPEC BREAK, NOTE, IA LINE & REV'D VA. @ H.S.	SRJ 12-93
2	4247	CRB	12-8-93	REV. FOR IWPF ADDENDUM 2 ADD EXIST. TRUCK LOAD. SUMP	
1	4247	CLW	10-12-93	ADD NEW MANIFOLD, REVISED TIE-INS & ADDED VALVES	
0	4247	JLH	6-7-93	APPROVED FOR DESIGN	RWC

ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
P.O. BOX 711
FM 2917
ALVIN, TEXAS 77512

COMPANY SOLUTIA | PLANT CHOCOLATE BAYOU

ENGINEERING FLOW DIAGRAM AREA 330/332 WASTE PONDS IWPF - PROCESS LINES & TIE-INS

DRAWN BY:	BUTLER		APPROVED	DATE	APPROVED	DATE
PHONE/DATE		05-04-93	COCHRANE	5-4-93		
CHKD/DATE	J. HAMMONS	5-26-93				
SCALE						

C.E.A.NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	REV
4247	46	D	332	FD	7	14A

PLANT DRAWING NO. 332FD-007

DESIGN FILE NAME: PRINTS ISSUED TO FIELD BY DATE REV

PLOTTED ON AND AT: $$$$DATE&TIME$$$$ PLOTTED BY: $USERS

GSI ENVIRONMENTAL

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDICES

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX A: PIPING MATERIAL SPECIFICATIONS

NOTE: Component descriptions listed in the latest version of this document shall govern when in conflict with alternate descriptions associated with this piping material specification.

1. INTRODUCTION

This piping materials specification describes piping component requirements for piping systems for which all of the following apply:

Fluid Service(s):	25% Caustic not exceeding 140ºF (see note 1)
Origin:	Plant F2CE1
Using Department(s):	All
Reliability Group:	C
Material:	Carbon steel
Flange Class & Face:	Class 150 raised face
Joints:	Buttweld & socketweld
Sealing Material:	PTFE
Corrosion Allowance:	1/8”

2. REFERENCES

Ascend Enterprise Standards

P21005	Piping Reliability Group Selection Guide
P53205	Gaskets
P53305	Bolting
P54220	Pipe Line Blinds
P71100	Fabrication and Examination Specification for ASME B31.3 Metallic Piping

Chocolate Bayou Plant Standards

MWP-104.0	Pipe Inspection, Testing, and Welding Requirements

Process Industry Practices Standards

PNF0200	Vent, Drain, and Instrument Connections Index

National Standards

ASME B31.3	ASME Code for Pressure Piping

3. PIPING COMPONENTS

NPS	PIPE (See Note 5)
1/2 - 1.1/2	size” seamless carbon steel pipe, ASTM A106 Gr. B, XS wall thickness
2 - 12	size” seamless carbon steel pipe, ASTM A53 Gr B Type S, STD wall thickness

NPS	FITTINGS (See Note 5)
1/2 - 1.1/2	size” XS wall thickness buttweld carbon steel fitting, ASTM A234 Gr WPB, ASME B16.9
2 - 12	size” STD wall thickness buttweld carbon steel fitting, ASTM A234 Gr WPB, ASME B16.9

BR. NPS	BRANCH CONNECTION FITTINGS (See Note 5)
1/2 - 1.1/2	size” on size” 3000# forged carbon steel sockolet, ASTM A105 MSS SP97
2 - 6	size” on size” STD bore forged carbon steel weldolet ASTM A105 MSS SP97

NPS	FLANGES (See Note 5)
1/2 - 1.1/2	size" class 150 weld neck flange, raised face, XS bore, forged carbon steel, ASTM A105, ASME B16.5
2 - 12	size" class 150 weld neck flange, raised face, STD bore, forged carbon steel, ASTM A105, ASME B16.5
1/2 - 12	size" class 150 blind flange, raised face, forged carbon steel, ASTM A105 ASME B16.5

NPS	SPECIAL FITTINGS
1/2 - 12	size" class 150 Figure 8 blind, ASTM A240 TP316, per P54220

4. VALVES

See Chocolate Bayou Valve Index for complete ordering descriptions of valves.

NPS	TAG No.	GATE VALVE
1/2 - 1.1/2	FA44	150# raised face flanged forged steel gate valve
2 - 12	FA42	150# raised face flanged cast steel gate valve
1/2 – 12	FA46	(see attachment 1) 150# raised face flanged carbon steel bellows sealed gate valve

NPS	TAG No.	GLOBE VALVE
1/2 - 1.1/2	FB44	150# raised face flanged forged steel globe valve
2 - 12	FB42	150# raised face flanged cast steel globe valve
1/2 - 8	FB46	(see attachment 1) 150# raised face flanged carbon steel bellows sealed globe valve

NPS	TAG No.	CHECK VALVE
1/2 - 1.1/2	FC44	150# raised face flanged forged steel lift check valve
2 - 12	FC41	150# raised face flanged cast steel swing check valve

NPS	TAG No.	PLUG VALVE
1/2 - 12	FE41	150# raised face carbon steel sleeve line plug valve

5. GASKETS

NPS	GASKET
1/2 - 12	size" class 150 spiral wound gasket, 316L SS winding, PTFE filler, 316L SS inner ring, ASME B16.20, Flexitallic style CGI or Garlock style CD-RWI. Flexitallic seating stress shall be nominal 5,000 PSI and the centering ring shall be stamped with the numeral "5000". Garlock centering ring shall be marked "Garlock CD". Flexitallic and Garlock centering rings edges shall be striped with four light blue stripes adjacent to the standard color code stripes.

6. BOLTING

NPS	CONN.	STUDS & BOLTS
All	flange pairs	size" x length" long alloy continuous threaded stud, ASTM A193 Gr B7 with 2 heavy hex nuts, ASTM A194 Gr 2H

7. INSTALLATION DETAILS

Vent, drain, and instrument connections shall be in accordance with PIP PNF0200. Where PIP branch connections conflict with the branch connection chart set forth in this piping material specification, the branch chart shall take precedence.

Hydro-test Vents/Drains:	Plugged	PIP PNF0304
	Flanged	PIP PNF0308 & PNF0309
Valved Vents/Drains:	Flanged	PIP PNF0418 & PNF0419
Pressure Connections:	Flanged	PIP PNF0512
Thermowell Connections:	Flanged	PIP PNF0613 & PNF0615
Orifice Flange Connections:	Flanged	PIP PNF0704

8. 90 DEGREE BRANCH CONNECTIONS

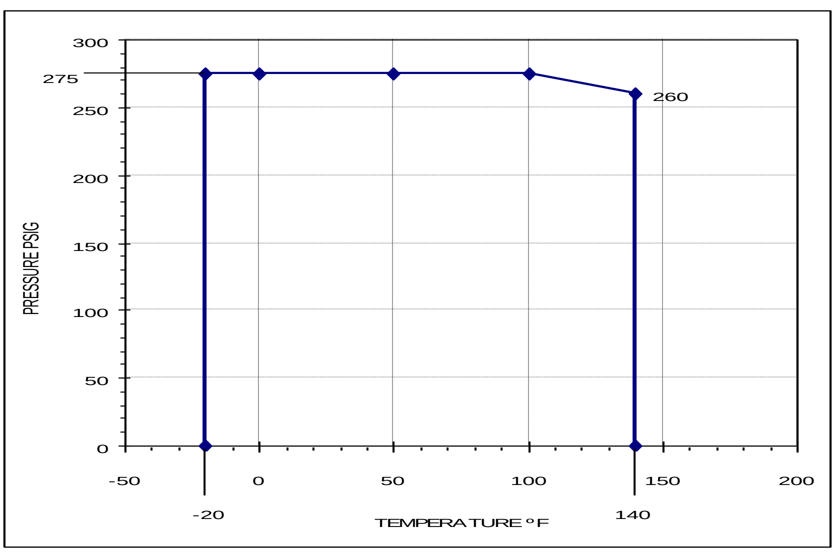
LEGEND:
T - STRAIGHT TEE
E - REDUCING TEE
W - WELDOLET

BRANCH SIZE	1/2	3/4	1	1-1/2	2	3	4	6	8	10	12
12											T
10										T	E
8									T	E	E
6								T	E	E	W
4							T	E	W	W	W
3						T	E	W	W	W	W
2					T	E	W	W	W	W	W
1-1/2				T	E	W	W	W	W	W	W
1			T	E	W	W	W	W	W	W	W
3/4		T	E	E	W	W	W	W	W	W	W
1/2	T	E	E	E	W	W	W	W	W	W	W

H E A D E R   S I Z E

9. PRESSURE-TEMPERATURE RATINGS

Do not use this piping material specification outside of the pressure-temperature limits shown. See note 1.



10. INSPECTION & WELDING

Pipe fabrication and examination shall be in accordance with ASME B31.3 and with Chocolate Bayou MWP-104.0

GENERAL NOTES:

1. For 25% caustic exceeding 140ºF use stainless steel piping specification R2BU1A*P.

2. Consult with the plant materials engineer prior to using carbon steel piping for caustic service.
   a) Carbon steel will cause iron contamination of caustic.
   b) Certain contaminants in caustic will accelerate the corrosion rate in carbon steel.
   c) High fluid velocities will accelerate the corrosion rate in carbon steel.
   d) Heat tracing must be designed to avoid exceeding maximum allowable temperatures.
   e) Post-weld heat treatment may be required.

3. Consult with unit safety specialists about unit-specific safety practices for caustic piping. Piping may require:
   a) color coded paint, labels, or other forms of line identification
   b) shields for piping flanges, valves, and other sources of leaks

4. Piping shall be routed to minimize personnel exposure to potential leaks.

5. In the EC unit, for CS piping from 332T1-1 & -2 outlet to the suction of 336P13-1 & -2, schedule 80 wall thickness pipe and fittings shall be substituted for standard weight pipe.

2	Changed ‘Solutia’ to ‘Ascend’ and updated **References**	NPW	MDH	7/17/14
1	Added Note 5	WEH	WEH	06/04/2003
0	Issued	ALN	WEH	05/22/03
REV	**DESCRIPTION**	**BY**	**APPD**	**DATE**

REVISION HISTORY

ATTACHMENT 1

BELLOWS SEALED VALVE USAGE

Bellows sealed valves feature a corrugated bellows located inside the valve bonnet such that the process fluid is isolated from the packing gland. The packing becomes a “backup” in the event of a bellows failure.

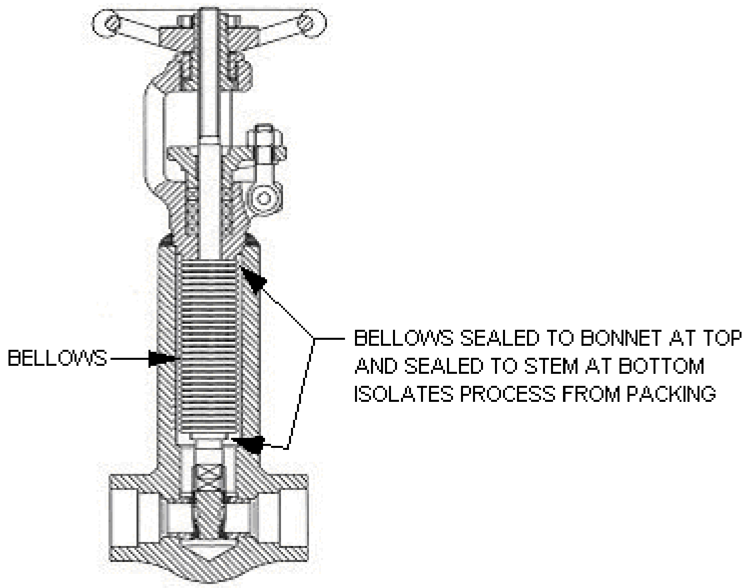


FIGURE 1

Bellows sealed valves are expensive, costing several times what conventional valves of comparable materials cost.

In services where packing leaks are a persistent problem (such as steam and condensate) or would pose a significant risk (such as sulfur dioxide), bellows sealed valves should be considered as an alternative to conventional valves.

In services where fines buildup or internal corrosion can prevent tight shutoff of gate valves, bellows sealed globe valves should be considered for shutoff valves.

In services where containment of packing leaks is required, bellows sealed valves may be an alternative to installing containment slabs or re-routing piping to a containment area[1].

[1] This is an ES&H issue and should be considered accordingly.

NOTE: Component descriptions listed in the latest version of this document shall govern when in conflict with alternate descriptions associated with this piping material specification.

1. INTRODUCTION

This piping materials specification describes piping component requirements for piping systems for which all of the following apply:

Fluid Service(s):	Acetic acid, $MeCl_2$, process water, SA/ $MeCl_2$ slurry, dilute SA/SAK/water solution, 25% NAOH, water/1.8% $MeCl_2$, neutral tars, other corrosive processes requiring TP316/316L SS **NOTE: Not for use in AN Quench Bottoms piping, use B1SD.3D1 and the HCN Handling Guidelines** **NOTE: Not for use in Formalin piping, use S2C3 and the Formalin Handling Guidelines**
Origin:	CED R2CV1, 1P0KL*P, LBS2*P, R2CT2*P, R2CV2*P
Using Department(s):	All
Reliability Group:	C
Material:	316/316L stainless steel
Flange Class & Face:	Class 150 raised face
Joints:	Buttweld & socketweld (see note 4)
Sealing Material:	PTFE or PFA
Corrosion Allowance:	0

2. REFERENCES

Ascend Enterprise Standards

P21005	Piping Reliability Group Selection Guide
P53205	Gaskets
P53305	Bolting
P54220	Pipe Line Blinds
P71100	Fabrication and Examination Specification for ASME B31.3 Metallic Piping
P71400	Leak Tests for Pipe

Chocolate Bayou Plant Standards

MWP-104.0	Pipe Inspection, Testing, and Welding Requirements

Process Industry Practices Standards

PNF0200	Vent, Drain, and Instrument Connections Index

National Standards

ASME B31.3	ASME Code for Pressure Piping

3. PIPING COMPONENTS

NPS	**PIPE**
1/2 - 1	size" fusion welded stainless steel pipe, ASTM A312-TP316/316L, S/40S wall thickness
1/2 - 1	size" fusion welded 316 stainless steel nipple, length" long, ASTM A312-TP316/316L, S/40S wall thickness, PBE
1.1/2 - 24	size" fusion welded stainless steel pipe, ASTM A312-TP316/316L, S/10S wall thickness
NPS	**FITTINGS** (see note 4)

1/2 - 1	size" 3000# socket weld stainless steel fitting, ASTM A182-F316/316L, ASME 16.11
1/2 - 1	size" x size" stainless steel concentric/eccentric swage, S/40S wall thickness, PBE, ASTM A403-WP-316/316L, MSS SP95
1.1/2 - 24	size" S/10S wall thickness buttweld stainless steel fitting, welded, ASTM A403-WP-W-316/316L, ASME B16.9
1.1/2 - 24	size" S/10S wall thickness buttweld stainless steel stub end, type "A", short pattern, welded, ASTM A403-WP-W-316/316L, ASME B16.9

BR. NPS	**BRANCH CONNECTION FITTINGS**
1/2 - 1	size" on size" 3000# forged stainless steel sockolet, ASTM A182-F316/316L, MSS SP97
1.1/2 - 12	size" on size" S/10S bore forged stainless steel weldolet, ASTM A182-316/316L, MSS SP97

NPS	**FLANGES** (see note 4)
1/2 - 1	size" class 150 stainless steel socketweld flange, raised face, ASTM A182-F316/316L ASME B16.5
1/2 - 1	size" class 150 stainless steel weld neck flange, raised face, S/40S bore, ASTM A182-F316/316L, ASME B16.5
1.1/2 - 24	size" class 150 forged carbon steel lap joint flange, ASTM A105, ASME B16.5, hot dip galvanized
1/2 - 24	size" class 150 stainless steel blind flange, raised face, ASTM A182-F316/316L, ASME B16.5

NPS	**SPECIAL FITTINGS**
1/2 - 24	size" class 150 Figure 8 blind, ASTM A240 TP316, per P54220

4. VALVES

See Chocolate Bayou Valve Index for complete ordering descriptions of valves.

NPS	**TAG No.**	**GATE VALVE**
1/2 - 1.1/2	TA30	800# socketweld stainless steel gate valve
1/2 - 24	TA40	150# raised face flanged stainless steel gate valve
1/2 - 1.1/2	TA36	(see attachment 1) 800# socketweld stainless steel bellows sealed gate valve
1/2 - 12	TA46	(see attachment 1) 150# raised face flanged stainless steel bellows sealed gate valve

NPS	**TAG No.**	**GLOBE VALVE**
1/2 - 1.1/2	TB30	800# socketweld stainless steel globe valve
1/2 - 12	TB40	150# raised face flanged stainless steel globe valve
1/2 - 1.1/2	TB36	(see attachment 1) 800# socketweld stainless steel bellows sealed globe valve
1/2 - 8	TB46	(see attachment 1) 150# raised face flanged stainless steel bellows sealed globe valve

NPS	**TAG No.**	**CHECK VALVE**
1/2 - 1.1/2	TC30	800# socketweld stainless steel swing check valve
1/2 - 24	TC40	150# raised face flanged stainless steel swing check valve

NPS	**TAG No.**	**BALL VALVE**
1/2 - 18	TF41	150# raised face flanged stainless steel ball valve

NPS	TAG No.	BUTTERFLY VALVE
3 - 24	TH44	150# threaded lug style stainless steel butterfly valve

NPS	TAG No.	PLUG VALVE
3 - 10	TE41	150# raised face flanged stainless steel sleeve plug valve

5. GASKETS

NPS	GASKET
1/2 - 24	size" class 150 spiral wound gasket, 316L SS winding, PTFE filler, 316L SS inner ring, ASME B16.20, Flexitallic style CGI or Garlock style CD-RWI. Flexitallic seating stress shall be nominal 5,000 PSI and the centering ring shall be stamped with the numeral "5000". Garlock centering ring shall be marked "Garlock CD". Flexitallic and Garlock centering rings edges shall be striped with four light blue stripes adjacent to the standard color code stripes.
3 - 24	(for use with butterfly valves where spiral wound gaskets will not seal) size" class 150 flat ring gasket 1/16" thick Garlock 3500 Gylon Fawn ASME B16.21

6. BOLTING

NPS	CONN.	STUDS & BOLTS
All	flange pairs	size" x length" long alloy continuous threaded stud, ASTM A193 Gr B7 with 2 heavy hex nuts, ASTM A194 Gr 2H
All	tapped holes	size" x length" long heavy hex head bolt, ASTM A193 Gr B7

7. INSTALLATION DETAILS

Vent, drain, and instrument connections shall be in accordance with PIP PNF0200. Where PIP branch connections conflict with the branch connection chart set forth in this piping material specification, the branch chart shall take precedence.

Hydro-test Vents/Drains:	Thrd.	PIP PNF0302 & PNF0304
Valved Vents/Drains:	Flgd.	SID-0401 & SID-0402
Pressure Connections:	Flgd.	SID-0501
Thermowell Connections:	Flgd.	PIP PNF0610 & PNF0612
Orifice Flange Connections:	Flgd.	SID-0701

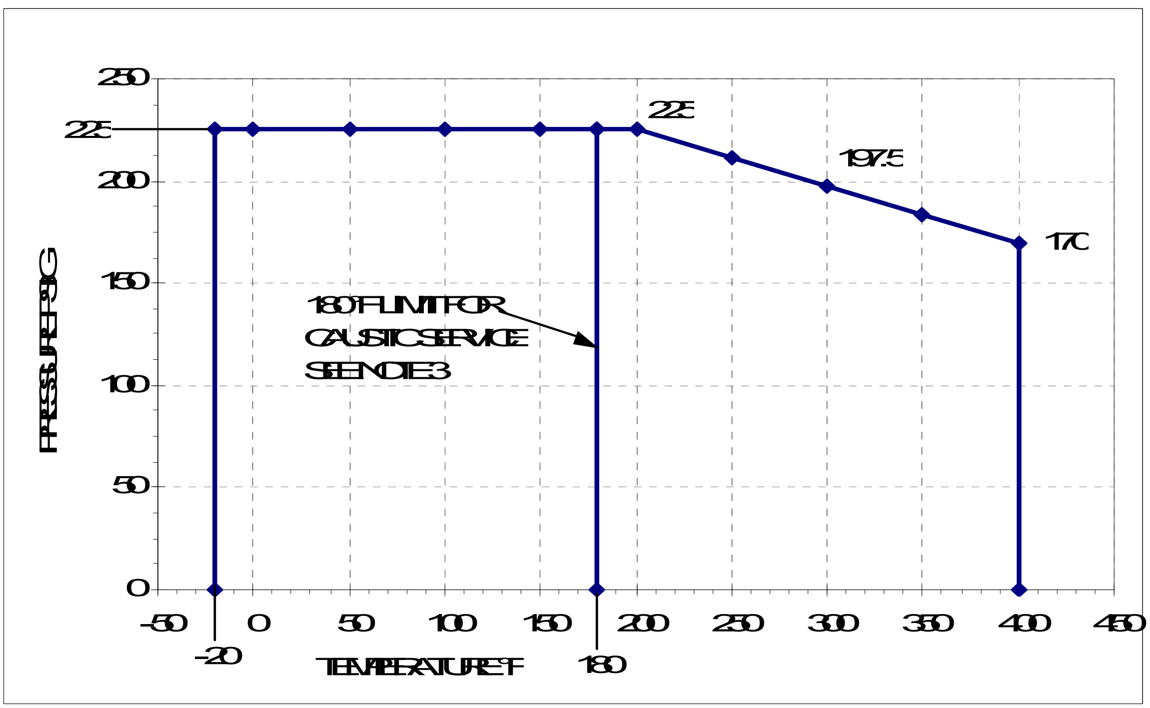
8. 90 DEGREE BRANCH CONNECTIONS

T - STRAIGHT TEE
E - REDUCING TEE
W - WELDOLET
S - SOCKOLET

BRANCH SIZE \ HEADER SIZE	1/2	3/4	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24
24																T
20															T	E
18														T	E	E
16													T	E	E	E
14												T	E	E	E	E
12											T	E	E	E	E	E
10										T	E	E	E	E	E	W
8									T	E	E	E	E	W	W	W
6								T	E	E	E	W	W	W	W	W
4							T	E	E	W	W	W	W	W	W	W
3						T	E	E	W	W	W	W	W	W	W	W
2					T	E	E	W	W	W	W	W	W	W	W	W
1.5				T	E	E	W	W	W	W	W	W	W	W	W	W
1			T	S	E	W	W	W	W	W	W	W	W	W	W	W
3/4		T	E	S	S	S	S	S	S	S	S	S	S	S	S	S
1/2	T	E	E	S	S	S	S	S	S	S	S	S	S	S	S	S

9. PRESSURE-TEMPERATURE RATINGS

Do not use this piping material specification outside of the pressure-temperature limits shown



10. INSPECTION & WELDING

Pipe fabrication and examination shall be in accordance with ASME B31.3 and with Chocolate Bayou MWP-104.0

GENERAL NOTES

1. Deleted

2. All threaded hydrostatic vent and drain connections shall be seal welded after completion of the hydrotest.

3. For caustic service do not use above 180 °F.

4. Lokring™ compression joint fittings per piping material specification R2CL1*P may be used for 1/2" – 3" piping systems where welding is undesirable.

5. For potable water: use piping specification D1SD.1 for SS up to 8" and LA3 for galvanized CS up to 2".

REV	DESCRIPTION	BY	APPD	DATE
10	Added 'Fluid Service' note to use B1SD.3D1 for AN quench bottoms piping	NPW	MDH	10/11/18
9	Changed 'Solutia' to 'Ascend' and updated **References,** added potable water note	NPW	MDH	7/17/14
8	Increased size range to 24", added socketweld valves in sizes 1/2"-1.1/2", added origin spec. references	ALN		04/25/03
7	Added bellows sealed valves and attachment 1	ALN	WEH	04/15/03
6	Removed note 1 requiring flange covers	ALN	WEH	02/26/03
5	Added note 4 to permit Lokring™ connections	ALN	WEH	10/01/02
4	Added note 3 about caustic temperature limit and revised pressure-temperature chart accordingly	WEH	WEH	6/3/2002
3	Added note about Formalin	WEH	WEH	4/11/02
2	Revised spiral wound gasket description to add Garlock	ALN		03/28/02
1	Revised NPS 1" from S/10S to S/40S and from buttweld to socketweld	ALN	WEH	03/12/01
0	Issued	ALN	WEH	07/28/00

REVISION HISTORY

ATTACHMENT 1

BELLOWS SEALED VALVE USAGE

Bellows sealed valves feature a corrugated bellows located inside the valve bonnet such that the process fluid is isolated from the packing gland. The packing becomes a "backup" in the event of a bellows failure.

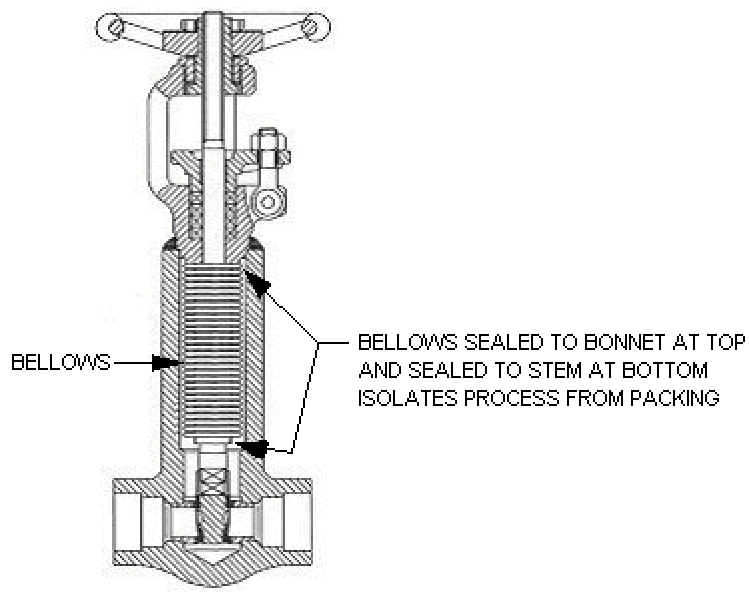


FIGURE 1

Bellows sealed valves are expensive, costing several times what conventional valves of comparable materials cost.

In services where packing leaks are a persistent problem (such as steam and condensate) or would pose a significant risk (such as sulfur dioxide), bellows sealed valves should be considered as an alternative to conventional valves.

In services where fines buildup or internal corrosion can prevent tight shutoff of gate valves, bellows sealed globe valves should be considered for shutoff valves.

In services where containment of packing leaks is required, bellows sealed valves may be an alternative to installing containment slabs or re-routing piping to a containment area[(1)].

[(1)] This is an ES&H issue and should be considered accordingly.

GSI ENVIRONMENTAL

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX B: VALVE SPECIFICATION

COMPONENT	GATE VALVE		
CLASS	800		
ENDS	SOCKETWELD		
BODY/BONNET MATERIAL	FORGED STAINLESS STEEL ASTM A182-F316L		
INTERNAL TRIM	316SS STEM & DISC, HARDFACED SEATS, API TRIM #12		
BELLOWS MATERIAL	ALLOY 625 (INCONEL)		
DESIGN	OS&Y		
OPERATION	HANDWHEEL		
BORE-PORT	CONVENTIONAL		
BONNET TYPE	WELDED BONNET		
STEM PACKING	CORROSION-INHIBITED DIE FORMED FLEXIBLE GRAPHITE WITH ANTI EXTRUSION RINGS		
WEDGE TYPE	SOLID DISC		
SPECIAL FEATURES	HYDROFORMED BELLOWS		
STANDARDS:			
DESIGN	API 602 TYPE		
ENDS	ASME B16.11		
BELLOWS	MSS SP-117		
RATING	API 602		
DIMENSIONAL	MANUFACTURERS STANDARD		
TESTING	API 598		
TAGGING	VENDOR SHALL TAG VALVE WITH PERMANENT WEATHER RESISTANT TAG READING "TA36"		
ACCEPTABLE VALVES	MANUFACTURER	MODEL NUMBER	SIZE RANGE
	BONNEY FORGE	SHWL-18LF-SW INC 625 BLS	1/2"-2"
	DIXON EAGLE	H8S44SW-D6GT	1/2"-2"
	SWI	BGF-24SN-AB1A	1/2"-2"
	VELAN	W-2054T-14MN	1/2"-2"
	OR ASCEND APPROVED EQUAL		
PIP VALVE NUMBER	NONE		

Approval & Revision History

NO.	DATE	REVISION DESCRIPTION	BY	APPROVED
0	4/1/03	Issued	ALN	
1	10/1/14	Changed 'Solutia' to 'Ascend' & corrected model #'s	NPW	DMD
2	7/17/15	Added Velan & Dixon Eagle	NPW	DMD

CERTIFICATION OF RCRA VALVE INSTALLATION

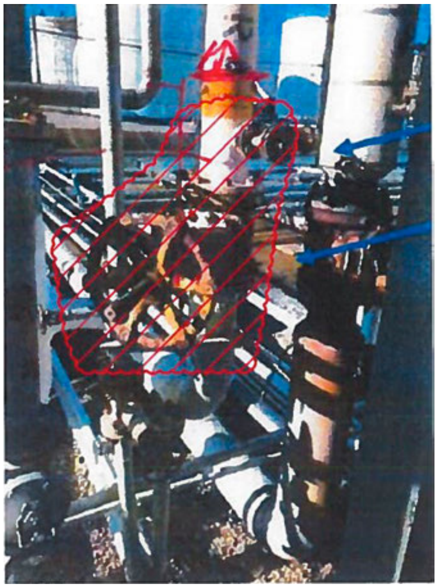
Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX C: PHOTOGRAPHS OF VALVES BEFORE AND AFTER MODIFICATION

APPENDIX C
PHOTOGRAPHS OF VALVES PRIOR TO AND AFTER MODIFICATION

Certification of RCRA Valve Installation
Ascend Performance Materials Texas Inc., Alvin, Texas

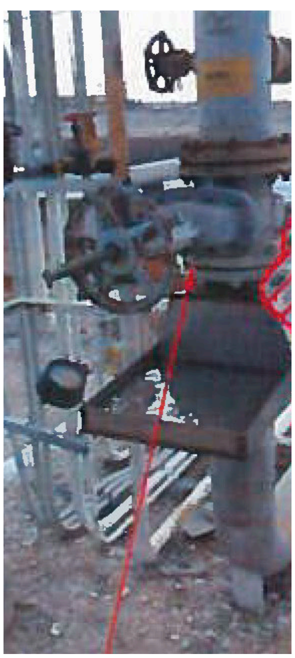
Tie-In Points 1 and 2: 6-in diam. valve replaced with spool; 3/4-in diam. valve removed and blind flange installed.



Prior to modification

After modification

Tie-In Points 5 and 6: 8-in diam. valve replaced with spool.



Before modification

After modification

Note: No dates available for photographs showing conditions prior to modification which were taken from plans prepared by Hargrove Engineers and Constructors issued 17 January 2019, 2019. Photographs showing conditions after modification taken by Ascend personnel on 17 May 2019.

APPENDIX C
PHOTOGRAPHS OF VALVES PRIOR TO AND AFTER MODIFICATION

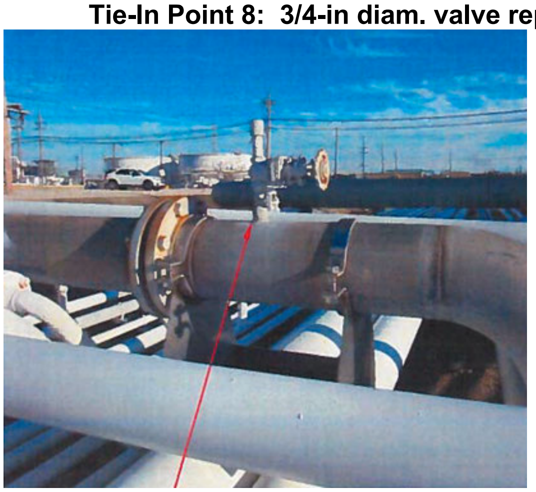
Certification of RCRA Valve Installation
Ascend Performance Materials Texas Inc., Alvin, Texas

Tie-In Point 7: 3/4-in diam. valve removed and blind flange installed.

Prior to modification

After modification

Tie-In Point 8: 3/4-in diam. valve replaced with bellows sealed valve.



Prior to modification

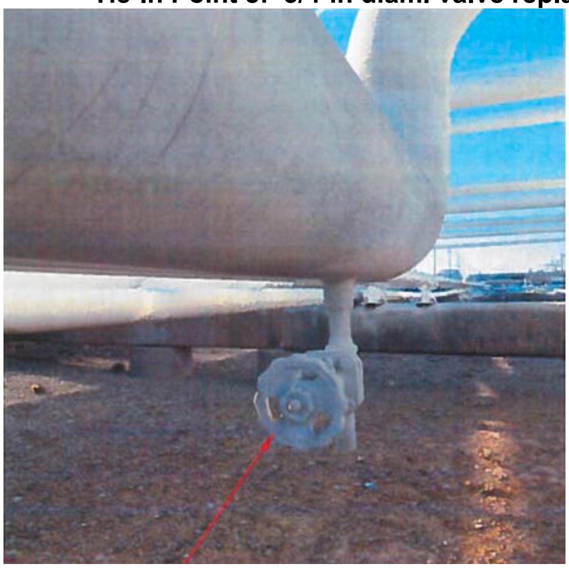
After modification

Note: No dates available for photographs showing conditions prior to modification which were taken from plans prepared by Hargrove Engineers and Constructors issued 17 January 2019, 2019. Photographs showing conditions after modification taken by Ascend personnel on 17 May 2019.

APPENDIX C
PHOTOGRAPHS OF VALVES PRIOR TO AND AFTER MODIFICATION

Certification of RCRA Valve Installation
Ascend Performance Materials Texas Inc., Alvin, Texas

Tie-In Point 8: 3/4-in diam. valve replaced with bellows sealed valve.



Prior to modification

After modification

Note: No dates available for photographs showing conditions prior to modification which were taken from plans prepared by Hargrove Engineers and Constructors issued 17 January 2019, 2019. Photographs showing conditions after modification taken by Ascend personnel on 17 May 2019.

GSI ENVIRONMENTAL

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX D: WELDER AND PIPEFITTER QUALIFICATIONS

Dynamic Laboratories, Incorporated

3650 Underwood ~ La Porte, Texas 77571 ~ U.S.A.
Phone - 281-478-0239 ~ Fax - 281-478-0259

Welder Performance Qualification Report

Welder Marco Farciert
SS # 1683
Test 321
ID# J
Test Date 8/30/2016
PQR#
The welder uses corrective lenses? no

Variables	essential / non-essential		actual values			range qualified		
Process / type		#1	gtaw	manual	solid	gtaw	manual	solid or metal cored
Process / type		#2	n/a			-		
Backing		#1	without			with or without		
Backing		#2	n/a			-		
Base Mat'	P#		P1 to P1			P1 thru P15F, P34 & P41 thru 49		
Base Mat'	diameter - groove		2.875"			1"minimum		
Base Mat'	diameter - fillet		n/a			unlimited		
Base Mat'	thickness - groove		.552"			wps limits		
Base Mat'	thickness - fillet		n/a			unlimited		
Filler metals	spec	#1	5.18			-		
Filler metals	spec	#2	n/a			-		
Filler metals	Class	#1	ER70S-2			-		
Filler metals	Class	#2	n/a			-		
Filler metals	F #	#1	6			6 only		
Filler metals	F #	#2	n/a			-		
Deposited Thickness		#1	.552"			unlimited		
3 layers minimum			yes			-		
Deposited Thickness		#2	n/a			-		
3 layers minimum			n/a			-		
Position			6G			all		
Weld Progression			uphill			uphill		
Shielding Gas			with			with only		
Backing Gas			without			with or without		
Electrical - current / polarity		#1	dcen/straight			dcen/straight		
Electrical - current / polarity		#2	n/a			-		
Consumeable inserts - GTAW			without			without only		

Visual Examination	Radiographic Examination
satisfactory	n/a

Bend test results

type / result	type / result
side-1 satisfactory	side-3 satisfactory
side-2 satisfactory	side-4 satisfactory

Fillet Weld Tests

Fillet Weld Fracture Test	n/a	Length & Percent Of Defects			n/a
Macro Fusion	n/a	Leg Size	n/a	Concave / Convex	n/a

Test conducted by DYNAMIC LABORATORIES, INC.
Rick Shepherd - CWI # 96080021
Randy Maxey - CWI # 06041201
Colton Shepherd - CWI # 11091921
John B. Costlow - CWI# 05070091

Lab Test # 16-3577-2

I / We certify that the statements made in this record are correct and that the test coupons were prepared, welded & tested in accordance with the requirements of the Latest Edition of **ASME Sect IX**

Company Tested For: Performance Contractors, Inc. Job# 6078
Witnessed By: Joe Laughlin
Accepted By: Date:

J

Dynamic Laboratories, Incorporated

3650 Underwood ~ La Porte, Texas 77571 ~ U.S.A.
Phone - 281-478-0239 ~ Fax - 281-478-0259

Welder Performance Qualification Report

Welder	Marco Farciert	**Test Date**	8/30/2016
SS #	1683	**ID#**	J
Test	100 R1	**PQR#**	
The welder uses corrective lenses?	no		

Variables	essential	non-essential	actual values	range qualified
Process / type		#1	smaw manual	smaw manual
Process / type		#2	smaw manual	smaw manual
Backing		#1	without	with or without
Backing		#2	with	with only
Base Mat'	P#		P1 to P1	P1 thru P15F, P34 & P41 thru 49
Base Mat'	diameter - groove		2.750"	1" minimum
Base Mat'	diameter - fillet		n/a	unlimited
Base Mat'	thickness - groove		.625"	wps limits
Base Mat'	thickness - fillet		n/a	unlimited
Filler metals	spec	#1	5.1	-
Filler metals	spec	#2	5.1	-
Filler metals	Class	#1	E6010	-
Filler metals	Class	#2	E7018	-
Filler metals	F #	#1	3	1 thru 3
Filler metals	F #	#2	4	1 thru 4
Deposited Thickness		#1	.125"	.250" maximum
3 layers minimum			n/a	-
Deposited Thickness		#2	.500"	unlimited
3 layers minimum			yes	-
Position			6G	all
Weld Progression			uphill/uphill	uphill/uphill
Shielding Gas			n/a	-
Backing Gas			n/a	-
Electrical - current / polarity		#1	dcep/reverse	dcep/reverse
Electrical - current / polarity		#2	dcep/reverse	dcep/reverse
Consumeable inserts - GTAW			n/a	-

Visual Examination	Radiographic Examination
satisfactory	n/a

Bend test results

type / result	type / result
side-1 satisfactory	side-3 satisfactory
side-2 satisfactory	side-4 satisfactory

Fillet Weld Tests

Fillet Weld Fracture Test	n/a	Length & Percent Of Defects			n/a
Macro Fusion	n/a	Leg Size	n/a	Concave / Convex	n/a

Test conducted by DYNAMIC LABORATORIES, INC.
Rick Shepherd - CWI # 96080021
Randy Maxey - CWI # 06041201
Colton Shepherd - CWI # 11091921
John B. Costlow - CWI# 05070091

Lab Test # 16-3577-1

I / We certify that the statements made in this record are correct and that the test coupons were prepared, welded & tested in accordance with the requirements of the Latest Edition of **ASME Sect IX**

Company Tested For: Performance Contractors, Inc. Job#6078

Witnessed By: Joe Laughlin

Accepted By: Date:

Dynamic Laboratories, Incorporated

3650 Underwood ~ La Porte. Texas 77571 ~ U.S.A.
Phone - 281-478-0239 ~ Fax - 281-478-0259

Welder Performance Qualification Report

Welder Constantino M. Farciert **Test Date** 11/29/2018
SS # 9527 **ID#** 21
Test 1011 **PQR#**
The welder uses corrective lenses? no

Variables essential non-essential			actual values			range qualified		
Process / type		#1	gtaw	manual	solid	gtaw	manual	solid or metal cored
Process / type		#2	n/a			-		
Backing		#1	without			with or without		
Backing		#2	n/a			-		
Base Mat'	P#		P1 to P1			P1 thru P15F. P34 & P41 thru 49		
Base Mat'	diameter - groove		.840"			.840" minimum		
Base Mat'	diameter - fillet		n/a			unlimited		
Base Mat'	thickness - groove		.147"			wps limits		
Base Mat'	thickness - fillet		n/a			unlimited		
Filler metals	spec	#1	5.18			-		
Filler metals	spec	#2	n/a			-		
Filler metals	Class	#1	ER70S-2			-		
Filler metals	Class	#2	n/a			-		
Filler metals	F #	#1	6			6 only		
Filler metals	F #	#2	n/a			-		
Deposited Thickness		#1	.147"			.294" maximum		
3 layers minimum			n/a			-		
Deposited Thickness		#2	n/a			-		
3 layers minimum			n/a			-		
Position			6G			all		
Weld Progression			uphill			uphill		
Shielding Gas			with			with only		
Backing Gas			without			with or without		
Electrical - current / polarity		#1	dcen/straight			dcen/straight		
Electrical - current / polarity		#2	n/a			-		
Consumeable inserts - GTAW			without			without only		

Visual Examination	**Radiographic Examination**
satisfactory	n/a

Bend test results

type / result	type / result
face-1 satisfactory	root-1 satisfactory
face-2 satisfactory	root-2 satisfactory

Fillet Weld Tests

Fillet Weld Fracture Test	n/a	Length & Percent Of Defects			n/a
Macro Fusion	n/a	Leg Size	n/a	Concave / Convex	n/a

Test conducted by DYNAMIC LABORATORIES, INC. **Lab Test #** 18-6127
Rick Shepherd - CWI # 96080021
Randy Maxey - CWI # 06041201
Colton Shepherd - CWI # 11091921
John B. Costlow - CWI# 05070091

I / We certify that the statements made in this record are correct and that the test coupons were prepared, welded & tested in accordance with the requirements of the Latest Edition of **ASME Sect IX**

Company Tested For: Performance Contractors. Inc. Job# 5782
Witnessed By: Joe Laughlin
Accepted By: Date:

Dynamic Laboratories, Incorporated

3650 Underwood ~ La Porte, Texas 77571 ~ U.S.A.
Phone - 281-478-0239 ~ Fax - 281-478-0259

Welder Performance Qualification Report

Welder: Jose L. Fernandez
SS #: 3556
Test: 100 RI
ID#: F
Test Date: 9/4/2018
PQR#:
The welder uses corrective lenses? no

Variables	essential	non-essential	actual values		range qualified	
Process / type		#1	smaw	manual	smaw	manual
Process / type		#2	smaw	manual	smaw	manual
Backing		#1	without		with or without	
Backing		#2	with		with only	
Base Mat'	P#		P1 to P1		P1 thru P15F, P34 & P41 thru 49	
Base Mat'	diameter - groove		2.750"		1" minimum	
Base Mat'	diameter - fillet		n/a		unlimited	
Base Mat'	thickness - groove		.625"		wps limits	
Base Mat'	thickness - fillet		n/a		unlimited	
Filler metals	spec	#1	5.1		-	
Filler metals	spec	#2	5.1		-	
Filler metals	Class	#1	E6010		-	
Filler metals	Class	#2	E7018		-	
Filler metals	F #	#1	3		1 thru 3	
Filler metals	F #	#2	4		1 thru 4	
Deposited Thickness		#1	.125"		.250" maximum	
3 layers minimum			n/a		-	
Deposited Thickness		#2	.500"		unlimited	
3 layers minimum			yes		-	
Position			6G		all	
Weld Progression			uphill/uphill		uphill/uphill	
Shielding Gas			n/a		-	
Backing Gas			n/a		-	
Electrical - current / polarity		#1	dcep/reverse		dcep/reverse	
Electrical - current / polarity		#2	dcep/reverse		dcep/reverse	
Consumeable inserts - GTAW			n/a		-	

Visual Examination: satisfactory

Radiographic Examination: n/a

Bend test results

type / result	type / result
side-1 satisfactory	side-3 satisfactory
side-2 satisfactory	side-4 satisfactory

Fillet Weld Tests

Fillet Weld Fracture Test: n/a — Length & Percent Of Defects: n/a
Macro Fusion: n/a — Leg Size: n/a — Concave / Convex: n/a

Test conducted by DYNAMIC LABORATORIES, INC.
Rick Shepherd - CWI # 96080021
Randy Maxey - CWI # 06041201
Colton Shepherd - CWI # 11091921
John B. Costlow - CWI# 05070091

Lab Test #: 18-4253-1

[signature]

I / We certify that the statements made in this record are correct and that the test coupons were prepared, welded & tested in accordance with the requirements of the Latest Edition of **ASME Sect IX**

Company Tested For: Performance Contractors, Inc. Job#5782
Witnessed By: Joe Laughlin
Accepted By:
Date:

Dynamic Laboratories, Incorporated

3650 Underwood ~ La Porte, Texas 77571 ~ U.S.A.
Phone - 281-478-0239 ~ Fax - 281-478-0259

Welder Performance Qualification Report

Welder: Jose L. Fernandez
SS #: 3556
Test: 321
ID#: F
Test Date: 9/4/2018
PQR#:
The welder uses corrective lenses?: no

Variables	essential	non-essential	actual values			range qualified		
Process / type		#1	gtaw	manual	solid	gtaw	manual	solid or metal cored
Process / type		#2	n/a			-		
Backing		#1	without			with or without		
Backing		#2	n/a			-		
Base Mat'	P#		P1 to P1			P1 thru P15F, P34 & P41 thru 49		
Base Mat'	diameter - groove		2.875"			1"minimum		
Base Mat'	diameter - fillet		n/a			unlimited		
Base Mat'	thickness - groove		.552"			wps limits		
Base Mat'	thickness - fillet		n/a			unlimited		
Filler metals	spec	#1	5.18			-		
Filler metals	spec	#2	n/a			-		
Filler metals	Class	#1	ER70S-2			-		
Filler metals	Class	#2	n/a			-		
Filler metals	F #	#1	6			6 only		
Filler metals	F #	#2	n/a			-		
Deposited Thickness		#1	.552"			unlimited		
3 layers minimum			yes			-		
Deposited Thickness		#2	n/a			-		
3 layers minimum			n/a			-		
Position			6G			all		
Weld Progression			uphill			uphill		
Shielding Gas			with			with only		
Backing Gas			without			with or without		
Electrical - current / polarity		#1	dcen/straight			dcen/straight		
Electrical - current / polarity		#2	n/a			-		
Consumeable inserts - GTAW			without			without only		

Visual Examination: satisfactory

Radiographic Examination: n/a

Bend test results

type / result	type / result
side-1 satisfactory	side-3 satisfactory
side-2 satisfactory	side-4 satisfactory

Fillet Weld Tests

Fillet Weld Fracture Test: n/a — Length & Percent Of Defects: n/a
Macro Fusion: n/a — Leg Size: n/a — Concave / Convex: n/a

Test conducted by DYNAMIC LABORATORIES, INC.
Rick Shepherd - CWI # 96080021
Randy Maxey - CWI # 06041201
Colton Shepherd - CWI # 11091921
John B. Costlow - CWI# 05070091

Lab Test #: 18-4253-2

I / We certify that the statements made in this record are correct and that the test coupons were prepared, welded & tested in accordance with the requirements of the **Latest Edition of** **ASME Sect IX**

Company Tested For: Performance Contractors, Inc. Job# 5782
Witnessed By: Joe Laughlin
Accepted By:
Date:

000380268 : Mims, Bradley W

Start date	Certificate group	Certificate type	Project ID	End date	Score	Notes
6/21/2018	Video Awareness	05: Confined Space-662-805	6261		Pass	
6/21/2018	Video Awareness	32: Confined Space Entry Update	6261		Pass	
3/1/2017	NCCER Assessment	Industrial Pipefitter	6136		Pass	Needs Hands-On
6/21/2018	Performance Craft Test	Bull Rigging	6261	6/21/2023	Pass	
6/21/2018	Performance Craft Test	Firewatch	6261	6/21/2023	Pass	
3/1/2017	Performance Craft Test	Rigging Fundamentals	6136	3/1/2022	Fail	
6/21/2018	Performance Craft Test	Rigging Fundamentals	6261	6/21/2023	Fail	
1/25/2019	Performance Craft Test	Rigging Fundamentals	6603	1/25/2024		
1/28/2019	Performance Craft Test	Rigging Fundamentals	6603	1/28/2024	Pass	
3/1/2017	Performance Operator Test	Scissor Lift	6136	3/1/2020	Pass	
7/5/2018	Practical Evaluation	Flagger/Spotter Practical	6261	7/5/2019	Pass	Drew Edwards
3/1/2017	Performance Test	Aerial Lift	6136	3/1/2020	Pass	
3/1/2017	Performance Test	Confined Space Awareness - Attendant (G...	6136	3/1/2018	Pass	
3/1/2017	Performance Test	Confined Space Awareness - Authorized En...	6136	3/1/2018	Pass	
3/1/2017	Performance Test	Fall Prevention & Protection	6136	3/1/2020	Pass	
6/21/2018	Performance Test	Fall Prevention & Protection	6261	6/21/2021	Pass	
3/1/2017	Performance Test	Flagger/Spotter	6136	3/1/2018	Fail	
6/21/2018	Performance Test	Flagger/Spotter	6261	6/21/2019	Pass	
6/21/2018	Performance Test	Line Break, Equipment Opening & Tie In T...	6261	6/21/2019	Pass	
6/21/2018	Performance Test	Lock Out / Tag Out	6261	6/21/2019	Pass	
3/1/2017	HR Craft Verified	Craftsman Pipefitter A	6136		Pass	Evaluated By: Glynn Allbritton
6/21/2018	Video Awareness	Cardinal Rules 1-8 with Safety Intro	6261		Pass	
6/21/2018	HR Craft Verified	Safety Evaluation	6261		Pass	Roberto De Luna
6/21/2018	Practical Evaluation	Bull Rigging Practical	6261	6/21/2023	Pass	Roberto De Luna
4/23/2019	Performance Test	Scaffold User V3	6630	4/23/2020	Pass	Jason Breaux

Certificate group: HR Craft Verified

Certificate type: Craftsman Pipefitter A

Project ID: 6136

Status: Pass

Start date: 3/1/2017 End date:

Require renewal:

Notes: Evaluated By: Glynn Allbritton

E0177997 : Cristan III, Gilbert

Start date	Certificate group	Certificate type	Project ID	End date	Score	Notes
11/8/2018	Performance Craft Test	Bull Rigging	5782	11/8/2023	Pass	
11/8/2018	Performance Craft Test	Firewatch	5782	11/8/2019	Pass	
9/24/2014	Performance Craft Test	Rigging Fundamentals		9/24/2019	Pass	5348-89% : 2
2/4/2019	Performance Craft Test	Rigging Fundamentals	5782	2/4/2024	Fail	Greg Abbott
11/8/2018	Performance Operator Test	Scissor Lift	5782	11/8/2021	Pass	
1/28/2013	NCCER Certified Plus	CP Industrial Pipefitter			Pass	9082838
9/24/2014	General Training	12PERFB - Basic		9/24/2016	Pass	5348 : 2
4/30/2011	General Training	TWIC Card (5 Years)		4/30/2016	Pass	
2/9/2019	Practical Evaluation	Aerial Lift Up to 80 Feet Practical	6630	2/9/2022	Pass	JLG 450AJ
11/18/2014	Supervisor Training	Foreman Development			Pass	: 1
9/24/2014	Performance Test	Aerial Lift		9/24/2017	Pass	5348-93% : 2
11/8/2018	Performance Operator Test	Aerial Lift	5782	11/8/2021	Pass	
2/5/2019	Performance Operator Test	Aerial Lift	5782	2/5/2022	Pass	Greg Abbott
11/8/2018	Performance Test	Fall Prevention & Protection	5782	11/8/2021	Pass	
11/8/2018	Performance Test	Flagger/Spotter	5782	11/8/2019	Pass	
11/8/2018	Performance Test	Line Break, Equipment Opening, & Tie In T...	5782	11/8/2019	Pass	
11/8/2018	Performance Test	Lock Out / Tag Out	5782	11/8/2019	Pass	
11/8/2018	HR Craft Verified	Craftsman Pipefitter A	5782		Pass	Roberto Deluna
11/8/2018	HR Craft Verified	Safety Evaluation	5782	11/8/2019	Pass	Roberto Deluna
11/9/2018	Practical Evaluation	Bull Rigging Practical	5782	11/9/2023	Fail	By Roberto De Luna
11/30/2018	HR Policies	Dispute Resolution Agreement (DRA)			Pass	
4/23/2019	Performance Test	Scaffold User V3	6630	4/23/2020	Pass	Jason Breaux

Certificate group: Performance Craft Test

Certificate type: Bull Rigging

Project ID: 5782

Status: Pass

Start date: 11/8/2018 End date: 11/8/20

Require renewal: ☑

Notes:

CERTIFICATION OF RCRA VALVE INSTALLATION

Hazardous Waste Permit No. 50159
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX E: INSPECTION REPORTS

SOUTHERN SERVICES INCORPORATED
S.T.S.
P.O. BOX 423 LAKE JACKSON, TEXAS 77566
(979) 265-3342 FAX (979) 265-1112

RADIOGRAPHIC INSPECTION REPORT

DATE:	2-12-19	ACCEPTANCE CRITERIA:	B31.3 NFS
CUSTOMER:	APM - PCI	WORK ORDER #:	1359 8786
LOCATION:	xray yard	ACCOUNT #:	
P.O. NUMBER:		CAPITOL NUMBER:	

LINE #	PIECE #	WELD #	EXPOSURE #	WELDER STENCIL	ACCEPT	REJECT	CRACK	LACK OF PENETRATION	I.P. DUE TO HI/LO	LACK OF FUSION	BURN THROUGH	INTERNAL UNDERCUT	EXTERNAL UNDERCUT	POROSITY	CLUSTER POROSITY	INTERNAL CONCAVITY	SLAG INCLUSIONS	OTHER DEFECTS	MATERIAL DIMENSIONS	NOMINAL WALL THICKNESS	PENTRAMETER	SOURCE TO FILM DISTANCE	EXPOSURE TIME	SINGLE WALL VIEW	DOUBLE WALL VIEW	SINGLE WALL EXPOSURE	DOUBLE WALL EXPOSURE
		2	1 2	J	✓							✓							6"	.280	15	6.6	:50	✓			✓
			2 3	S	✓							✓		✓													
			3 1		✓									✓													
		13	1 2	U	✓									✓													
			2 3	S	✓																						
			3 1		✓																						

Notes:

SOURCE: Ir 192
CURIES: 43.3
FOCAL SPOT: .125"
FILM / TYPE: AGFA D4
TOTAL FILM USED & SIZE: 6 - 3.5"X10"
RADIOGRAPHER LEVEL II: Gene D. Dean
RT ASSISTANT: Jeremy ~~Bard~~ Barnard
FILM INTERPRETED BY: [illegible signature]

% X-RAY:	%
PROFILES:	
100% X-RAY:	✓
SPOT X-RAY:	

SSI-202

SOUTHERN SERVICES INCORPORATED
S.T.S.
P.O. BOX 423 LAKE JACKSON, TEXAS 77566
(979) 265-3342 FAX (979) 265-1112

RADIOGRAPHIC INSPECTION REPORT

DATE:	5-22-19	ACCEPTANCE CRITERIA:	B 31.3 nfs
CUSTOMER:	Ascend PCI	WORK ORDER #:	13602334
LOCATION:	Xray yard	ACCOUNT #:	
P.O. NUMBER:		CAPITOL NUMBER:	

LINE #	PIECE #	WELD #	EXPOSURE #	WELDER STENCIL	ACCEPT	REJECT	CRACK	LACK OF PENETRATION	I.P. DUE TO HI/LO	LACK OF FUSION	BURN THROUGH	INTERNAL UNDERCUT	EXTERNAL UNDERCUT	POROSITY	CLUSTER POROSITY	INTERNAL CONCAVITY	SLAG INCLUSIONS	OTHER DEFECTS	MATERIAL DIMENSIONS	NOMINAL WALL THICKNESS	PENTRAMETER	SOURCE TO FILM DISTANCE	EXPOSURE TIME	SINGLE WALL VIEW	DOUBLE WALL VIEW	SINGLE WALL EXPOSURE	DOUBLE WALL EXPOSURE
RCRA		69	1-2	U	✓														8"	.148	12	4.3	:14	✓		✓	
			2-3		✓																						
			3-1		✓																						

Notes:

SOURCE: Ir^{192}
CURIES: 31.8
FOCAL SPOT: .129
FILM / TYPE: AGFA D4
TOTAL FILM USED & SIZE: (3) 3.5x17"
RADIOGRAPHER LEVEL II: GD Dean
RT ASSISTANT: TJ Reed
FILM INTERPRETED BY: [signature]

% X-RAY: %
PROFILES:
100% X-RAY: ✓
SPOT X-RAY:

SSI-202

Performance
CONTRACTORS, INC.

Performance Contractors, Inc.
9865 Pecue Lane   Baton Rouge, LA 70810
Ph: 225-751-4156   Fax: 225-215-8930

LIQUID PENETRANT INSPECTION REPORT

P.T. PROCEDURE: PT-100 REV. 13

CLIENT: Ascend

JOB #: 6630 TEMP-001

DATE: 5-22-19

ASME CODE – EXAMINED IN ACCORDANCE WITH:

(Circle): Section I. Section VIII. B31.1. B31.3

TIME: 9:00AM

WELD/SPOOL #	MATERIAL THICKNESS	PENETRANT & PART TEMPERATURE °F	ACCEPTED	REJECTED
68	.148	84 °F / 86 °F	✓	
69	.148	84 °F / 86 °F	✓	
		°F / °F		
		°F / °F		

LIQUID PENETRANT TYPE: VISIBLE: ________
NAME BRAND FOR:

PENETRANT: SPotcheck

CLEANER: SPotcheck

DEVELOPER: SPotcheck

MINIMUM DWELL TIME FOR PENETRANT: PENETRANT: 10 Minutes
{Minimum Drying time after cleaning/Penetrant removal, shall be per procedure}

MAXIMUM DWELL TIME FOR PENETRANT: PENETRANT: 10 Minutes

MINIMUM DWELL TIME FOR DEVELOPER:(PRIOR TO INSPECTION): DEVELOPER: 10 Minutes

LIGHTING EQUIPMENT USED: Daylight

POST CLEANING COMPLETE: Yes MAP OR RECORD OF INDICATIONS ATTACHED: None

NON-REJECTABLE INDICATIONS: None

REMARKS: No Indications Found

TECHNICIAN & LEVEL OF CERTIFICATION: Blake Havibrook PT II

Southern Services, Inc.

Dba. Southern Technical Services
P.O. Box 423 Lake Jackson, Texas 77566
(979) 265-3342 Fax (979) 265-1112

Dba. Baytown Inspection & Xray
324 S. Airhart Baytown, Texas 77520
(281) 422-3656 Fax (281) 427-1525

DYE PENETRANT INSPECTION PROCEDURE

DETAILED INDICATION REPORT

Customer: PCI Location:
Date: 6-14-19 W.O.# 13529967 Page No: 1 of 1
Time: 12:00 Item #: 1-332T1.1-8" LBS2
Inspector: Reese Lara Certification / Grade: II Due Date: 9/1/2020
Inspector: John Macek Certification / Grade: II Due Date:

Scope

FLOURESCENT PENETRANT [ ] VISIBLE PENETRANT [X]

PREPARATION

CONDITION BEFORE DYE PENETRANT TEST: Clean new welds

PREPARATION METHOD:

Sandblast [ ]
Grinder [ ]
Sandpaper [ ]
Other None

MATERIALS

PENETRANT USED: *Ardrox P6R* DWELL TIME: *10MIN*

Water Washable [X] Solvent Removable [ ]

Solvent (if used):

DEVELOPER USED: *Ardrox 9D1B* DEVELOPING TIME: *5MIN*

AMBIENT TEMPERATURE: 88 °F Material Type: S/S

Material Thickness: .113" / .148"

APPLICATION

SPRAY CAN [ ] PUMP SPRAYER [ ] BRUSH [X]

BLACKLIGHT USED: S/N OUTPUT :
LIGHTMETER USED: S/N CALIBRATION DATE

ACCEPT / REJECT CRITERIA: B31.3

RESULTS: Inspection on (6) socket weld finals & (1) butt weld final, W#'s 86, 87, 89, 93, 96-98. No rejectable indications found.

INSPECTORS SIGNATURE: Reese Lara / Reese Lara

INSPECTORS SIGNATURE:

Southern Services, Inc.

Dba. Southern Technical Services
P.O. Box 423 Lake Jackson, Texas 77566
(979) 265-3342 Fax (979) 265-1112

Dba. Baytown Inspection & Xray
324 S. Airhart Baytown, Texas 77520
(281) 422-3656 Fax (281) 427-1525

DYE PENETRANT INSPECTION PROCEDURE
DETAILED INDICATION REPORT

Customer: PCI
Location: DIST / ECU
Date: 6-14-19
W.O.# 13602334
Page No: 1 of 1
Time: 5:00
Item #: 1-332-1-1-8"LBS2
Inspector: Reese Lara
Certification / Grade: II
Due Date: 9/1/2020
Inspector:
Certification / Grade:
Due Date:

Scope

FLOURESCENT PENETRANT [ ]
VISIBLE PENETRANT [X]

PREPARATION

CONDITION BEFORE DYE PENETRANT TEST: Clean new welds

PREPARATION METHOD:
- Sandblast [ ]
- Grinder [ ]
- Sandpaper [ ]
- Other None

MATERIALS

PENETRANT USED: *Ardrox P6R*
DWELL TIME: *10MIN*

Water Washable [X]
Solvent Removable [ ]
Solvent (if used):

DEVELOPER USED: *Ardrox 9D1B*
DEVELOPING TIME: *5MIN*
AMBIENT TEMPERATURE: 86 °F
Material Type: S/S
Material Thickness: .113" / .322"

APPLICATION

SPRAY CAN [ ]
PUMP SPRAYER [ ]
BRUSH [X]

BLACKLIGHT USED:
S/N
OUTPUT :
LIGHTMETER USED:
S/N
CALIBRATION DATE

ACCEPT / REJECT CRITERIA: B31.3

RESULTS: Inspection on (12) 3/4" socket weld prep & finals & (1) 8" butt weld final, W#s 86-87, 89, 93, 96-106. After all repairs were made, no rejectable indications were found.

INSPECTORS SIGNATURE: Reese Lara / Reese Lara

INSPECTORS SIGNATURE:

Performance CONTRACTORS, INC.

Performance Contractors, Inc.

9865 Pecue Lane Baton Rouge, LA 70810
Ph: 225-751-4156 Fax: 225-215-3930

LIQUID PENETRANT INSPECTION REPORT

P.T. PROCEDURE: PT-100 REV. 13

CLIENT: Ascend

JOB #: 6630

DATE: 6-11-2019

ASME CODE – EXAMINED IN ACCORDANCE WITH:

(Circle): Section I. Section VIII. B31.1. B31.3

TIME: 3:00PM

WELD/SPOOL #	MATERIAL THICKNESS	PENETRANT & PART TEMPERATURE °F	ACCEPTED	REJECTED
84,85,88	.179	84 °F / 92 °F	✓	
91,92,90	.179	84 °F / 90 °F	✓	
94, 95	.179	86 °F / 88 °F	✓	
98	.179	86 °F / 89 °F	✓	

LIQUID PENETRANT TYPE: VISIBLE: ________

NAME BRAND FOR:

PENETRANT: SpotCheck

CLEANER: SpotCheck

DEVELOPER: SpotCheck

MINIMUM DWELL TIME FOR PENETRANT: PENETRANT: 10 Minutes

(Minimum Drying time after cleaning/Penetrant removal, shall be per procedure)

MAXIMUM DWELL TIME FOR PENETRANT: PENETRANT: 10 Minutes

MINIMUM DWELL TIME FOR DEVELOPER: (PRIOR TO INSPECTION): DEVELOPER: 10 Minutes

LIGHTING EQUIPMENT USED: Daylight

POST CLEANING COMPLETE: Yes MAP OR RECORD OF INDICATIONS ATTACHED: None

NON-REJECTABLE INDICATIONS: None

REMARKS: No Relevant Indications

TECHNICIAN & LEVEL OF CERTIFICATION: Blake Haulbrook PT II

GSI Job No. 5508

GSI ENVIRONMENTAL

ATTACHMENT V.4
ENGINEERING REPORT FOR
IWPF TANKS (PERMIT UNITS 08 AND 09)

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX V.4.8

Appendix V.4.8	Certification of Modification of Pump Connection to RCRA Line

CERTIFICATION OF MODIFICATION OF PUMP CONNECTION TO RCRA LINE

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc.
Alvin, Texas

Issued: 30 July 2020

Prepared for: Ascend Performance Materials Texas Inc.

GSI Environmental Inc.
2211 Norfolk, Suite 1000, Houston, Texas 77098-4054 tel. 713.522.6300

GSI Job No. 5508

CERTIFICATION OF MODIFICATION OF PUMP CONNECTION TO RCRA LINE

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

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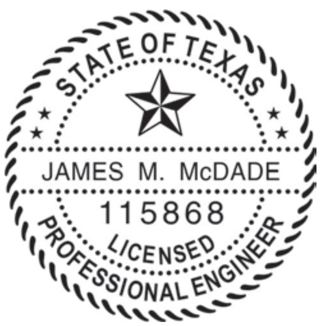
GSI Job No. 5508

GSI ENVIRONMENTAL

CERTIFICATION OF MODIFICATION OF PUMP CONNECTION TO RCRA LINE

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

This is to certify that the modification of piping and replacement of valves to increase pumping rates and capacity from hazardous waste tanks 332T1-1 and 332T1-2 to the deep well injection system described in this report have been completed on the Ascend Performance Materials Texas Inc. facility in Alvin, Texas, in accordance with applicable provisions of 40 CFR 264.192(d) and 264.192(g) and 40 CFR 264.193(f). The modification of piping and the replacement of the valves have been performed in accordance and compliance with good engineering practices.



30 July 2020

James M. McDade, P.E.
State of Texas Registration No. 115868
GSI Environmental Inc.
Registered Engineering Firm No. F-01198

1.0 BASIS FOR CERTIFICATION

GSI Environmental Inc. (GSI) has prepared this certification for the modification of piping and replacement of the valves to add backup pumping capabilities to the tank and injection well systems in hazardous waste service at the Ascend Performance Materials Texas Inc. (Ascend). Existing non-hazardous pumps, 332P15-1 and 332P15-2 (332P15), located in close proximity to hazardous waste storage tanks 332T1-1 and 332T1-2 (Permit Units 08 and 09; IWPF Tanks), were added in series after the existing deep well injection pumps (336P13A/B), in order to increase wastewater injection rates and pumping capacity from the IWPF Tanks to the deep injection wells. The piping employed to convey hazardous waste are modified within the Environmental Control block and pipeway located south of C Street (see Figure 1). Valves are installed on the piping employed for the conveyance of hazardous waste within the IWPF tanks area. As attested in this assessment, the piping and valves have sufficient structural integrity and are acceptable for conveying hazardous waste.

For the purposes of this report, available documentation has been reviewed and site visits conducted by GSI on 17 June and 20 July 2020 to confirm compliance with applicable provisions of 40 CFR 264.192(d) and 264.192(g) and 40 CFR 264.193(f)(3) for the piping and valves. As required under RCRA, proper design and installation of piping must be certified in accordance with the specifications of 40 CFR 264.192(g) and 40 CFR 264.193(b), respectively, as adopted by the TCEQ per 30 TAC 335.152(a)(8). This document reviews relevant design and installation procedures and provides certification of compliance with RCRA standards.

Evaluation of the design and installation of the valves and the containment areas has been based upon information derived from the following sources: i) piping and instrumentation diagrams, ii) installation reports; iii) photographs of completed work; iv) interviews with Ascend personnel, and v) site visits by GSI.

2.0 DESIGN AND MODIFICATION OF HAZARDOUS WASTE PIPING

2.1 Piping Description

The piping reviewed in this report is located on the following lines:

- 8-inch diameter line designated as 332P1 that runs from the IWPF Tanks on-site waste injection suction pumps 332P1-1/2 to the deep injection well pumps 336P13A/B (see Figure 2);
- 6-in diameter line designated as 332P15 that runs from the 332P15-1/2 pumps to the non-hazardous deep injection well (WDW-359) (see Figure 3);
- 10-in diameter line designated 336WW (RCRA line) that runs from waste injection pumps 336P13-1/2 to two 8-in diameter lines, which eventually go to the two hazardous deep Injection Wells, WDW-13 and WDW-318 (NOR Units Nos. 23 and 70) respectively (see Figure 4). The two hazardous deep injection wells are the receptors of the process wastewaters from the IWPF tanks.

2.2 Wastes Description

The line carries wastewater associated with the manufacture of acrylonitrile; therefore, the waste has been assigned USEPA waste codes K011 and K013. The wastes handled in IWPF tanks and thus disposed of via the Injection Wells (WDW-13 and WDW-318) include the wastewater associated with the manufacture of acrylonitrile, inorganic and organic wastewater, and landfill leachate; therefore, the USEPA waste codes assigned to these wastes include K011, K013, D002-D005, D007, D010, D018, D033, D038, F003, F039, P063, P101, U002, U009, U019, U122, U154, U161, U188, and U220.

2.3 Specifications for Piping Modifications

The former conveyance of hazardous waste from the IWPF Tanks to the deep hazardous injection wells involved the following process: pumping the hazardous waste in the tanks with Waste Injection Suction Pumps 332P1-1/2 via the 10-inch line 332T1 to the 8-inch line 332P1 to the Turbine Pumps 336P13, and then finally pumped via the 10-inch and 8-inch RCRA lines to WDW-13 and WDW-318. Pump 336P13 is reaching the end of its service life and has limited pumping capacity; therefore, existing non-hazardous injection well feed pumps 332P15-1/2 were added to the hazardous waste conveyance between 332P1-1/2 and the 10-inch RCRA line. In order to route pumps 332P15-1/2 in line with the conveyance from pumps 332P1-1/2 to the 10-inch RCRA line, piping lines described in Section 2.1 above have been modified in ways of cutting, adding, and capping, in accordance with Ascend piping material specifications. Each piping material specification has been prepared to provide a standard for design and installation of piping systems. For identified applications and particular materials to be conveyed, each piping material specification details the acceptable procedures to be employed for installation and inspection, as well as standards for the system components (i.e., piping, fittings, flanges, gaskets, bolts, and valves). The piping material specifications addressed in this report are provided in Appendix A. The replacement valve specification is provided in Appendix B.

2.4 Description of Piping Modifications

Modifications of the lines described in Sections 2.1 and 2.3 involved 17 Tie-in Points (TPs), and are detailed in the Exhibit 1 below. Part of these modifications including TP1, TP2, TP13, TP14, TP15A and TP15B were completed during the RCRA line outage that occurred in May 2020, and the remainder Tie-in Points were completed in June and July 2020.

Exhibit 1: Summary of Piping Modifications

Tie-In Point(s)	Line	Diameter (inch)	Purpose	Action	Piping Material Specification	Figure Reference
1, 2	1-332P1-1-8”	8	Provide suction piping for pumps 332P15-1/2	Added 6-in TA40 valve and 6-in suction piping (1-332P1-4-6”)	R2CV1	2
3	1-332P1-5-6”	6	Connect suction piping 1-332P1-4-6” to pumps 332P15-1/2	Added 6-in TA42 valve and 6-in suction piping (1-332P1-4-6”)	R2CV1/ B1SD.3	5

Tie-In Point(s)	Line	Diameter (inch)	Purpose	Action	Piping Material Specification	Figure Reference
4, 5	332P15-4-2"	2	Provide recirculate line for pumps 332P15-1/2 back to IWPF tanks	Replaced with ¾-in TA40 valves	B6SD.2D1	5
6	332P15-100-2"	2	Provide recirculate line for pumps 332P15-1/2 back to IWPF tanks	Added 2-in recirculate line (332P15-100-2") that connects to 1-332T1-11 at TP9	B6SD.2D1	5
7, 8	332P15-5-2"	2	Formerly recirculate line for 332P15-1/2; No longer in use	Cut line and capped	--	5
9	332P15-100-2"	2	Provide recirculate line for pumps 332P15-1/2 back to IWPF tanks	Added 1½-in and ¾-in TA40 valves and recirculate line (332P15-100-2") that runs from TP6	R2CV1	2
10	332P15-1-6"	6	Formerly a pressure relief; no longer in use	Cut line and capped	--	5
11, 12	332P10-5-6"		Formerly feed line to 332P15-1/2; No longer in use	Cut line and capped with flanges	--	6
13	332P15-1-6"	6	Disconnect 332P15 pumps to non-haz deepwell and connect the pumps to 336WW	Cut line (332P15-1-6') and added 6-in piping (332P15-101-6") in connection with TP15A/ B	B6SD.2	3
14	332P151-332P15-1-6"	6	Disconnect 332P15 pumps to non-haz deepwell	Cut line and capped	B6SD.2	3
15A & 15B	336WW35/ 321WW8	3/4	Incorporate 6-in 332P15 to the RCRA line	Cut line (321WW8) and added flanged 10-in tee among TP15A, TP15B, and the 6-in 332P15 line	LE1A	4
17	1-332P1-5-6"	6	Connect suction piping 1-332P1-4-6" to pumps 332P15-1/2	¾-in diameter valve replaced with 1-in TA40 valve	B1SD.3	5

Before and after photographs of the valve locations listed in Exhibit 1 are provided in Appendix C.

3.0 QUALITY CONTROL

Available documentation and testing has demonstrated that no leaks are present and the piping is suitable for conveying the hazardous wastes to be managed. Qualifications for welders and craft persons are provided in Appendix D, and inspection reports are provided in Appendix E.

3.1 Personnel Qualification

Welding was performed by welders qualified in accordance with ASME Section IX as documented on the Welder Performance Qualification Reports (see Appendix D). Other associated work was performed by craft-verified personnel in pipefitting and bull rigging (i.e., using chain hoists and other similar devices to drift, upright, and turn loads into and out of engineered structures).

3.2 Inspection

The valve replacements were installed in accordance with the requirements of 40 CFR 264.192(d). In order to verify the leak-free condition of the installation, welds were tested using liquid penetrant and dye penetrant procedures in accordance with procedures specified in ASME Code for Pressure Piping B31.1 for Chemical Plant and Petroleum Refinery Piping.

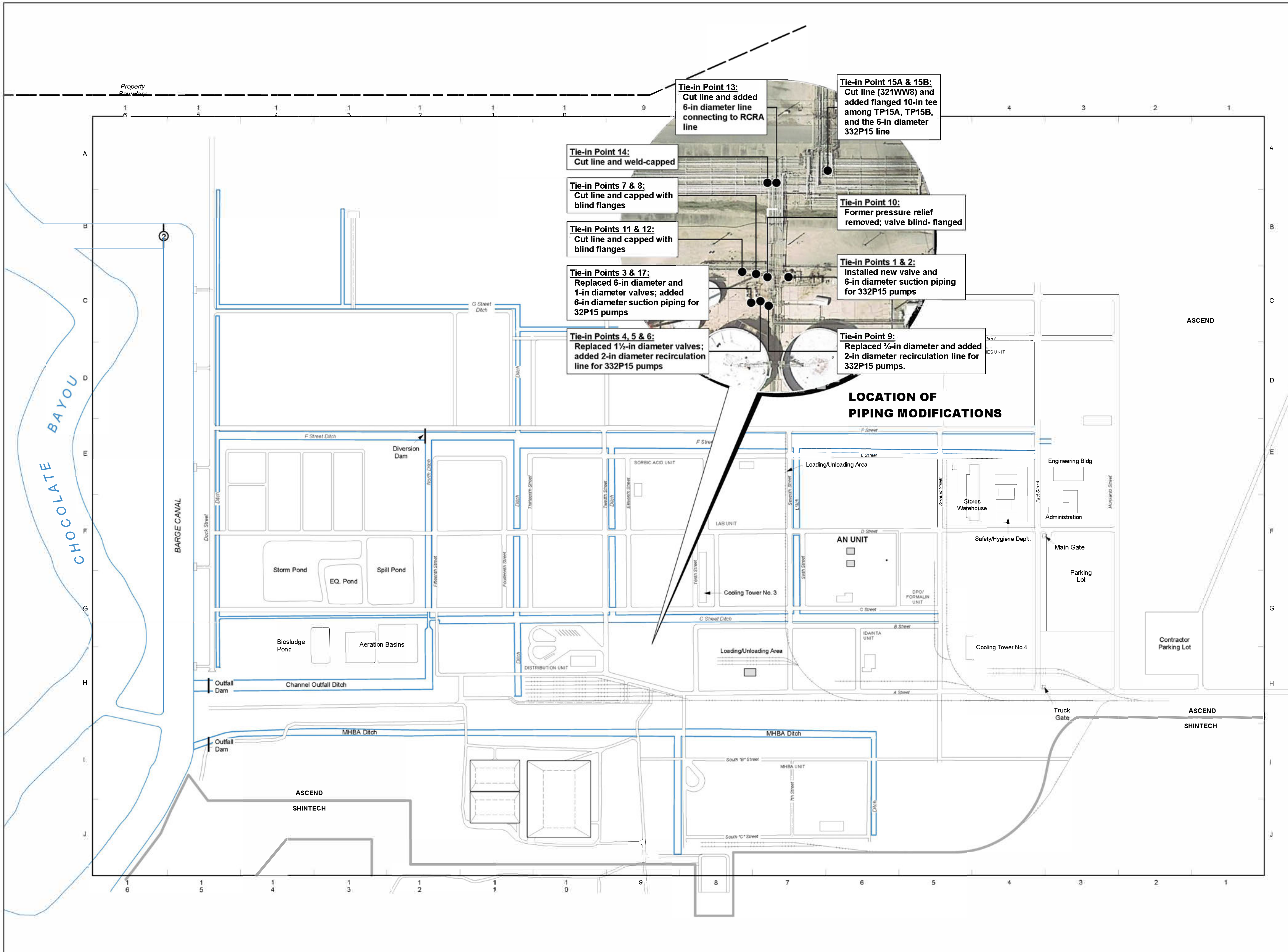
4.0 RECORD KEEPING

This written assessment and certification will be maintained on file at the facility as required under 40 CFR 264.192(g).

CERTIFICATION OF MODIFICATION OF PUMP CONNECTION TO RCRA LINE

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

FIGURES



NOTE:

1) Base maps compiled from Solutia drawing No. 340GA2 issued June 4, 1992, and aerial photographs obtained from Aerial Viewpoint, Inc., Negative No. 87B-1922, flight date April 1987, and Negative No. 2, flight date January 26, 1993.
2) Locations of valve upgrades and modifications takes from drawing prepared from Hargrove Engineers and Construction issued 18 April 2020.
3) Locations are approximate.

GSI ENVIRONMENTAL
Texas Registration Number: F-1198

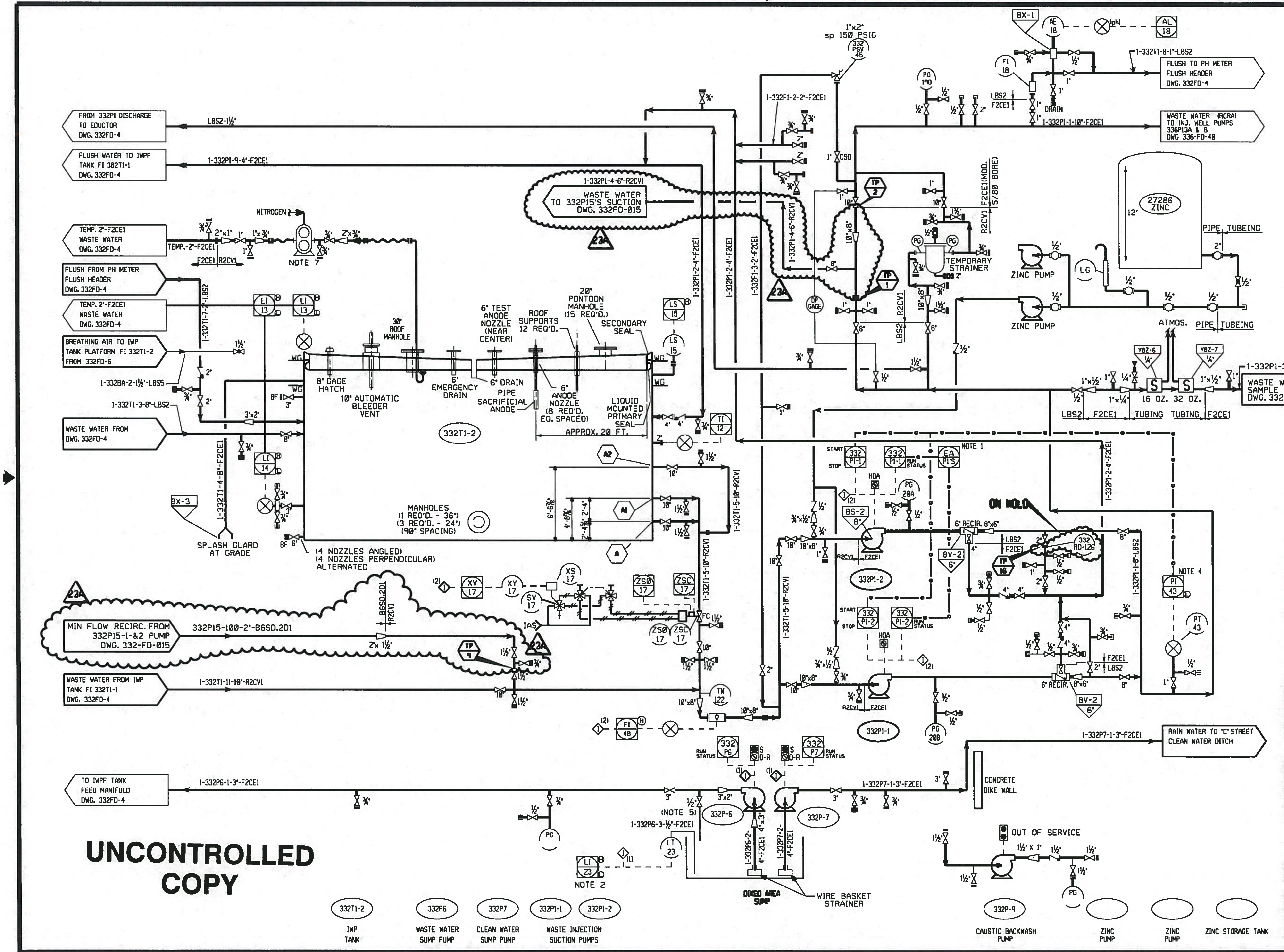
LOCATION OF PIPING MODIFICATIONS

Certification of Modification of Pump Connection to RCRA Line

Hazardous Waste Permit No. 50189

Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No.	5508	Drawn By	CDM
Issued	30-Jul-2020	Chk'd By	BYL
Revised		Appv'd By	
Scale	As Shown		FIGURE 1



UNCONTROLLED COPY

NOTES:

1. IF BOTH SUCTION PUMPS ARE NOT RUNNING AN ALA OCCURS ON DCS.
2. HI LEVEL ALARM, MANUAL START ONLY, WHEN START IT WILL SHUT PUMP DOWN AUTOMATICLLY WHEN LOW LEVEL IS REACHED.
3. SEE NOTE 1 DWG. 332-FD-4.
4. THE SUCTION PUMP WILL AUTOMATICALLY START ON FAILURE OF THE ONE IN USE, (IN AUTO) THRU PSL 43.
5. DO NOT EXTEND P6 PUMP DISCHARGE BLEED BELOW THE LIQUID LEVEL.
6. ALL INSTRUMENTS & INTERLOCKS ON THIS EFD ARE DEPT. 332 UNLESS OTHERWISE NOTED.
7. PUMP IS LOCATED ON ROOF OF 332-T1-2
8. UPGRADED CS OUTLET PIPING TO SS PER MOC M2017602-001.

INTERLOCKS

322-1 (CLASS 4)

1. HIGH SUCTION FLOW (2000 GPM) TO THE P-1 PUMPS CLOSES XV-011 & XV-017 ON THE T-1 OUTLETS. WHENEVER BOTH XV'S ARE CLOSED AT THE SAME TIME BOTH P-1 PUMPS WILL STOP RUNNING.

ISSUE FOR

APR 18 2020

REVIEW

REV	CEA	BY		DESCRIPTION
		PHON	DATE	
23A	ENGR# 3285	EDO 4238	3/20/20	BYPASS LINE FROM 332P1'S TO 332P15'S. AS-BUILT 332PSV-45 AND 1 1/2" LINE TO EDUCTOR
22	TX 21091	DJ WOLTERS 4176	11/29/17	ECU CONTROLS MODERNIZATION UPDATED DCS SYMOBOLOGY
21	TX30006	EDO	3/18/16	REPLACED 1-332T1-5-F2CE1-10" TO R2CV1, REVISED LN. NO. TO 1-332T1-5-R2CV1-10", ADD NOTE 8, PER MOC M2017602-001
20	TX88503	K. ARMSTRONG 4319	5/25/16	OIF UPDATES PER UNIT MARK-UPS
19	TX88425	K. ARMSTRONG 4319	3/31/16	OIF UPDATES PER UNIT MARK-UPS
18	ENG#2753	EDO	8/25/14	ADDED TEMPORARY STRAINERS
17	ENG# 2535	D.PHELPS	4/2013	ADDED PT-43 TO DWG.
16	ENG# 1235	A. MATHIS	2/22/12	REPLACED LINE# 1-332T1-11-10" -F2CE1 WITH SPEC R2CV1
15	ENG# 2145	TEC	12/16/2011	CORRECTED PS43,P1-1,P1-2 INTERLOCKS & CONTROLS
14	ENG# 1235	A. MATHIS	5/2/2011	REPLACED LINE# 1-332T1-11-10" -F2CE1 BY SPEC R2CV1

ASCEND PERFORMANCE MATERIALS

ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
P.O. BOX 711
FM 2917
ALVIN, TEXAS 77512

COMPANY ASCEND | PLANT CHOC.BAYOU

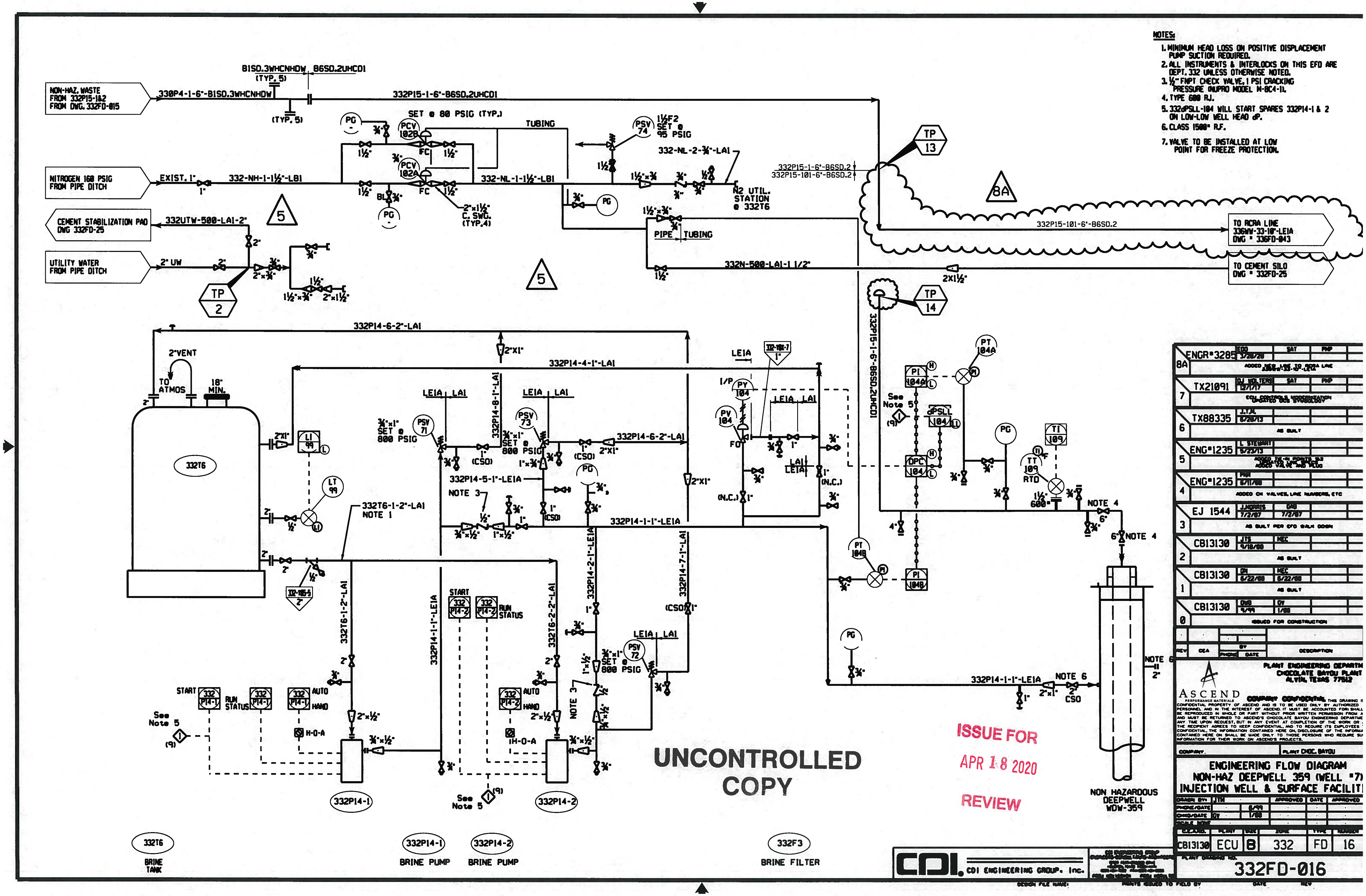
ENGINEERING FLOW DIAGRAM
AREA 332 IWPF
WASTE WATER STORAGE SH. 2 OF 2

			APPROVED	DATE	APPROVED
DRAWN BY:	BUTLER	01-28-93			
PHONE/DATE	J. HAMMONDS	5-25-93			
CHKD/DATE	R.W.COCHRAN				
SCALE					

C.E.A.NO.	PLANT	SIZE	ZONE	TYPE	NUMBER
	46	D	332	FD	5

PLANT DRAWING NO. 332FD-005

DESIGN FILE NAME: | PRINTS ISSUED TO FIELD BY | DATE | REV


NOTES:
1. MINIMUM HEAD LOSS ON POSITIVE DISPLACEMENT PUMP SUCTION REQUIRED.
2. ALL INSTRUMENTS & INTERLOCKS ON THIS EFD ARE DEPT. 332 UNLESS OTHERWISE NOTED.
3. ½" FNPT CHECK VALVE, 1 PSI CRACKING PRESSURE (NUPRO MODEL M-8C4-1).
4. TYPE 600 RJ.
5. 332dPSLL-104 WILL START SPARES 332P14-1 & 2 ON LOW-LOW WELL HEAD dP.
6. CLASS 1500# R.F.
7. VALVE TO BE INSTALLED AT LOW POINT FOR FREEZE PROTECTION.
NON-HAZ. WASTE FROM 332P15-1&2 FROM DWG. 332FD-015
330P4-1-6"-B1SD.3WHCNHDW
332P15-1-6"-B6SD.2UHC01
B1SD.3WHCNHDW B6SD.2UHC01
NITROGEN 160 PSIG FROM PIPE DITCH
332-NH-1-1½"-LB1
332-NL-1-1½"-LB1
332-NL-2-¾"-LA1
N2 UTIL. STATION @ 332T6
CEMENT STABILIZATION PAD DWG 332FD-25
332UTW-500-LA1-2"
UTILITY WATER FROM PIPE DITCH
TO RCRA LINE 336WW-33-10"-LE1A DWG # 336FD-043
332P15-101-6"-B6SD.2
TO CEMENT SILO DWG # 332FD-25
332N-500-LA1-1 1/2"
332P14-6-2"-LA1
332P14-4-1"-LA1
332P14-1-1"-LE1A
332P14-5-1"-LE1A
332T6-1-2"-LA1 NOTE 1
332P15-1-6"-B6SD.2UHC01
NON HAZARDOUS DEEPWELL WDW-359
332T6 BRINE TANK
332P14-1 BRINE PUMP
332P14-2 BRINE PUMP
332F3 BRINE FILTER
UNCONTROLLED COPY
ISSUE FOR APR 18 2020 REVIEW
REV	CEA	BY	DATE	DESCRIPTION
8A	ENGR#3285			ADDED NEW LINE TO RCRA LINE
7	TX21091	DJ WOLTERS 12/7/17		CCU CONTROLS MODERNIZATION
6	TX88335	6/20/13		AS BUILT
5	ENG#1235	L STEWART 6/23/13		
4	ENG#1235	6/11/08		ADDED CK VALVES, LINE NUMBERS, ETC
3	EJ 1544	J.MORRIS 7/2/07	7/2/07	AS BUILT PER EFD WALK DOWN
2	CB13130	4/18/00		AS BUILT
1	CB13130	6/22/00	6/22/00	AS BUILT
0	CB13130	9/99	1/00	ISSUED FOR CONSTRUCTION
PLANT ENGINEERING DEPARTMENT CHOCOLATE BAYOU PLANT ALVIN, TEXAS 77512
ASCEND PERFORMANCE MATERIALS
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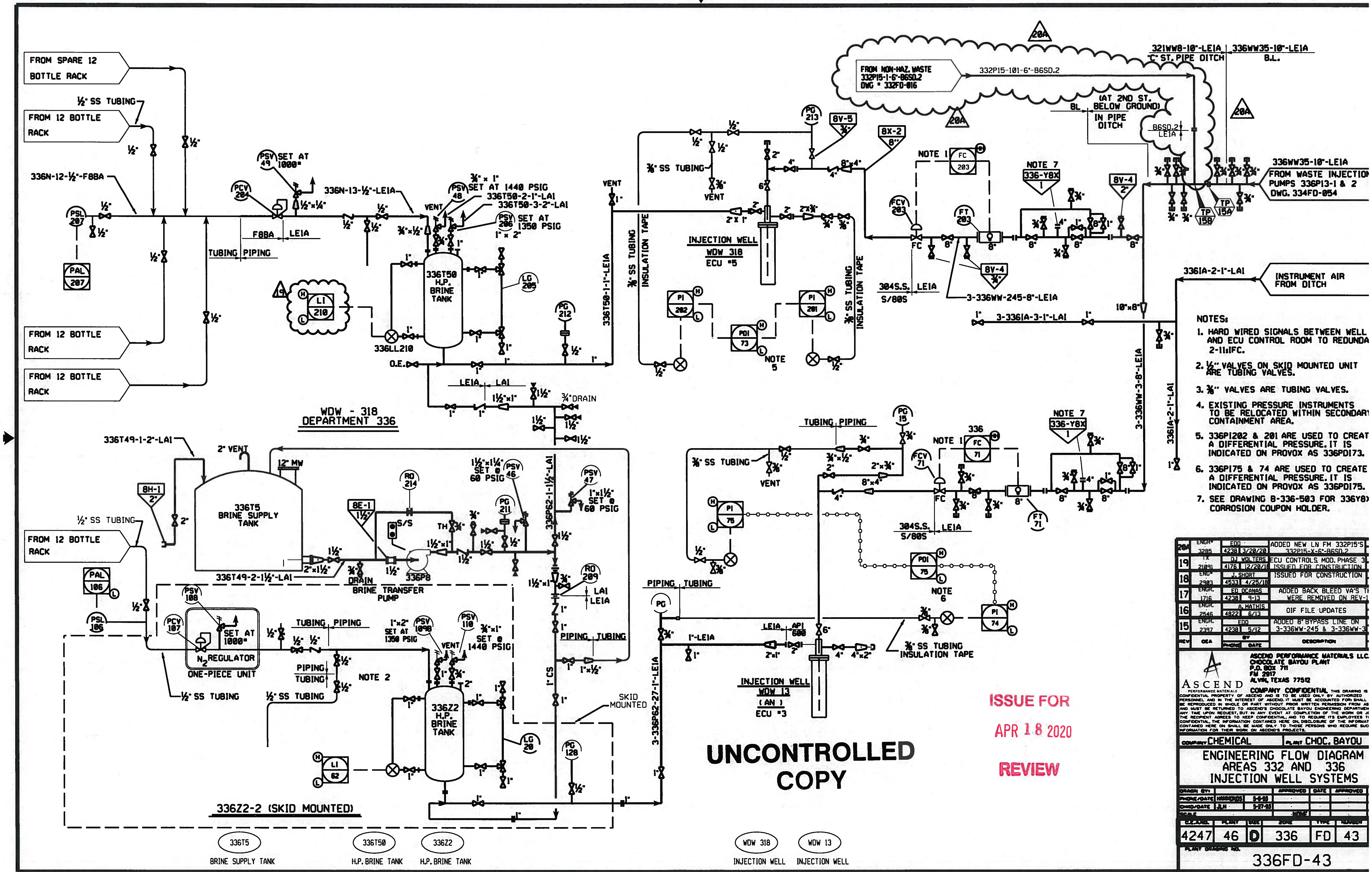
PLANT CHOC. BAYOU
ENGINEERING FLOW DIAGRAM NON-HAZ DEEPWELL 359 (WELL #7) INJECTION WELL & SURFACE FACILITIES
DRAWN BY: JTM 6/99
CHKD/DATE DV 1/00
CB13130 ECU B 332 FD 16
332FD-016
CDI ENGINEERING GROUP, Inc.



FROM SPARE 12 BOTTLE RACK
FROM 12 BOTTLE RACK
½" SS TUBING
336N-12-½"-F8BA
PSL 207
PAL 207
PSV 49 SET AT 1000#
PCV 204
336N-13-½"-LEIA
F8BA
LEIA
TUBING
PIPING
¾" x 1"
PSV 48 SET AT 1440 PSIG
336T50-2-1"-LAI
336T50-3-2"-LAI
PSV 206 SET AT 1350 PSIG
336T50 H.P. BRINE TANK
LI 210
336LL210
LG 205
PG 212
336T50-1-1"-LEIA
VENT
¾" SS TUBING
INSULATION TAPE
INJECTION WELL WDW 318 ECU #5
PI 202
PDI 73
PI 201
NOTE 5
PG 213
8V-5
8X-2
FROM NON-HAZ. WASTE 332P15-1-6"-B6SD.2 DWG # 332FD-016
332P15-101-6"-B6SD.2
321WW8-10"-LEIA "C" ST. PIPE DITCH
336WW35-10"-LEIA B.L.
(AT 2ND ST. BELOW GROUND)
IN PIPE DITCH
B6SD.2 LEIA
20A
NOTE 1
FC 203
FCV 203
FT 203
NOTE 7 336-Y8X
8V-4
8V-4
304S.S. LEIA S/80S
3-336WW-245-8"-LEIA
3-336IA-3-1"-LAI
336WW35-10"-LEIA
FROM WASTE INJECTION PUMPS 336P13-1 & 2 DWG. 334FD-054
TP 15A
TP 15B
336IA-2-1"-LAI
INSTRUMENT AIR FROM DITCH
10"x8"
3-336WW-3-8"-LEIA
336IA-2-1"-LAI
NOTES:
1. HARD WIRED SIGNALS BETWEEN WELL AND ECU CONTROL ROOM TO REDUNDA 2-11:IFC.
2. ½" VALVES ON SKID MOUNTED UNIT ARE TUBING VALVES.
3. ⅜" VALVES ARE TUBING VALVES.
4. EXISTING PRESSURE INSTRUMENTS TO BE RELOCATED WITHIN SECONDAR CONTAINMENT AREA.
5. 336PI202 & 201 ARE USED TO CREAT A DIFFERENTIAL PRESSURE. IT IS INDICATED ON PROVOX AS 336PDI73.
6. 336PI75 & 74 ARE USED TO CREATE A DIFFERENTIAL PRESSURE. IT IS INDICATED ON PROVOX AS 336PDI75.
7. SEE DRAWING B-336-503 FOR 336Y8X CORROSION COUPON HOLDER.
WDW - 318 DEPARTMENT 336
336T49-1-2"-LAI
2" VENT
12" MW
8H-1
336T5 BRINE SUPPLY TANK
336T49-2-1½"-LAI
DRAIN
336P8
BRINE TRANSFER PUMP
8E-1
RO 214
S/S
PSV 46 SET @ 60 PSIG
PG 211
PSV 47 SET @ 60 PSIG
336P62-1-1½"-LAI
RO 209
LAI LEIA
PIPING TUBING
1" CS
SKID MOUNTED
PAL 106
PSL 106
PSV 108 SET AT 1000#
PCV 107
N2 REGULATOR
ONE-PIECE UNIT
½" SS TUBING
NOTE 2
PSV 109B SET AT 1350 PSIG
PSV 110 SET @ 1440 PSIG
336Z2 H.P. BRINE TANK
LI 62
LG 28
PG 128
336Z2-2 (SKID MOUNTED)
3-336P62-27-1"-LEIA
TUBING PIPING
PG 15
NOTE 1
336 FC 71
FCV 71
FT 71
NOTE 7 336-Y8X
⅜" SS TUBING
VENT
304S.S. LEIA S/80S
PI 75
PDI 75
NOTE 6
PI 74
⅜" SS TUBING INSULATION TAPE
1"-LEIA
LEIA API 600
INJECTION WELL WDW 13 (AN) ECU #3
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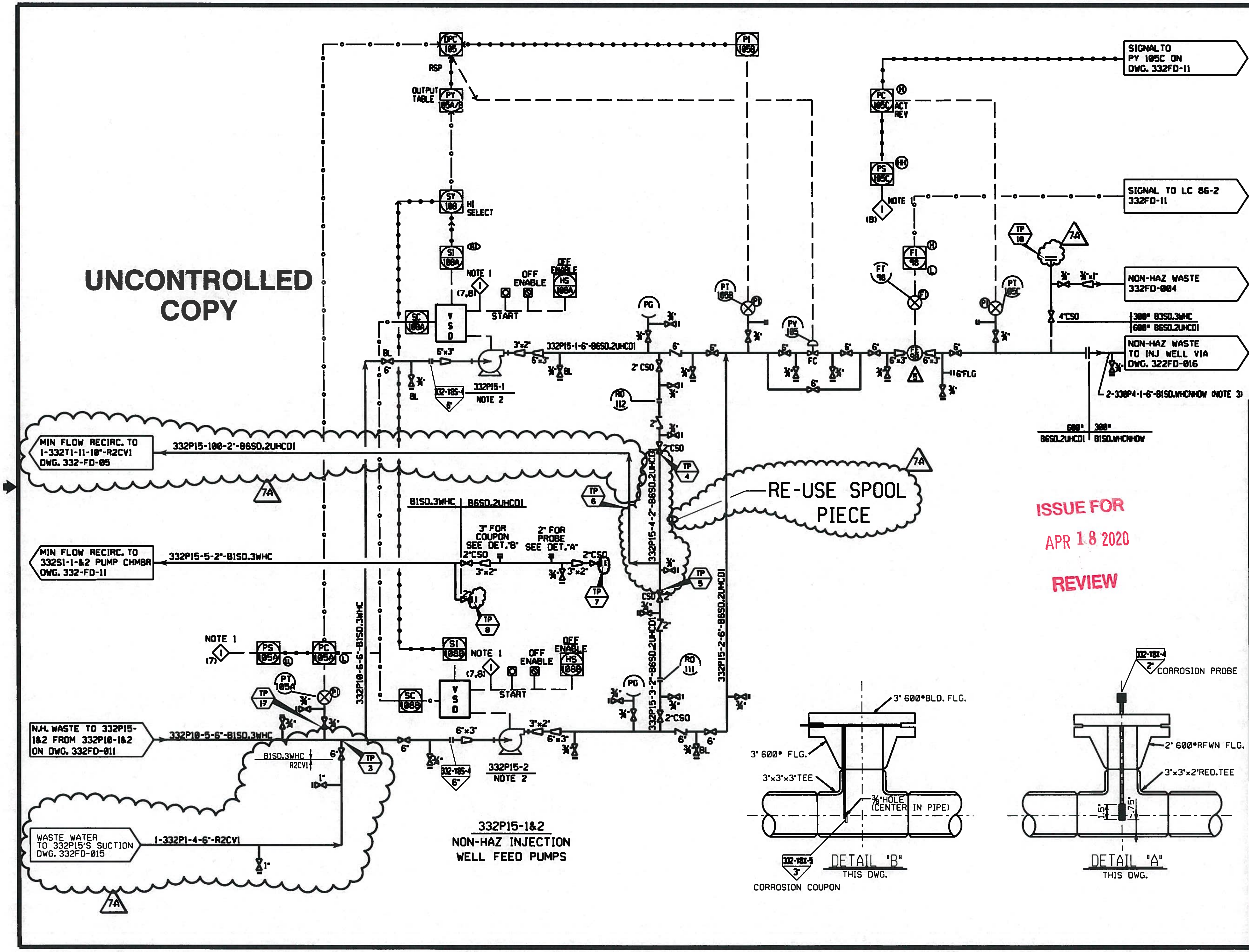
ISSUE FOR APR 18 2020 REVIEW
336T5 BRINE SUPPLY TANK
336T50 H.P. BRINE TANK
336Z2 H.P. BRINE TANK
WDW 318 INJECTION WELL
WDW 13 INJECTION WELL
20A ADDED NEW LN FM 332P15'S 332P15-X-6"-B6SD.2
19 ECU CONTROLS MOD. PHASE 3 ISSUED FOR CONSTRUCTION
18 ISSUED FOR CONSTRUCTION
17 ADDED BACK BLEED VA'S THAT WERE REMOVED ON REV-
16 OIF FILE UPDATES
15 ADDED 8" BYPASS LINE ON 3-336WW-245 & 3-336WW-3
ASCEND PERFORMANCE MATERIALS LLC CHOCOLATE BAYOU PLANT P.O. BOX 711 FM 2917 ALVIN, TEXAS 77512
ASCEND PERFORMANCE MATERIALS
COMPANY CONFIDENTIAL
CHEMICAL
CHOC. BAYOU
ENGINEERING FLOW DIAGRAM AREAS 332 AND 336 INJECTION WELL SYSTEMS
4247 46 D 336 FD 43
336FD-43
R.W.COCHRAN 6-7-93



NOTES:

1. PSLL-105 OR PSHH 105C SHUTS DOWN 332P15-1 & 2.
2. 332P15 SUCTION FLANGES ARE 600#
3. EXIST LINE 2-330P4-1-LBS2-6". ALL EXIST. FLANGES (CLASS 150) WILL BE REPLACED WITH 300# FLANGES. LINE MAWP = 574 PSIG. 322PSV70 IS SET AT 120% OF LINE MAWP AS PERMITTED BY ASME B31.1
4. ALL INSTRUMENTS & INTERLOCKS ON THIS EFD ARE DEPT. 332 UNLESS OTHERWISE NOTED

REV.	PROJECT NO.	BY / DATE	CHECKED / DATE	APPROVED / DATE	APPROVED / DATE	DETAILED REVISION DESCRIPTION
7A	ENGR#3285	EDD 3/20/20	SAT	PAP		ADDED BYPASS LINE FROM 332P1'S REVISED MIN FLOW LINE TO 1-332T1-11-10"-R2CV1 REMOVED PSV 332PSV-70
6	TX21091	DJ WOLTERS 11/30/17	SAT	PAP		ECU CONTROLS MODERNIZATION UPDATED DCS SYMBOLOGY
5	EJ 1875	J.L.R. 10/7/08				CHANGED FT-98 FROM 6" VORTEX FLOW METER TO A 3" MICRO MOTION
4	EJ 1544	J.MORRIS 7/2/07	GAB 7/2/07			AS BUILT PER EFD WALK DOWN
3	CHB93562	CH SHORT 05/04				ADDED SIGNAL TO LIC 86-2 FROM FI-98
2		AKAHR 4-04				REVISED PRESSURE LOOP 105C
1	CB13130	DH 6/22/00	REC 6/22/00			AS BUILT
0	CB13130	JTH 6/99	GV 1/6/00			ISSUE FOR CONSTRUCTION

ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
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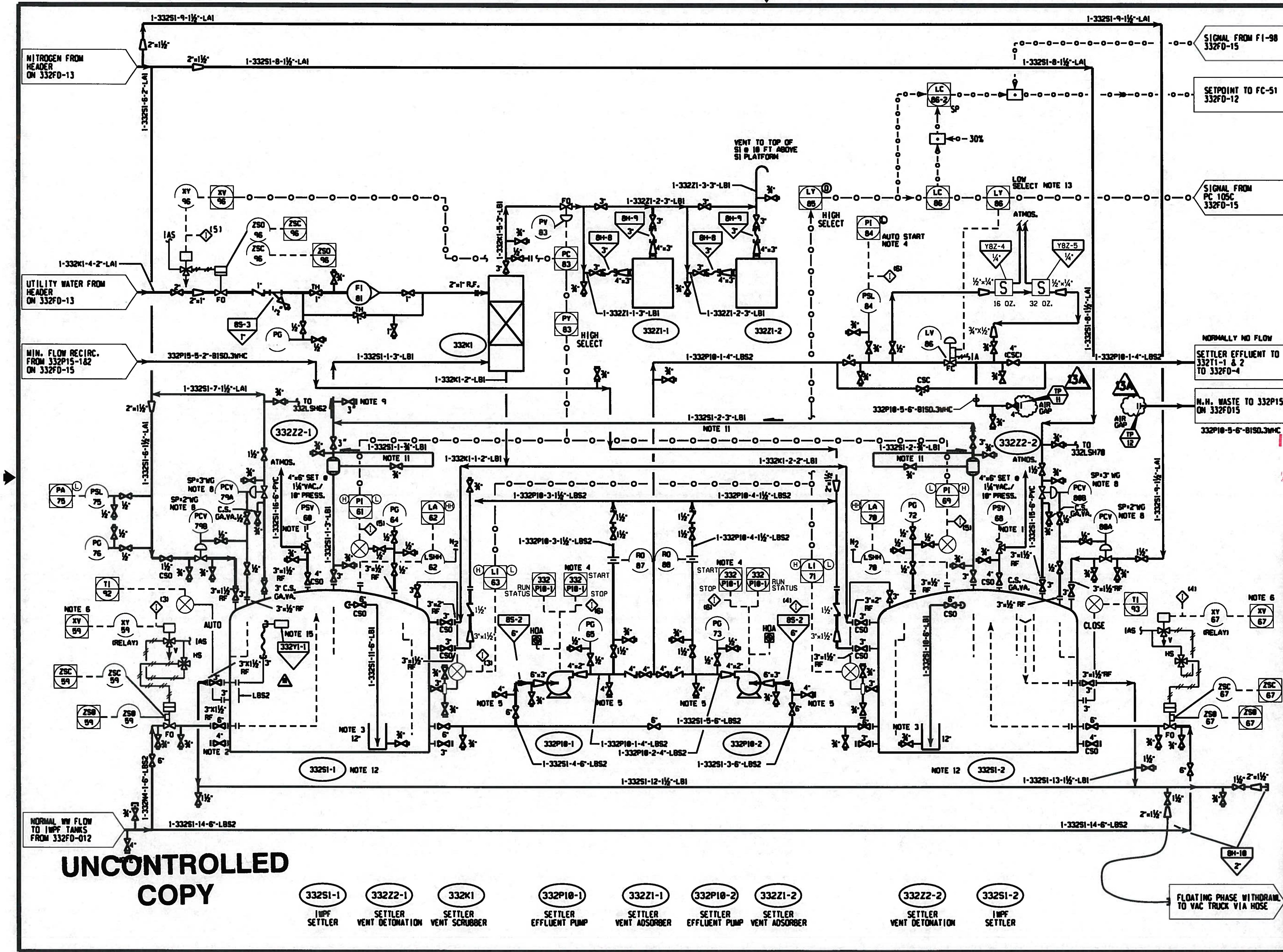
ENGINEERING FLOW DIAGRAM NON-HAZ DEEPWELL 359 INJECTION PUMPS 332P15-1 & 2

	BY	DATE	APPROVED	DATE	SITE/FUNCT/LOC
DRAWN	JH	6/99			
CHECKED	GV	1/00			SCALE
DESIGNED					

PROJECT NO. CB13130

SIZE D | SITE DRAWING NO. 332FD-015 | REV. 7A

CAD FILENAME: DATE REV



NOTES

1. PRESSURE/VACUUM CONSERVATION VENT.
2. 8 - 4" CLEANOUT NOZZLES PER SETTLER, ALTERNATING BETWEEN TANGENTIAL AND RADIAL ENTRY.
3. OVERFLOW LINE TO LIQUID SEAL POT. LIQUID SEAL POT CONSTRUCTED OF 12"Ø C.S. PIPE 42" HIGH. NLL IS 38". EXTEND 6" OVERFLOW LINE INTO SEAL POT 6" FROM BOTTOM.
4. SPARE P10 AUTO STARTS ON FAILURE OF PRIMARY WHEN IN AUTO VIA PSL-84.
5. 4" VALVES PROVIDED FOR SI DEINVENTOR VIA TEMP. PIPE.
6. XV'S HAVE LOCAL CLOSE ABILITY AT DI WALL.
7. ALL VALVES AND INSTRUMENTS ON TOP OF 332SI-1 & 2 TO BE ACCESSIBLE FRO PLATFORM.
8. MOUNT N_2 BLANKETING VALVE WITH 3 F OF LINE NOZZLE CONNECTION ON SETTL
9. FUTURE BIO FILTER CONNECTION.
10. LOCATE VENT VALVE @ A WORK PLATFOR
11. ——— DENOTES DIRECTION OF SLOPE SLOPE ⅛" PER FOOT.
12. ALL NOZZ'S ON SI-1 & SI-2 THAT HAVE PIPING ATTACHED TO THEM OR NOZZ'S WHICH HAVE INSTR. LEADS i.e. TUBING OF ELECTRICAL SHALL BE SUPPLIED WITH INSULATION KITS. SPECILITY ITEM NO. 8X-2 DO NOT INSTALL KITS FOR CATHODIC PROTECTION NOZZ'S, FUTURE NOZZ'S OR MANWAY NOZZ'S.
13. LC 86 IS THE MASTER LOOP. LV 86 CAN OPERATED IN MANUAL ONLY FROM LIC 86
14. ALL INSTRUMENTS & INTERLOCKS ON THI EFD ARE DEPT. 332 UNLESS OTHERWISE NOTED.
15. ADDED FLOATING OIL SKIMMER TO 332SI- PER MOC M2013858-001

GENERAL NOTES

1. ALL OPEN ENDED VALVES TO BE PLUGGE OR BLINDED.

ISSUE FOR

APR 18 2020

REVIEW

REV	OEA	BY / PHONE / DATE	DESCRIPTION
13A	ENGR# 3285	EBD 4238 3/19/20	AIR GAP LINE 332P10-5-6"-8ISO.3WHC
12	TX 21091	DJ WOLTERS 4176 1/23/17	ECU CONTROLS MODERNIZATION UPDATED DCS SYMBOLGY
11	2546	DWW . 1/14	OIF UPDATE
10	.	JBH . 7/07	REVISED PER EFD WALK DOWN
9	.	. 3-05	ADD 16 & 32 OZ SAMPLER AT 332P10 DISCHARGE
8	CHB 93562	CN SHORT . 05/04	ADD SIGNAL FROM FI-98 & SETPOINT TO FIC-51
7	.	. .	REVISED LOOP AT LV 86
4	CB13130	DMB . 9/1/99	REVISED FOR NON-HAZ. DEEPWELL FEE PKG.
2	15045	DFC . 3/15/96	ADDED XV-96

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COMPANY. PLANT.

ENGINEERING FLOW DIAGRAM
IWPF REPLACEMENT - PHASE
SETTLING TANKS & VENT TRE

DRAWN BY:	DFC		APPROVED	DATE	APPROVED
PHONE/DATE	.	6/28/95	.	.	.
CHKD/DATE	RTATE	3/17/95	.	.	.
SCALE	.		.	.	.

CE.AUTH.	PLANT	SIZE	ZONE	TYPE	NUMBER
.	46	D	332	FD	11

PLANT DRAWING NO.
332FD-011

DESIGN FILE NAME: PRINTS ISSUED TO FIELD BY DATE REV

GSI Job No. 5508

CERTIFICATION OF MODIFICATION OF PUMP CONNECTION TO RCRA LINE

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDICES

Appendix A	Piping Material Specifications
Appendix B	Valve Specification
Appendix C	Photographs of Tie-in Points Before and After Modification
Appendix D	Welder and Pipefitter Qualifications
Appendix E	Inspection Reports on Piping Modification

CERTIFICATION OF MODIFICATION OF PUMP CONNECTION TO RCRA LINE

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX A: PIPING MATERIAL SPECIFICATIONS

NOTE: Component descriptions listed in the latest version of this document shall govern when in conflict with alternate descriptions associated with this piping material specification.

1. INTRODUCTION

This piping materials specification describes piping component requirements for piping systems for which all of the following apply:

Fluid Service(s):	Acetic acid, $MeCl_2$, process water, SA/ $MeCl_2$ slurry, dilute SA/SAK/water solution, 25% NAOH, water/1.8% $MeCl_2$, neutral tars, other corrosive processes requiring TP316/316L SS **NOTE: Not for use in AN Quench Bottoms piping, use B1SD.3D1 and the HCN Handling Guidelines** **NOTE: Not for use in Formalin piping, use S2C3 and the Formalin Handling Guidelines**
Origin:	CED R2CV1, 1P0KL*P, LBS2*P, R2CT2*P, R2CV2*P
Using Department(s):	All
Reliability Group:	C
Material:	316/316L stainless steel
Flange Class & Face:	Class 150 raised face
Joints:	Buttweld & socketweld (see note 4)
Sealing Material:	PTFE or PFA
Corrosion Allowance:	0

2. REFERENCES

Ascend Enterprise Standards

P21005	Piping Reliability Group Selection Guide
P53205	Gaskets
P53305	Bolting
P54220	Pipe Line Blinds
P71100	Fabrication and Examination Specification for ASME B31.3 Metallic Piping
P71400	Leak Tests for Pipe

Chocolate Bayou Plant Standards

MWP-104.0	Pipe Inspection, Testing, and Welding Requirements

Process Industry Practices Standards

PNF0200	Vent, Drain, and Instrument Connections Index

National Standards

ASME B31.3	ASME Code for Pressure Piping

3. PIPING COMPONENTS

NPS	PIPE
1/2 - 1	size" fusion welded stainless steel pipe, ASTM A312-TP316/316L, S/40S wall thickness
1/2 - 1	size" fusion welded 316 stainless steel nipple, length" long, ASTM A312-TP316/316L, S/40S wall thickness, PBE

1.1/2 - 24	size" fusion welded stainless steel pipe, ASTM A312-TP316/316L, S/10S wall thickness

NPS	FITTINGS (see note 4)
1/2 - 1	size" 3000# socket weld stainless steel fitting, ASTM A182-F316/316L, ASME 16.11
1/2 - 1	size" x size" stainless steel concentric/eccentric swage, S/40S wall thickness, PBE, ASTM A403-WP-316/316L, MSS SP95
1.1/2 - 24	size" S/10S wall thickness buttweld stainless steel fitting, welded, ASTM A403-WP-W-316/316L, ASME B16.9
1.1/2 - 24	size" S/10S wall thickness buttweld stainless steel stub end, type "A", short pattern, welded, ASTM A403-WP-W-316/316L, ASME B16.9

BR. NPS	BRANCH CONNECTION FITTINGS
1/2 - 1	size" on size" 3000# forged stainless steel sockolet, ASTM A182-F316/316L, MSS SP97
1.1/2 - 12	size" on size" S/10S bore forged stainless steel weldolet, ASTM A182-316/316L, MSS SP97

NPS	FLANGES (see note 4)
1/2 - 1	size" class 150 stainless steel socketweld flange, raised face, ASTM A182-F316/316L ASME B16.5
1/2 - 1	size" class 150 stainless steel weld neck flange, raised face, S/40S bore, ASTM A182-F316/316L, ASME B16.5
1.1/2 - 24	size" class 150 forged carbon steel lap joint flange, ASTM A105, ASME B16.5, hot dip galvanized
1/2 - 24	size" class 150 stainless steel blind flange, raised face, ASTM A182-F316/316L, ASME B16.5

NPS	SPECIAL FITTINGS
1/2 - 24	size" class 150 Figure 8 blind, ASTM A240 TP316, per P54220

4. VALVES

See Chocolate Bayou Valve Index for complete ordering descriptions of valves.

NPS	TAG No.	GATE VALVE
1/2 - 1.1/2	TA30	800# socketweld stainless steel gate valve
1/2 - 24	TA40	150# raised face flanged stainless steel gate valve
1/2 - 1.1/2	TA36	(see attachment 1) 800# socketweld stainless steel bellows sealed gate valve
1/2 - 12	TA46	(see attachment 1) 150# raised face flanged stainless steel bellows sealed gate valve

NPS	TAG No.	GLOBE VALVE
1/2 - 1.1/2	TB30	800# socketweld stainless steel globe valve
1/2 - 12	TB40	150# raised face flanged stainless steel globe valve
1/2 - 1.1/2	TB36	(see attachment 1) 800# socketweld stainless steel bellows sealed globe valve
1/2 - 8	TB46	(see attachment 1) 150# raised face flanged stainless steel bellows sealed globe valve

NPS	TAG No.	CHECK VALVE
1/2 - 1.1/2	TC30	800# socketweld stainless steel swing check valve
1/2 - 24	TC40	150# raised face flanged stainless steel swing check valve

NPS	TAG No.	BALL VALVE
1/2 - 18	TF41	150# raised face flanged stainless steel ball valve

NPS	TAG No.	BUTTERFLY VALVE
3 - 24	TH44	150# threaded lug style stainless steel butterfly valve

NPS	TAG No.	PLUG VALVE
3 - 10	TE41	150# raised face flanged stainless steel sleeve plug valve

5. GASKETS

NPS	GASKET
1/2 - 24	size" class 150 spiral wound gasket, 316L SS winding, PTFE filler, 316L SS inner ring, ASME B16.20, Flexitallic style CGI or Garlock style CD-RWI. Flexitallic seating stress shall be nominal 5,000 PSI and the centering ring shall be stamped with the numeral "5000". Garlock centering ring shall be marked "Garlock CD". Flexitallic and Garlock centering rings edges shall be striped with four light blue stripes adjacent to the standard color code stripes.
3 - 24	(for use with butterfly valves where spiral wound gaskets will not seal) size" class 150 flat ring gasket 1/16" thick Garlock 3500 Gylon Fawn ASME B16.21

6. BOLTING

NPS	CONN.	STUDS & BOLTS
All	flange pairs	size" x length" long alloy continuous threaded stud, ASTM A193 Gr B7 with 2 heavy hex nuts, ASTM A194 Gr 2H
All	tapped holes	size" x length" long heavy hex head bolt, ASTM A193 Gr B7

7. INSTALLATION DETAILS

Vent, drain, and instrument connections shall be in accordance with PIP PNF0200. Where PIP branch connections conflict with the branch connection chart set forth in this piping material specification, the branch chart shall take precedence.

Hydro-test Vents/Drains:	Thrd.	PIP PNF0302 & PNF0304
Valved Vents/Drains:	Flgd.	SID-0401 & SID-0402
Pressure Connections:	Flgd.	SID-0501
Thermowell Connections:	Flgd.	PIP PNF0610 & PNF0612
Orifice Flange Connections:	Flgd.	SID-0701

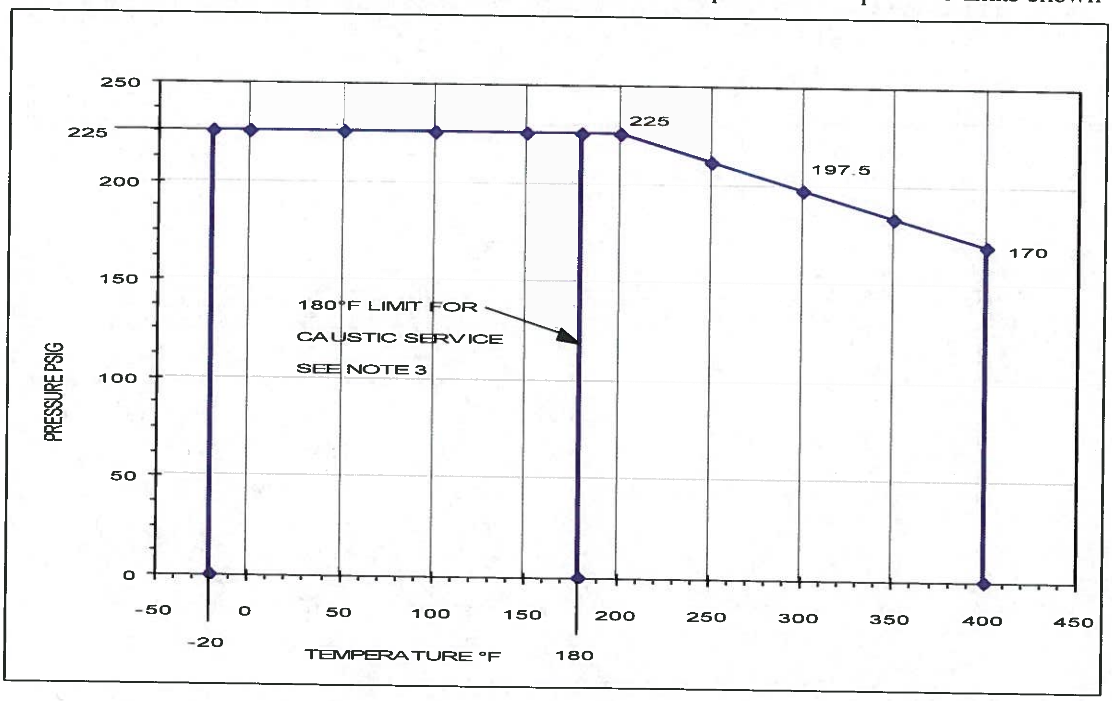
8. 90 DEGREE BRANCH CONNECTIONS

T - STRAIGHT TEE
E - REDUCING TEE
W - WELDOLET
S - SOCKOLET

BRANCH SIZE																
24																T
20															T	E
18														T	E	E
16													T	E	E	E
14												T	E	E	E	E
12											T	E	E	E	E	E
10										T	E	E	E	E	E	W
8									T	E	E	E	E	W	W	W
6								T	E	E	E	W	W	W	W	W
4							T	E	E	W	W	W	W	W	W	W
3						T	E	E	W	W	W	W	W	W	W	W
2					T	E	E	W	W	W	W	W	W	W	W	W
1.5				T	E	E	W	W	W	W	W	W	W	W	W	W
1			T	S	E	W	W	W	W	W	W	W	W	W	W	W
3/4		T	E	S	S	S	S	S	S	S	S	S	S	S	S	S
1/2	T	E	E	S	S	S	S	S	S	S	S	S	S	S	S	S
HEADER SIZE	1/2	3/4	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24

9. PRESSURE-TEMPERATURE RATINGS

Do not use this piping material specification outside of the pressure-temperature limits shown



10. INSPECTION & WELDING

Pipe fabrication and examination shall be in accordance with ASME B31.3 and with Chocolate Bayou MWP-104.0

GENERAL NOTES

1. Deleted
2. All threaded hydrostatic vent and drain connections shall be seal welded after completion of the hydrotest.
3. For caustic service do not use above 180 °F.
4. Lokring™ compression joint fittings per piping material specification R2CL1*P may be used for 1/2" – 3" piping systems where welding is undesirable.
5. For potable water: use piping specification D1SD.1 for SS up to 8" and LA3 for galvanized CS up to 2".

REV	DESCRIPTION	BY	APPD	DATE
10	Added 'Fluid Service' note to use B1SD.3D1 for AN quench bottoms piping	NPW	MDH	10/11/18
9	Changed 'Solutia' to 'Ascend' and updated **References,** added potable water note	NPW	MDH	7/17/14
8	Increased size range to 24", added socketweld valves in sizes 1/2"-1.1/2", added origin spec. references	ALN		04/25/03
7	Added bellows sealed valves and attachment 1	ALN	WEH	04/15/03
6	Removed note 1 requiring flange covers	ALN	WEH	02/26/03
5	Added note 4 to permit Lokring™ connections	ALN	WEH	10/01/02
4	Added note 3 about caustic temperature limit and revised pressure-temperature chart accordingly	WEH	WEH	6/3/2002
3	Added note about Formalin	WEH	WEH	4/11/02
2	Revised spiral wound gasket description to add Garlock	ALN		03/28/02
1	Revised NPS 1" from S/10S to S/40S and from buttweld to socketweld	ALN	WEH	03/12/01
0	Issued	ALN	WEH	07/28/00

REVISION HISTORY

ATTACHMENT 1

BELLOWS SEALED VALVE USAGE

Bellows sealed valves feature a corrugated bellows located inside the valve bonnet such that the process fluid is isolated from the packing gland. The packing becomes a "backup" in the event of a bellows failure.

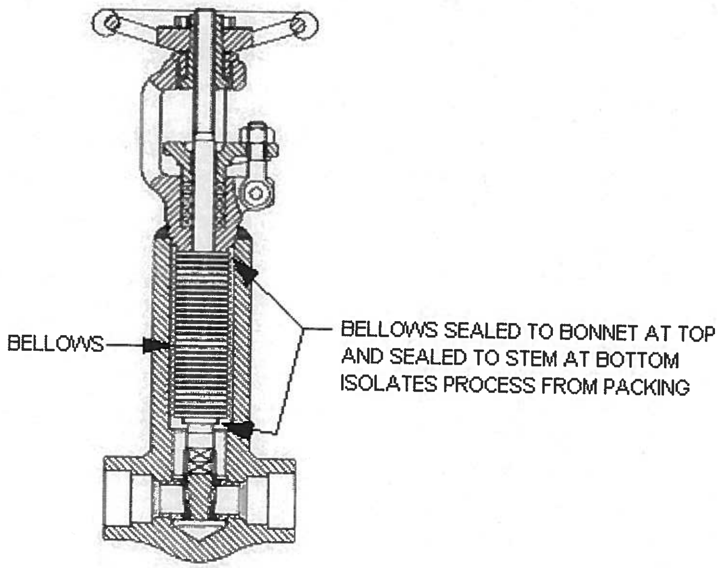


FIGURE 1

Bellows sealed valves are expensive, costing several times what conventional valves of comparable materials cost.

In services where packing leaks are a persistent problem (such as steam and condensate) or would pose a significant risk (such as sulfur dioxide), bellows sealed valves should be considered as an alternative to conventional valves.

In services where fines buildup or internal corrosion can prevent tight shutoff of gate valves, bellows sealed globe valves should be considered for shutoff valves.

In services where containment of packing leaks is required, bellows sealed valves may be an alternative to installing containment slabs or re-routing piping to a containment area[1].

[1] This is an ES&H issue and should be considered accordingly.

1. INTRODUCTION: This piping materials specification describes piping component requirements for piping systems for which all of the following apply:

- Reliability Group B
- Class 600
- 316/316L Stainless steel
- Corrosion allowance = none

2. REFERENCES

Ascend Enterprise Standards

P21005	Piping Reliability Group Selection Guide
P30105	Piping Material Specification Numbering
P53205	Gaskets
P53305	Bolting
P54220	Pipe Line Blinds

Chocolate Bayou Standards

MWP104	Pipe Inspection, Testing & Welding Requirements

3. PIPING COMPONENTS: Components are described for NPS 3/4 - 6. Piping smaller than NPS 3/4 is not to be used except where needed to match equipment or instruments. When used, the smaller components shall be the same as specified for NPS 3/4.

NPS	**PIPE**
3/4 - 6	Fusion welded stainless steel pipe ASTM A312-TP316/316L S/40S wall thickness
NPS	**FITTINGS**
3/4 - 1.1/2	ASTM A182-F316/316L stainless steel, Class 3000 SW ANSI B16.11
2 - 6	ASTM A403-WP-W-316/316L welded stainless steel buttweld S/40S wall thickness ANSI B16.9
BRANCH NPS	**BRANCH CONNECTION FITTINGS**
3/4 - 6	ASTM A182 F316/316L forged stainless steel welding outlet fitting per Table 1, bore to match branch size
NPS	**FLANGES**
3/4 - 1.1/2	Class 600, ASTM A182-F316/316L RF SW, bore to match pipe, ASME B16.5
2 - 6	Class 600, ASTM A182-F316/316L RF WN forged stainless steel, bore to match pipe, ASME B16.5
NPS	**SPECIAL ITEMS**
3/4 - 6	Class 600 Figure 8 blind, ASTM A240 TP316, per Ascend P54220

VALVE SPECIFICATIONS

NPS	TAG	
3/4 - 6	TA60	**GATE VALVE** Class 600 RF flanged gate valve, 316 stainless steel, bolted bonnet, OS&Y, 316 SS stem, disc, and integral seats, PTFE packing, 316 SS/PTFE spiral wound gasket

NPS	TAG	
3/4 - 6	TB60	**GLOBE VALVE** Class 600 RF flanged globe valve, 316 stainless steel, bolted bonnet, OS&Y, with 316SS stem, disk & trim, PTFE packing, 316SS/PTFE spiral wound gasket

NPS	TAG	
3/4 - 6	TC60	**CHECK VALVES** Class 600 RF flanged swing check valve, 316 stainless steel, cast A351-CF8M with integral seat, 316SS disk & trim, 316SS/PTFE spiral wound gasket

4. GASKETS

UH — Class 600 spiral wound gasket, 316L SS winding, PTFE filler, 316L SS inner ring, ASME B16.20, Flexitallic style CGI or Garlock style RWI. Centering ring edges shall be striped with the standard color code stripes .

5. BOLTING

7 — Continuous threaded stud, ASTM A193 Gr B7 with heavy hex nuts, ASTM A194 Gr 2H

6. **INSTALLATION DETAILS** - Shall be in accordance with PIP PNF0200. Where PIP PNF0200 branch connections are in conflict with the Piping Material Specification branch connection chart, the Piping Material Specification branch connection chart shall take precedence.

Hydrostatic Vents/Drains:	PNF0418 & PNF0419
Valved Vents/Drains:	PNF0418 & PNF0419
Pressure Connections:	PNF0512
Thermowell Connections:	PNF0613 & PNF0615
Orifice Flange Tap Conn:	PNF0704

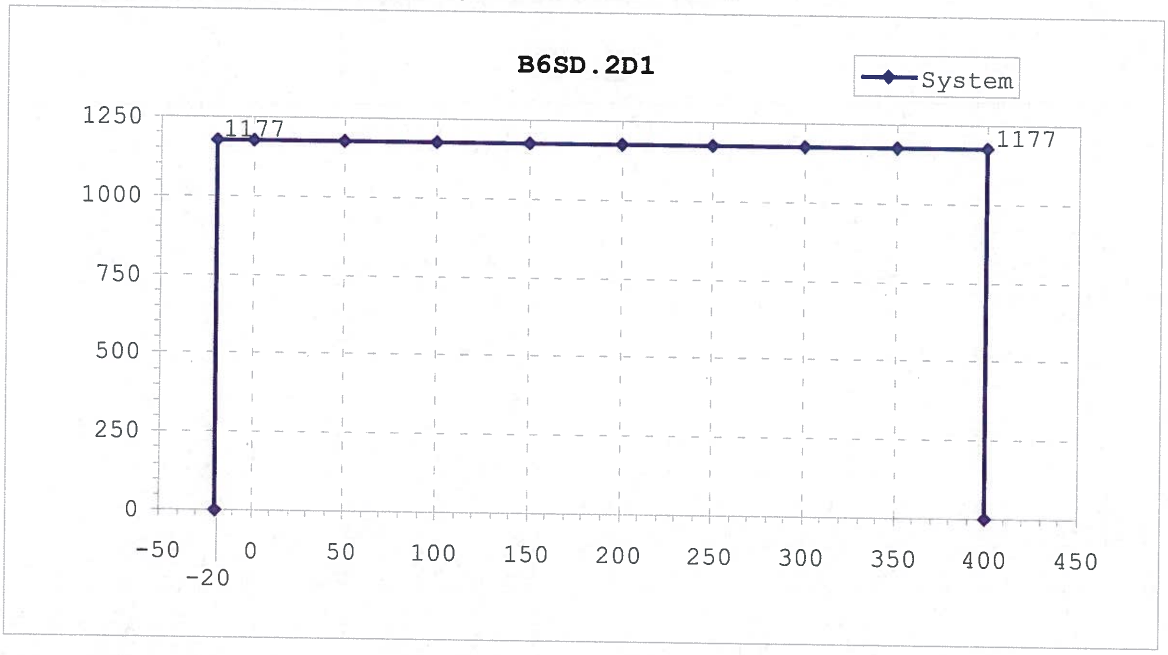
7. **Table 1**: 90 degree branch connections

LEGEND:

T STRAIGHT TEE
E REDUCING TEE
S SOCKOLET
W WELDOLET

BRANCH SIZE \ HEADER SIZE	3/4	1	1.5	2	3	4	6
6							T
4						T	E
3					T	E	E
2				T	E	E	W
1.5			T	S	S	S	S
1		T	E	S	S	S	S
3/4	T	E	E	S	S	S	S

8. **PRESSURE AND TEMPERATURE RATINGS**
Do not exceed pressure and temperature limits shown.



INSPECTION:
Fabrication and examination shall be per ASME B31.3 and Chocolate Bayou MWP 104.0, Pipe Inspection, Testing & Welding Requirements.

NOTES:
1. Threaded joints not permitted in this piping system.

NO.	DATE	REVISION DESCRIPTION	BY	APPROVED
0	6/24/99	Issued	WEH	
1A	6/28/99	Review & Comments	ALN	
1	7/12/99	Updated per comments	WEH	
2	05/02/00	Added gasket notching requirements	ALN	
3	06/19/00	Added inner rings to all sizes of spiral wound gaskets	ALN	
4	06/27/00	Removed gaskets with flexible graphite filler, changed tag numbers of valves from xx-62 to xx-60	ALN	
5	04/10/03	Revised inspection requirements to include MWP-104.0	ALN	
6	7/18/14	Changed 'Solutia' to 'Ascend' and updated **References**	NPW	MDH
7	3/1/18	5 year review, updated hyperlinks and corrected gasket description.	NPW	MDH

NOTE: Component descriptions listed in the latest version of this document shall govern when in conflict with alternate descriptions associated with this piping material specification.

1. INTRODUCTION

This piping materials specification describes piping component requirements for piping systems for which all of the following apply:

Fluid Service(s):	General hydrocarbons
	Note: Not for liquid propylene – see note 3
Origin:	LE1A, Bechtel E1A
Using Department(s):	All
Reliability Group:	B
Material:	Carbon steel
Flange Class & Face:	Class 600 raised face
Joints:	Buttweld & socketweld
Sealing Material:	Flexible graphite
Corrosion Allowance:	1/16"

2. REFERENCES

Ascend Enterprise-Wide Standards

P21005	Piping Reliability Group Selection Guide
P53205	Gaskets
P53305	Bolting
P54220	Pipe Line Blinds
P71100	Fabrication and Examination Specification for ASME B31.3 Metallic Piping
P71400	Leak Tests for Pipe

Chocolate Bayou Plant Standards

MWP-104.0	Pipe Inspection, Testing, and Welding Requirements

Process Industry Practices Standards

PNF0200	Vent, Drain, and Instrument Connections Index

National Standards

ASME B31.3	ASME Code for Pressure Piping

3. PIPING COMPONENTS

NPS	PIPE
1/2 - 1.1/2	size" seamless carbon steel pipe, ASTM A106 Gr. B, XS wall thickness
1/2 - 1.1/2	size" seamless carbon steel nipple, length" long, ASTM A106 Gr. B, XS wall thickness, PBE
2 - 24	size" seamless carbon steel pipe, ASTM A53 Gr. B, Type S, S/80 wall thickness

NPS	FITTINGS
1/2 - 1.1/2	size" 3000# socketweld forged steel fitting, ASTM A105, ASME B16.11
1/2 - 1.1/2	size" x size" carbon steel concentric/eccentric swage, XS wall thickness, PBE, ASTM A234 Gr. WPB, MSS SP95
2 - 24	size" buttweld carbon steel fitting, S/80 wall thickness, ASTM A234 Gr. WPB, ASME B16.9

BR. NPS	BRANCH CONNECTION FITTINGS
1/2 – 1.1/2	size" on size" 3000# forged carbon steel sockolet, ASTM A105, MSS SP97
2 - 12	size" on size" S/80 bore forged carbon steel weldolet, ASTM A105, MSS SP97

NPS	FLANGES
1/2 - 1-1/2	size" class 600 socketweld flange, raised face, forged carbon steel ASTM A105, ASME B16.5
2 - 24	size" class 600 weld neck flange, raised face, S/80 bore, forged carbon steel ASTM A105, ASME B16.5
1/2 - 24	size" class 600 blind flange, raised face, forged carbon steel ASTM A105, ASME B16.5

NPS	SPECIAL FITTINGS
1/2 - 24	size" class 600 figure 8 blind, raised face, ASTM A240 TP316, per P54220

4. VALVES

See Chocolate Bayou Valve Index for complete ordering descriptions of valves.

NPS	TAG No.	GATE VALVE
1/2 - 1.1/2	FA39	800# socketweld forged steel gate valve
1/2 - 1.1/2	FA64	600# raised face flanged forged steel gate valve
2 - 24	FA62	600# raised face flanged cast steel gate valve
1/2 – 2	FA36	(see attachment 1) 800# socketweld carbon steel bellows sealed gate valve
1/2 – 12	FA66	(see attachment 1) 600# raised face flanged carbon steel bellows sealed gate valve

NPS	TAG No.	GLOBE VALVE
1/2 - 1.1/2	FB39	800# socketweld forged steel globe valve
1/2 - 1.1/2	FB64	600# raised face flanged forged steel globe valve
2 - 12	FB62	600# raised face flanged cast steel globe valve
1/2 – 2	FB36	(see attachment 1) 800# socketweld carbon steel bellows sealed globe valve
1/2 – 8	FB66	(see attachment 1) 600# raised face flanged carbon steel bellows sealed globe valve

NPS	TAG No.	CHECK VALVE
1/2 - 1.1/2	FC37	800# socket weld forged steel swing check valve
1/2 - 1.1/2	FC64	600# raised face flanged forged steel lift check valve
2 - 24	FC61	600# raised face flanged cast steel swing check valve

5. GASKETS

NPS	GASKET
1/2 - 24	size" class 600 spiral wound gasket, 316L SS winding, flexible graphite filler, 316L SS inner ring, ASME B16.20. Flexitallic style CGI or Garlock style RWI. Flexitallic and Garlock centering rings edges shall be notched with three single notches per Chocolate Bayou Gasket Notching Practice.

6. BOLTING

NPS	CONN.	STUDS & BOLTS
All	flange pairs	size" x length" long alloy continuous threaded stud, ASTM A193 Gr. B7 with 2 heavy hex nuts, ASTM A194 Gr. 2H

7. INSTALLATION DETAILS

Vent, drain, and instrument connections shall be in accordance with PIP PNF0200. Where PIP branch connections conflict with the branch connection chart set forth in this piping material specification, the branch chart shall take precedence.

Hydro-test Vents/Drains:	Socketweld	PIP PNF0302 & PNF0304
Valved Vents/Drains:	Socketweld	PIP PNF0421 & PNF0422
Pressure Connections:	Flanged	SID0501
Thermowell Connections:	Flanged	PIP PNF0607 & PNF0609
Orifice Flange Connections:	Socketweld	PIP PNF0707

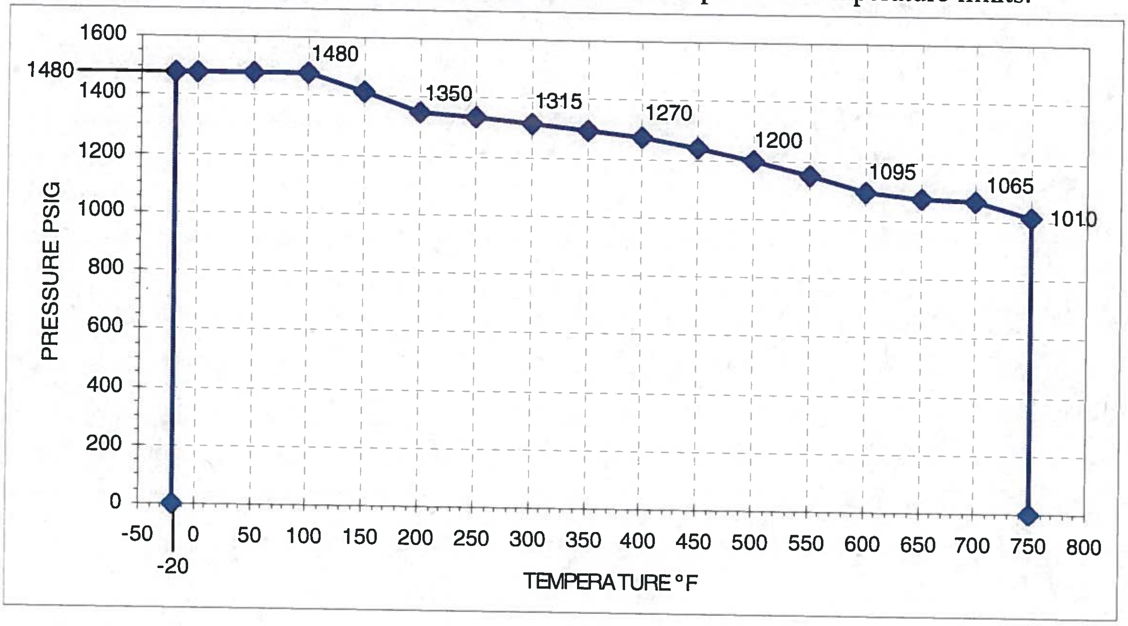
8. 90 DEGREE BRANCH CONNECTIONS

LEGEND:
T - STRAIGHT TEE
E - REDUCING TEE
W - WELDOLET
S - SOCKOLET

BRANCH SIZE \ HEADER SIZE	1/2	3/4	1	1.1/2	2	3	4	6	8	10	12	14	16	18	20	24
24																T
20															T	E
18														T	E	E
16													T	E	E	E
14												T	E	E	E	E
12											T	E	E	E	E	W
10										T	E	E	E	E	W	W
8									T	E	E	E	W	W	W	W
6								T	E	E	W	W	W	W	W	W
4							T	E	W	W	W	W	W	W	W	W
3						T	E	W	W	W	W	W	W	W	W	W
2					T	E	W	W	W	W	W	W	W	W	W	W
1.1/2				T	S	S	S	S	S	S	S	S	S	S	S	S
1			T	E	S	S	S	S	S	S	S	S	S	S	S	S
3/4		T	E	E	S	S	S	S	S	S	S	S	S	S	S	S
1/2	T	E	E	E	S	S	S	S	S	S	S	S	S	S	S	S

9. PRESSURE-TEMPERATURE RATINGS

Do not use this piping material specification outside of the pressure-temperature limits.



10. INSPECTION & WELDING

Pipe fabrication and examination shall be in accordance with ASME B31.3 and with Chocolate Bayou MWP-104.0

GENERAL NOTES

1. Valves 6" and larger shall have 1" pressure equalizing bypass. Connections for bypass lines shall be made in the piping, not in the valve bodies.
2. Gear operators shall be installed on valves NPS 6" and larger if differential pressure is more than 600 PSIG.
3. Liquid propylene piping shall be in accordance with piping specification B6CA.5D1.

REV	DESCRIPTION	BY	APPD	DATE
5	Changed 'Solutia' to 'Ascend' and updated **References**	NPW	MDH	7/22/14
4	Added bellows sealed valves and attachment 1	ALN	WEH	04/15/03
3	Added ref to spec B6CA.5D1 for liquid propylene service	ALN		04/10/03
2	Revised spiral wound gasket description to add Garlock	ALN		03/28/02
1	Corrected NPS 1/2-1.1/2 flange from RTJ to raised face and corrected valve FB62 from RTJ to raised face	ALN	WEH	07/12/01
0	Issued	ALN	WEH	05/14/01

REVISION HISTORY

ATTACHMENT 1

BELLOWS SEALED VALVE USAGE

Bellows sealed valves feature a corrugated bellows located inside the valve bonnet such that the process fluid is isolated from the packing gland. The packing becomes a "backup" in the event of a bellows failure.

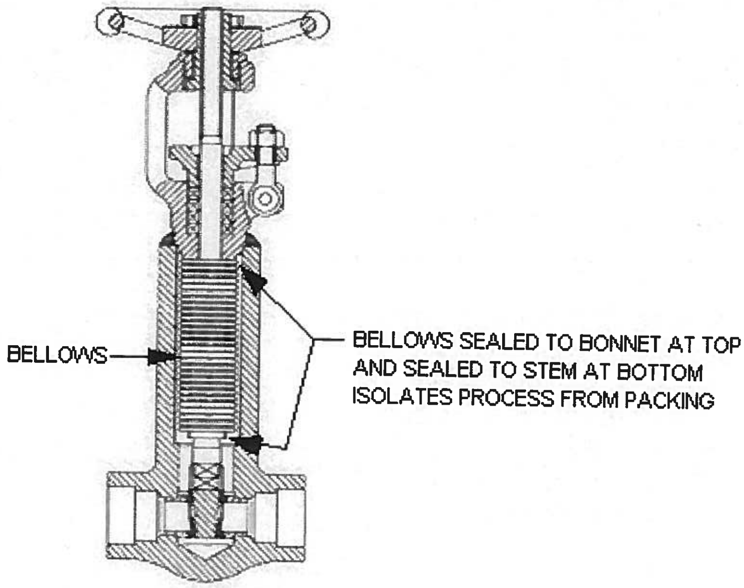


FIGURE 1

Bellows sealed valves are expensive, costing several times what conventional valves of comparable materials cost.

In services where packing leaks are a persistent problem (such as steam and condensate) or would pose a significant risk (such as sulfur dioxide), bellows sealed valves should be considered as an alternative to conventional valves.

In services where fines buildup or internal corrosion can prevent tight shutoff of gate valves, bellows sealed globe valves should be considered for shutoff valves.

In services where containment of packing leaks is required, bellows sealed valves may be an alternative to installing containment slabs or re-routing piping to a containment area[1].

[1] This is an ES&H issue and should be considered accordingly.

1. INTRODUCTION: This piping materials specification describes piping component requirements for piping systems for which all of the following apply:

- Reliability Group B
- Class 150
- 316/316L Stainless Steel
- Corrosion allowance = none

2. REFERENCES

Ascend Enterprise Standards

P21005	Piping Reliability Group Selection Guide
P30105	Piping Material Specification Numbering
P53205	Gaskets
P53305	Bolting
P54220	Pipe Line Blinds

Chocolate Bayou Standards

MWP104 Pipe Inspection, Testing & Welding Requirements

3. PIPING COMPONENTS: Components are described for NPS 3/4 - 36. Piping smaller than NPS 3/4 is not to be used except where needed to match equipment or instruments. When used, the smaller components shall be the same as specified for NPS 3/4.

NPS	PIPE
3/4 - 2	Fusion welded stainless steel pipe ASTM A312-TP316/316L S/40S wall thickness
3 - 24	Fusion welded stainless steel pipe ASTM A312-TP316/316L S/10S wall thickness
26 - 36	Fusion welded stainless steel pipe ASTM A312-TP316/316L .375" wall thickness

NPS	FITTINGS
3/4 - 2	ASTM A403-WP-W-316/316L welded stainless steel buttweld fitting S/40S wall thickness ASME B16.9
3 - 24	ASTM A403-WP-W-316/316L or ASTM A403-WP-S-316/316L welded or seamless stainless steel buttweld fitting S/10S wall thickness ASME B16.9
26 - 36	ASTM A403-WP-W-316/316L or ASTM A403-WP-S-316/316L welded or seamless stainless steel buttweld fitting .375" wall thickness ASME B16.9

BRANCH NPS	BRANCH CONNECTION FITTINGS
1 - 6	ASTM A182-F316/316L forged stainless steel welding outlet fitting, bore to match branch size

NPS	FLANGES [1]
3/4 - 24	Class 150 ASTM A182-F316/316L RF weld neck forged stainless steel, bore to match pipe, ASME B16.5
26 - 36	Class 150 ASTM A182-F316/316L RF weld neck forged stainless steel, bore to match pipe, ASME B16.47 series A

NPS	SPECIAL ITEMS
1 - 24	Class 150 Figure 8 blanks, paddle blanks and paddle spacers, ASTM A240 TP316, per Ascend P54220
1 - 6	Class 150 bleed ring per Chocolate Bayou drawing A-SDPP-55, latest revision

VALVE SPECIFICATIONS

NPS	TAG	GATE VALVE
3/4 - 24	TA42	Class 150 RF flanged gate valve, ASTM A312 F316 or A351 CF8M stainless steel, bolted bonnet, 0S&Y, 316 stainless steel disk, stem, and trim, flexible graphite packing, 304 or 316 SS spiral wound gasket with flexible graphite filler, or soft iron gasket. ASME B16.34 or API 600.
3/4 - 12	TA46	(see attachment 1) 150# bellows sealed RF flanged stainless steel gate valve

NPS	TAG	GLOBE VALVES
3/4 - 16	TB42	Class 150 RF flanged globe valve, 316 stainless steel, A182-F316 with pressed in seat and body/bonnet to API 602; A351-CF8M with body/bonnet to ASME B16.34; bolted bonnet, OS&Y, with 316SS stem, disk & trim, flexible graphite packing, 316SS or stellited seat, spiral wound gasket with 316SS/flexible graphite filler.
3/4 - 8	TB46	(see attachment 1) 150# bellows sealed RF flanged stainless steel globe valve

NPS	TAG	CHECK VALVES
3/4 - 12	TC42	Class 150 RF flanged swing check valve, 316 stainless steel, cast A351-CF8M with integral seat, body/bonnet to ASME B16.34; forged A182-F316 with pressed in seat, body/bonnet to API 602. 316SS disk & trim, 316SS or stellited seat, spiral wound gasket with 316SS/flexible graphite filler.

NPS	TAG	BALL VALVES
3/4 - 12	TF41	Class 150 RF flanged ball valve, ASTM A182-F316 or A351-CF8M, 316 SS ball & stem, RTFE seat, PTFE or PFA stem seal, two piece bolted or unibody.

NPS	TAG	BUTTERFLY VALVES
2 - 36	TH46	Class 150 lug style butterfly valve, 316/316L body with 316/316L disc and stem; 316SS, Armco Nitronic 50 or Inconel X750 shaft; PTFE or PFA seats with 316/316L secondary seat
36	TH47	Class 150 lug style butterfly valve, 316SS body with 316SS disc, 17-4PH shaft, 316SS trim, 316SS & flexible graphite laminated metal seats, fire tested per API 607

4. GASKETS (1)

WG		Use gasket ZG
ZG	3/4 - 8	Class 150 spiral wound gasket, 316L SS winding, flexible graphite filler, ASME B16.20, Flexitallic style CG or Garlock style CD-RW. Flexitallic seating stress shall be nominal 5,000 PSI and the centering ring shall be stamped with the numeral “5000”. Garlock centering ring shall be marked “Garlock CD”. Flexitallic and Garlock centering rings edges shall be striped with four light blue stripes adjacent to the standard color code stripes and notched with three single notches per Chocolate Bayou Gasket Notching Practice.
ZG	10 - 24	Class 150 spiral wound gasket, 316L SS winding, flexible graphite filler, 316L SS inner ring, ASME B16.20, Flexitallic style CGI or Garlock style CD-RWI. Flexitallic seating stress shall be nominal 5,000 PSI and the centering ring shall be stamped with the numeral “5000”. Garlock centering ring shall be marked “Garlock CD”. Flexitallic and Garlock centering rings edges shall be striped with four light blue stripes adjacent to the standard color code stripes and notched with three single notches per Chocolate Bayou Gasket Notching Practice.

ZG	26 – 36 (note 1)	ASME B16.47 Series A Class 150 spiral wound gasket, 316L SS winding, flexible graphite filler, 316L SS inner ring, ASME B16.20, Flexitallic style CGI or Garlock style CD-RWI. Flexitallic seating stress shall be nominal 5,000 PSI and the centering ring shall be stamped with the numeral "5000". Garlock centering ring shall be marked "Garlock CD". Flexitallic and Garlock centering rings edges shall be striped with four light blue stripes adjacent to the standard color code stripes and notched with three single notches per Chocolate Bayou Gasket Notching Practice.
WH	3/4 - 24	Class 150 spiral wound gasket, 316L SS winding, PTFE filler, 316L SS inner ring, ASME B16.20, Flexitallic style CGI or Garlock style CD-RWI. Flexitallic seating stress shall be nominal 5,000 PSI and the centering ring shall be stamped with the numeral "5000". Garlock centering ring shall be marked "Garlock CD". Flexitallic and Garlock centering rings edges shall be striped with four light blue stripes adjacent to the standard color code stripes.
WH	26 – 36 (note 1)	ASME B16.47 Series A Class 150 spiral wound gasket, 316L SS winding, PTFE filler, 316L SS inner ring, ASME B16.20, Flexitallic style CGI or Garlock style CD-RWI. Flexitallic seating stress shall be nominal 5,000 PSI and the centering ring shall be stamped with the numeral "5000". Garlock centering ring shall be marked "Garlock CD". Flexitallic and Garlock centering rings edges shall be striped with four light blue stripes adjacent to the standard color code stripes.

In order to assure a good seal, gaskets used on both sides of butterfly valves shall be:

GG	0.018" (0.46 mm) min. thickness corrugated 316 SS inserted flexible graphite (Graphonic), 1/16" (1.5 mm) total thickness, ASME B16.21. Gasket shall be tagged with orange loops in accordance with Chocolate Bayou "Tagging Practice for Metal Core Sheet Gaskets"

5. BOLTING

7	Alloy continuous threaded stud, ASTM A193 Gr B7 with heavy hex nuts, ASTM A194 Gr 2H
special	Alloy hex head bolt ASTM A193 Gr B7 (for use at lug type butterfly valves)
C	fluoropolymer coated alloy continuous threaded stud, ASTM A193, Gr B7, with two fluoropolymer coated heavy hex nuts, ASTM A194, Gr 2H
special	Alloy hex head bolt ASTM A193 Gr B7, fluoropolymer coated (for use at lug type butterfly valves)

6. INSTALLATION DETAILS - Shall be in accordance with PIP PNF0200. Where PIP PNF0200 branch connections are in conflict with the Piping Material Specification branch connection chart, the Piping Material Specification branch connection chart shall take precedence.

Hydrostatic Vents/Drains:	PNF0418 & PNF0419
Valved Vents/Drains:	PNF0418 & PNF0419
Pressure Connections:	PNF0512
Thermowell Connections:	PNF0613 & PNF0615
Orifice Flange Tap Conn.	PNF0704

7. Table 1: 90 degree branch connections

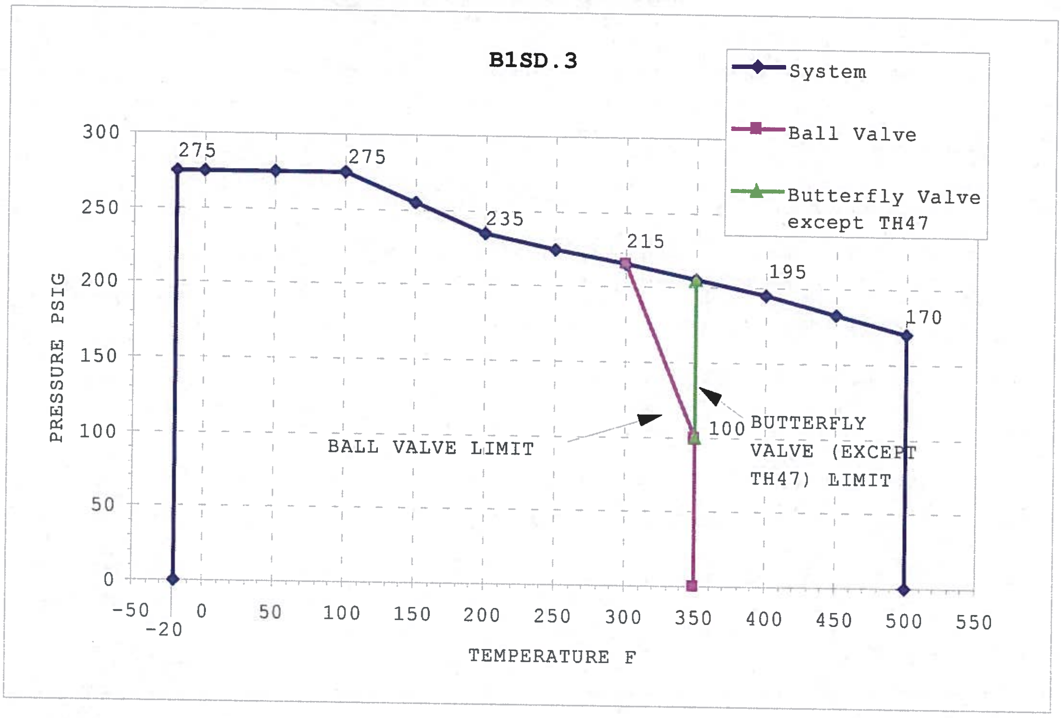
LEGEND:

T - STRAIGHT TEE
E - REDUCING TEE
ER - REDUCING TEE WITH REDUCER
W - WELDOLET
Z1 - Engineering Option:
- **P** BRANCH WELD WITH REINFORCING PAD
  PAD THICKNESS = RUN PIPE THICKNESS
  PAD WIDTH = 1/2 OF BRANCH O.D.
- **E** REDUCING TEE
- **ER** REDUCING TEE WITH REDUCER
- **W** WELDOLET

BRANCH SIZE \ HEADER SIZE	3/4	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	30	36
36																	T
30																T	Z1
24															T	Z1	Z1
20														T	E	Z1	Z1
18													T	E	E	Z1	Z1
16												T	E	E	E	Z1	Z1
14											T	E	E	E	E	Z1	Z1
12										T	E	E	E	E	E	Z1	Z1
10									T	E	E	E	E	ER	ER	Z1	Z1
8								T	E	E	E	E	ER	ER	ER	Z1	Z1
6							T	E	E	E	W	W	W	W	W	W	W
4						T	E	E	W	W	W	W	W	W	W	W	W
3					T	E	E	W	W	W	W	W	W	W	W	W	W
2				T	E	E	W	W	W	W	W	W	W	W	W	W	W
1.5			T	E	E	W	W	W	W	W	W	W	W	W	W	W	W
1		T	E	E	E	W	W	W	W	W	W	W	W	W	W	W	W
3/4	T	E	E	E	W	W	W	W	W	W	W	W	W	W	W	W	W

8. PRESSURE AND TEMPERATURE RATINGS

Do not exceed pressure and temperature limits shown.



INSPECTION:

Fabrication and examination shall be per ASME B31.3 and Chocolate Bayou MWP 104.0, Pipe Inspection, Testing & Welding Requirements.

NOTES:

1. Series B flanges may be required to fit up to vessels or other equipment. If a Series B flange is required, the gasket description should be changed to Series B gasket dimensions.

Approval & Revision History

NO.	DATE	REVISION DESCRIPTION	BY	APPROVED
0	5/9/99	Issued	ALN	
1	10/30/00	Added gaskets for butterfly valves	ALN	
2	03/26/01	Added TH47 butterfly valve	ALN	
3	03/28/02	Revised spiral wound gasket descriptions to substitute ZG for WG and to add Garlock as an approved manufacturer	ALN	
4	11/20/02	Revised description of Graphonic gasket	ALN	
5	04/15/02	Added bellows sealed valves & attachment 1	ALN	MDH
6	7/15/14	Changed 'Solutia' to 'Ascend' and updated **References.**	NPW	MDH
7	3/1/18	5 year review, updated broken hyperlinks	NPW	MDH

ATTACHMENT 1

BELLOWS SEALED VALVE USAGE

Bellows sealed valves feature a corrugated bellows located inside the valve bonnet such that the process fluid is isolated from the packing gland. The packing becomes a "backup" in the event of a bellows failure.

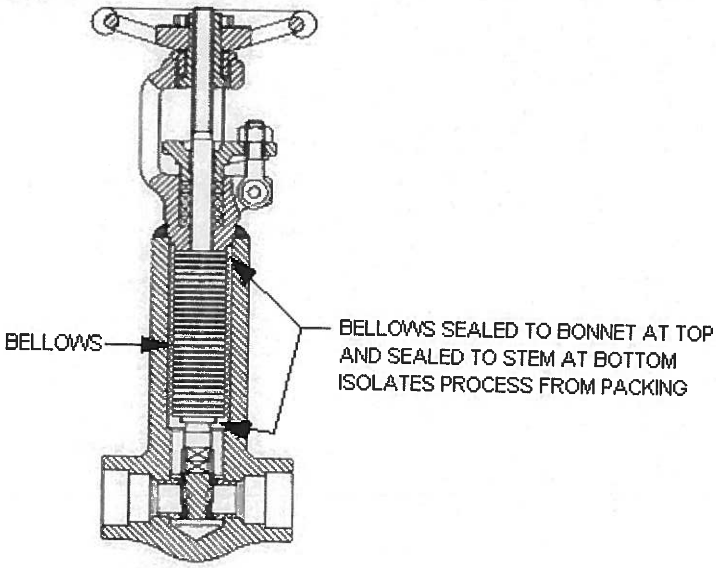


FIGURE 1

Bellows sealed valves are expensive, costing several times what conventional valves of comparable materials cost.

In services where packing leaks are a persistent problem (such as steam and condensate) or would pose a significant risk (such as sulfur dioxide), bellows sealed valves should be considered as an alternative to conventional valves.

In services where fines buildup or internal corrosion can prevent tight shutoff of gate valves, bellows sealed globe valves should be considered for shutoff valves.

In services where containment of packing leaks is required, bellows sealed valves may be an alternative to installing containment slabs or re-routing piping to a containment area(1).

(1) This is an ES&H issue and should be considered accordingly.

CERTIFICATION OF MODIFICATION OF PUMP CONNECTION TO RCRA LINE

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX B: VALVE SPECIFICATION

	METAL GATE VALVE SPECIFICATION Class 150 RF 316SS Trim 10 PTFE		CHB – TA40
	Author **N. Wilson**	Revision No. **4**	Owning Group: **Eng Stds: Piping-CHB**
	Issue Date **8/2015**	Next Review Date **8/2020**	

COMPONENT	GATE VALVE		
CLASS	150		
END CONNECTIONS	R.F.		
BODY/BONNET MATERIAL	316 SS ASTM A351-CF8M		
INTERNAL TRIM	316SS STEM, DISC & SEATS, API TRIM #10		
DESIGN	OS&Y		
OPERATION	HANDWHEEL		
BORE-PORT	FULL		
BONNET TYPE	BOLTED		
STEM PACKING	PTFE		
WEDGE TYPE	MANUFACTURER'S STANDARD		
GASKETS	FILLED OR REINFORCED PTFE		
BOLTS/NUTS	MANUFACTURER'S STANDARD		
SPECIAL FEATURES			
STANDARDS:			
DESIGN	ASME B16.34		
ENDS	ASME B16.5		
RATING	ASME B16.34		
DIMENSIONAL	ASME B16.10		
TESTING	API 598		
TAGGING	VENDOR WILL TAG VALVE WITH PERMANENT WEATHER RESISTANT TAG READING "TA40"		
ACCEPTABLE VALVES	MANUFACTURER	MODEL NUMBER	SIZE RANGE
	ALOYCO	117-CF8M	1/2"-24"
	BONNEY FORGE	1-18-RF-TFE	2"-24"
	COOPER	GA015RF-C-316/10-FH-TFE	1/2"-24"
	KITZ	150UMHAMT	1/2"-24"
	LADISH	8275-007	1/2"-24"
	NEWCO	11F-C8M4-TFE	2"-24"
	VELAN	F-0064C-13SX	1/2"-24"
	OR ASCEND APPROVED EQUAL		
PIP VALVE NUMBER	GA01ST500		

Approval & Revision History

NO.	DATE	REVISION DESCRIPTION	BY	APPROVED
0	1/13/00	Issued	ALN	
1	3/12/01	Removed Powell from acceptable valve list	ALN	
2	1/19/05	Revised to full port, updated manufacturers	ALN	
3	9/26/14	Changed 'Solutia' to 'Ascend' & corrected model #'s	NPW	DMD
4	7/28/15	Added Bonney	NPW	DMD

COMPONENT	GATE VALVE		
CLASS	150		
END CONNECTIONS	R.F.		
BODY/BONNET MATERIAL	316SS ASTM A351-CF8M		
INTERNAL TRIM	316SS STEM, DISC & SEATS, API TRIM #10		
DESIGN	OS&Y		
OPERATION	HANDWHEEL		
BORE-PORT	FULL		
BONNET TYPE	BOLTED		
STEM PACKING	CORROSION INHIBITED DIE FORMED FLEXIBLE GRAPHITE WITH ANTI-EXTRUSION RINGS		
WEDGE TYPE	1/2”-4”	SOLID OR FLEXIBLE	
	6”-24”	FLEXIBLE	
GASKETS	API 600 - GRAPHITE		
BOLTS/NUTS	MANUFACTURER’S STANDARD		
SPECIAL FEATURES			
STANDARDS:			
DESIGN	ASME B16.34		
ENDS	ASME B16.5		
RATING	ASME B16.34		
DIMENSIONAL	ASME B16.10		
TESTING	API 598		
TAGGING	VENDOR WILL TAG VALVE WITH PERMANENT WEATHER RESISTANT TAG READING “TA42”		
ACCEPTABLE VALVES	MANUFACTURER	MODEL NUMBER	SIZE RANGE
	ALOYCO	117-CF8M-GRA	1/2”-24”
	BONNEY FORGE	1-18-RF	2”-24”
	COOPER	GA015RF-C-316/10-FH	1/2”-24”
	KITZ	150UMHAMG	1/2”-24”
	LADISH	8275-007-GRA	1/2”-24”
	NEWCO	11F-C8M4	2”-24”
	VELAN	F-0064C-13GX	1/2”-24”
	OR ASCEND APPROVED EQUAL		
PIP VALVE NUMBER	GA01ST501		

Approval & Revision History

NO.	DATE	REVISION DESCRIPTION	BY	APPROVED
0	9/99	Issued	ALN	
1	3/12/01	Removed Powell from acceptable valve list	ALN	
2	1/19/05	Updated manufacturers	ALN	
3	11/27/11	Added Warren valve to acceptable valve list	DMD	
4	7/9/13	Removed Warren Valve from acceptable valve list	DMD	
5	9/26/14	Changed ‘Solutia’ to ‘Ascend’ & corrected model #’s	NPW	DMD
6	7/28/15	Added Bonney	NPW	DMD

CERTIFICATION OF MODIFICATION OF PUMP CONNECTION TO RCRA LINE

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX C: PHOTOGRAPHS OF TIE-IN POINTS BEFORE AND AFTER MODIFICATION

GSI Job No. 5508

APPENDIX C
PHOTOGRAPHS OF TIE-IN POINTS PRIOR TO AND AFTER MODIFICATION

Certification of Modification of Pump Connection to RCRA Line
Ascend Performance Materials Texas Inc., Alvin, Texas

Tie-In Points 1 & 2: New 6-in diam. Valves and new 6-in diam. suction piping.

Prior to modification

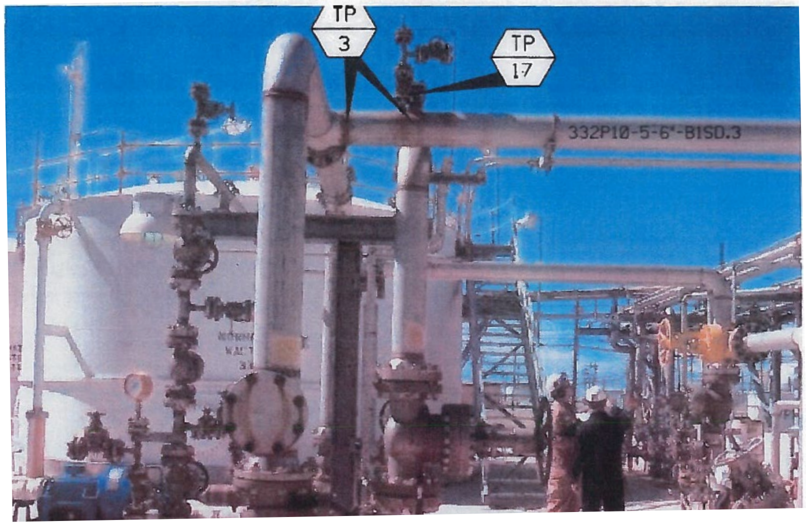
After modification

Note: No dates available for photographs showing conditions prior to modification which were taken from plans prepared by Hargrove Engineers and Constructors issued 18 April 2020. Photographs showing conditions after modification taken by Ascend personnel in July 2020.

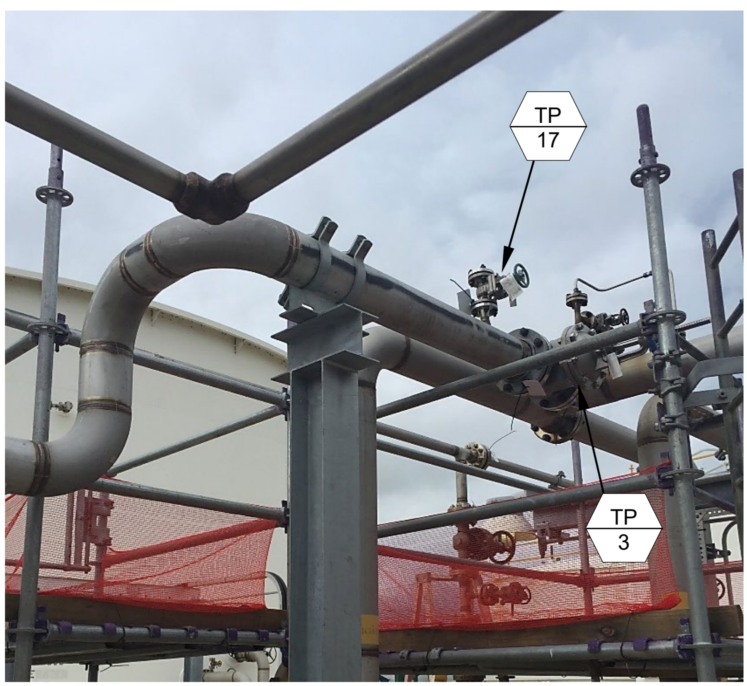
APPENDIX C
PHOTOGRAPHS OF TIE-IN POINTS PRIOR TO AND AFTER MODIFICATION

Certification of Modification of Pump Connection to RCRA Line
Ascend Performance Materials Texas Inc., Alvin, Texas

Tie-In Points 3 & 17: new 6-in diam. valve and new 6-in diam. suction piping added at TP3; ¾-in diam. valve replaced with 1-in diam. valve added at TP17



Before modification (looking plant west)



After modification (looking plant south)

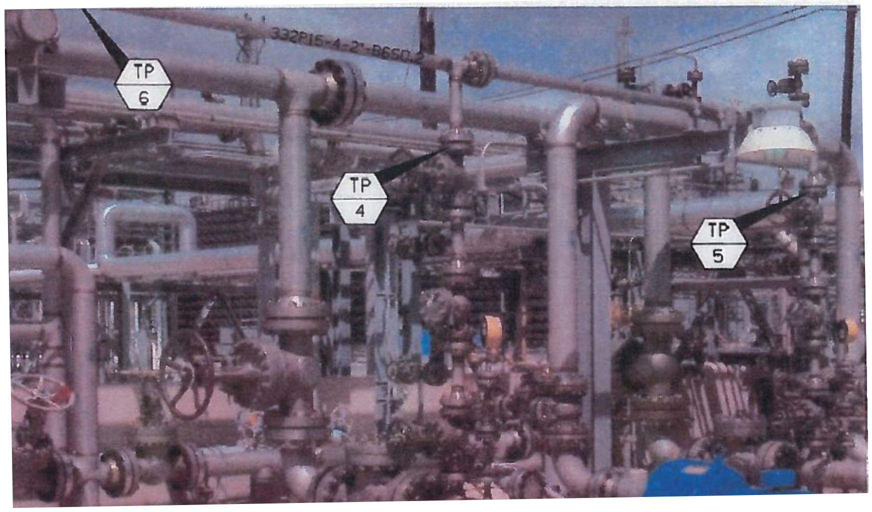
Note: No dates available for photographs showing conditions prior to modification which were taken from plans prepared by Hargrove Engineers and Constructors issued 18 April 2020. Photographs showing conditions after modification taken by Ascend personnel in July 2020.

GSI Job No. 5508

APPENDIX C
PHOTOGRAPHS OF TIE-IN POINTS PRIOR TO AND AFTER MODIFICATION

Certification of Modification of Pump Connection to RCRA Line
Ascend Performance Materials Texas Inc., Alvin, Texas

Tie-In Pointss 4, 5 & 6: new 3/4-in diam. valve added at TP4 & 5; Added 2-in recirculate line (332P15-100-2") that connects to TP9 at TP6.



Prior to modification (looking north-east)

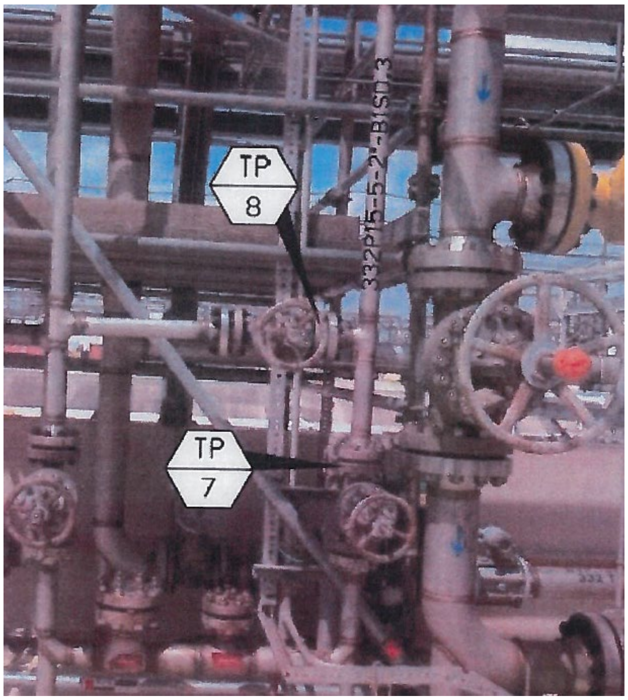
After modification (looking north-west)

Note: No dates available for photographs showing conditions prior to modification which were taken from plans prepared by Hargrove Engineers and Constructors issued 18 April 2020. Photographs showing conditions after modification taken by Ascend personnel in July 2020.

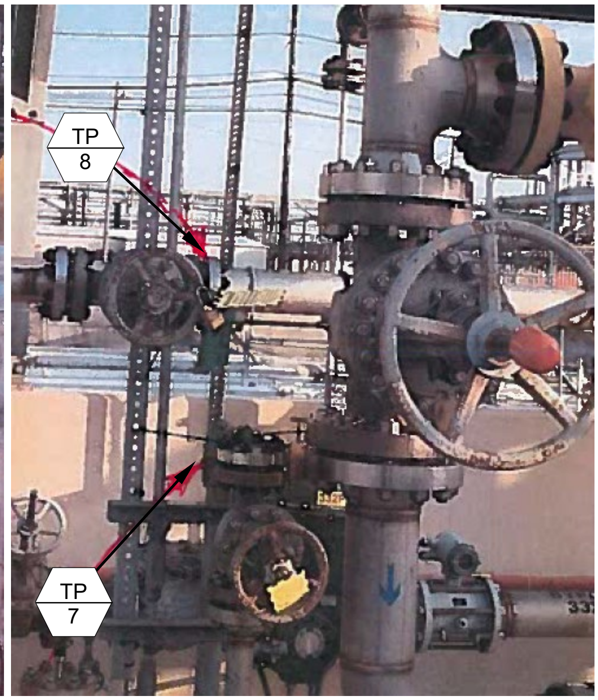
APPENDIX C
PHOTOGRAPHS OF TIE-IN POINTS PRIOR TO AND AFTER MODIFICATION

Certification of Modification of Pump Connection to RCRA Line
Ascend Performance Materials Texas Inc., Alvin, Texas

Tie-In Points 7 & 8: cut 2-in diam. recirculation line no longer in use and capped with blind flanges.



Prior to modification



After modification

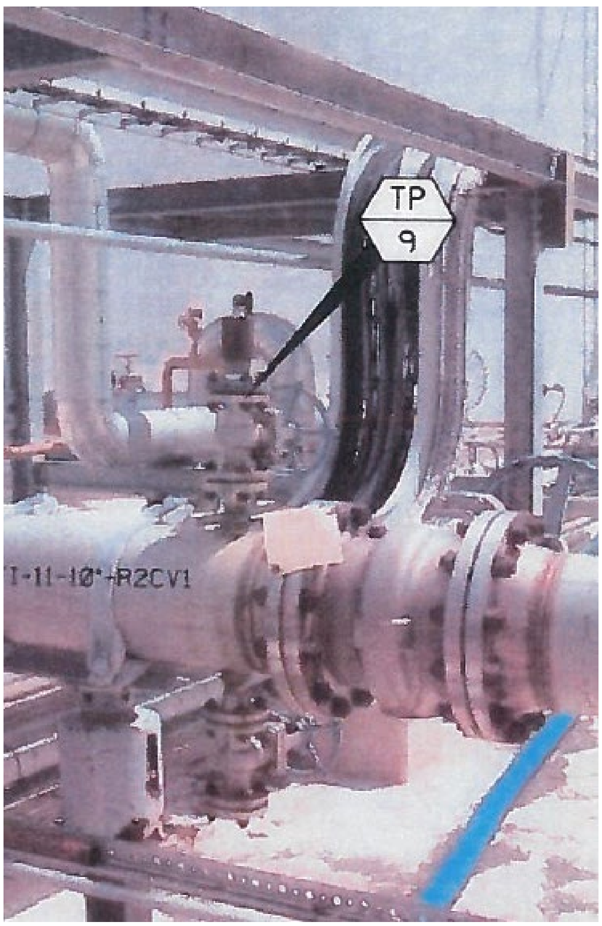
Note: No dates available for photographs showing conditions prior to modification which were taken from plans prepared by Hargrove Engineers and Constructors issued 18 April 2020. Photographs showing conditions after modification taken by Ascend personnel in July 2020.

GSI Job No. 5508

APPENDIX C
PHOTOGRAPHS OF TIE-IN POINTS PRIOR TO AND AFTER MODIFICATION

Certification of Modification of Pump Connection to RCRA Line
Ascend Performance Materials Texas Inc., Alvin, Texas

Tie-In Points 9: 1½-in valve replace with new 1½-in and ¾-in valves and 2-in diam. recirculate line added



Prior to modification

After modification

Note: No dates available for photographs showing conditions prior to modification which were taken from plans prepared by Hargrove Engineers and Constructors issued 18 April 2020. Photographs showing conditions after modification taken by Ascend personnel in July 2020.

APPENDIX C
PHOTOGRAPHS OF TIE-IN POINTS PRIOR TO AND AFTER MODIFICATION

Certification of Modification of Pump Connection to RCRA Line
Ascend Performance Materials Texas Inc., Alvin, Texas

Tie-In Points 10: Former pressure relief no longer in use removed and capped with blind flanges.

Prior to modification

After modification

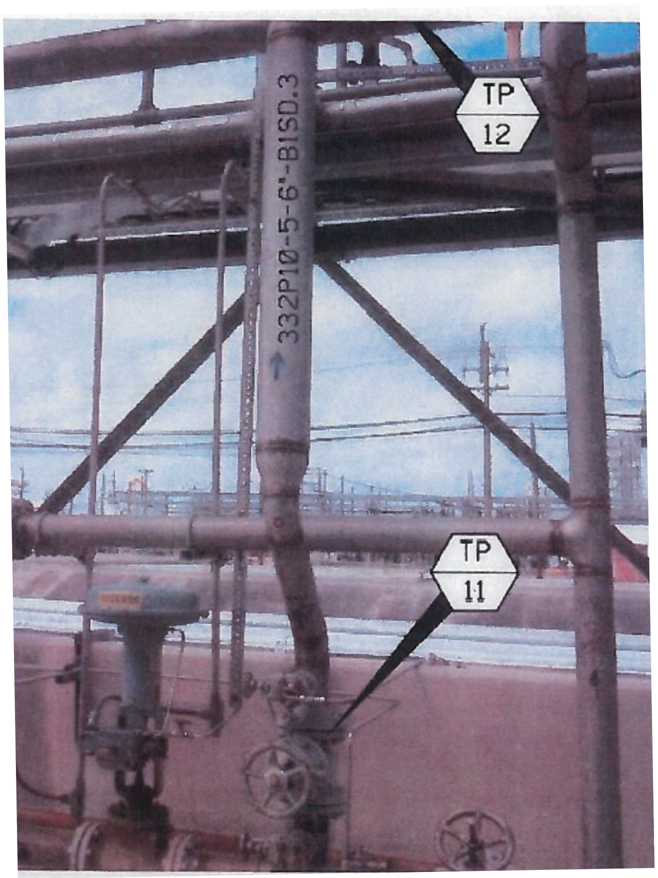
Note: No dates available for photographs showing conditions prior to modification which were taken from plans prepared by Hargrove Engineers and Constructors issued 18 April 2020. Photographs showing conditions after modification taken by Ascend personnel in July 2020.

GSI ENVIRONMENTAL

APPENDIX C
PHOTOGRAPHS OF TIE-IN POINTS PRIOR TO AND AFTER MODIFICATION

Certification of Modification of Pump Connection to RCRA Line
Ascend Performance Materials Texas Inc., Alvin, Texas

Tie-In Points 11 & 12: Former feed line to 332P15 pumps no longer in use removed and capped with blind flanges.



Prior to modification

After modification

Note: No dates available for photographs showing conditions prior to modification which were taken from plans prepared by Hargrove Engineers and Constructors issued 18 April 2020. Photographs showing conditions after modification taken by Ascend personnel in July 2020.

GSI Job No. 5508

APPENDIX C
PHOTOGRAPHS OF TIE-IN POINTS PRIOR TO AND AFTER MODIFICATION

Certification of Modification of Pump Connection to RCRA Line
Ascend Performance Materials Texas Inc., Alvin, Texas

Tie-In Points 13 & 14: Former feed line from 332P15 pumps to the non-hazardous deep injection well no longer in use removed; added 6-in diam. piping connecting to RCRA line at TP13; weld-capped at TP14

Prior to modification

After modification

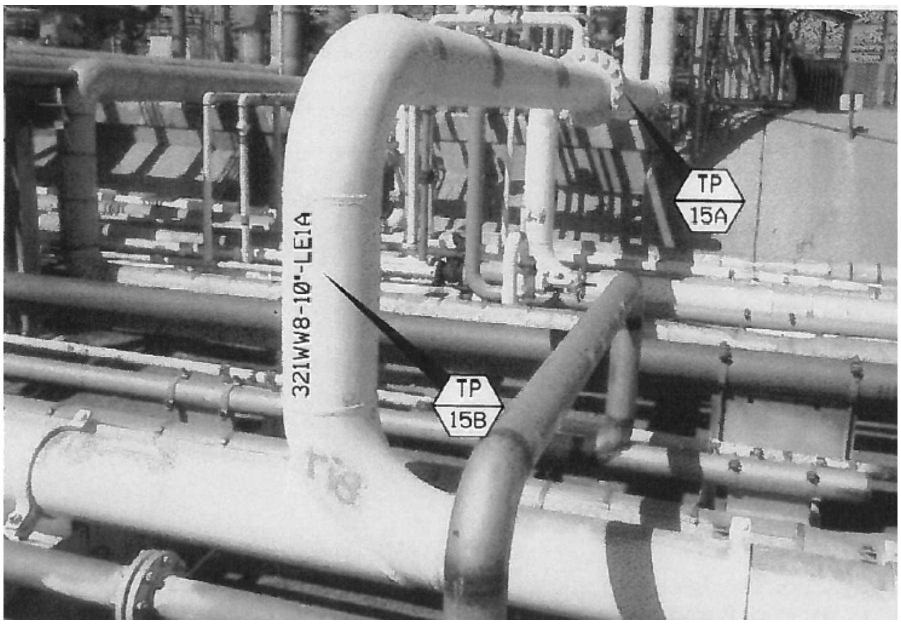
Note: No dates available for photographs showing conditions prior to modification which were taken from plans prepared by Hargrove Engineers and Constructors issued 18 April 2020. Photographs showing conditions after modification taken by Ascend personnel in July 2020.

GSI Job No. 5508

APPENDIX C
PHOTOGRAPHS OF TIE-IN POINTS PRIOR TO AND AFTER MODIFICATION

Certification of Modification of Pump Connection to RCRA Line
Ascend Performance Materials Texas Inc., Alvin, Texas

Tie-In Points 15A & 15B: Cut line (321WW8) and added flanged 10-in tee among TP15A, TP15B, and the 6-in diam. 332P15 line



Prior to modification

After modification

Note: No dates available for photographs showing conditions prior to modification which were taken from plans prepared by Hargrove Engineers and Constructors issued 18 April 2020. Photographs showing conditions after modification taken by Ascend personnel in July 2020.

CERTIFICATION OF MODIFICATION OF PUMP CONNECTION TO RCRA LINE

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX D: WELDER AND PIPEFITTER QUALIFICATIONS

TURNER INDUSTRIES

AUTHORIZATION FOR WELD TEST

#7546764

DATE: 10/12/18 JOB #: 11102091 7002

TO: Maverick PO #: 9011 1415

THIS FORM, IF SIGNED BY OUR REPRESENTATIVE, IS YOUR AUTHORIZATION TO RENDER AN A.S.M.E. WELD TEST TO THE FOLLOWING EMPLOYEE:

Apolonio Fonseca III — EMPLOYEE NAME

Olin Capital — JOB DESCRIPTION

CW — CRAFT

XXX XX 6027 — SOC. SEC. NO.

TEST THIS EMPLOYEE ~~ON~~ THE FOLLOWING ITEM(S) BELOW:

#8151 Bend Test Only

#8151A

#8025G Visual

#5041

WQ18-4316

EMPLOYEE ARRIVED AT 9:46 A.M. P.M. RELEASED 8:55 A.M. P.M. 10-16-18

☑ PASSED TEST Mag 10/17/18

☐ FAILED TEST

☐ OTHER ______

NOTE: PLEASE RETAIN THE WHITE ORIGINAL FOR INVOICING, RETURN THE YELLOW COPY WITH THE EMPLOYEE. SUBMIT ALL ORIGINALS WITH YOUR INVOICE TO: P.O. BOX 1613, BATON ROUGE, LOUISIANA 70821

CONTRACTOR WELD TEST INSPECTOR

TI-832 Rev 05/12 INVOICE COPY

Welder Testing Guidelines
The following instructions shall apply to personnel when testing for Turner Industries Group LLC

Preparation of test coupon

- ✓ Internal and external surfaces 1" from the bevel end shall be clean and free of any substance that would be detrimental to either the weld or base metal when heat is applied.
- ✓ End preparation of bevel is only acceptable if the surface is reasonably smooth and true.

Alignment of test coupon

- ✓ Internal surfaces at the bevel ends shall not exceed 1/8".

Electrode Diameter

- ✓ Bare Wire and electrode size will be 3/32" and 1/8".

Tacking

Once tacked the coupon will be mounted in the test position and will not be removed or moved without instruction by the test administrator.

Interpass Cleaning

- ✓ Manual hand brushing and filing are permitted.
- ✓ Electric wire brushing and grinding are permitted.

External Re-inforcement

- ✓ Weld cover pass shall be smooth and consistent and not to exceed 1/8.
- ✓ Cleaning
- ✓ The final weld pass shall be cleaned free of all slag and any other substance that would interfere with the final visual interpretation of the weld. Hand brushing is permissible. No filling of the cap edges.

Final Visual Examination

- ✓ Performance test coupon shall show complete joint penetration, no suck back, lack of fusion, undercut, porosity or slag inclusions.

Weld Booth Responsibility

- ✓ Each welder upon completion of testing is required to thoroughly police his area and restore it back to its original condition. This is the final requirement to successfully pass your hire-on qualification.

Weld Test Time Allowed.

1. 6"/sch 80 ------- 4.0 hrs
2. 2"/sch XXH ---- 3.0 hrs
3. 2"./688" --------4.0 hrs
4. Plate Test -------- 3.0 hrs (per position)
5. 2"/.109" ---------2.0 hrs (Visual Test 5G position, Stainless Steel Pipe)

Signature________________ Date 10-12-18

TURNER INDUSTRIES

Turner Industries Group, L.L.C.
3850 Pasadena Blvd; Pasadena Tx. 77503
Phone - 713-470-1113 or 713-598-4650
Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder	Apolonio Fonseca III	SS #	6027	Test Date	10/18/2018
Test #	802	WPS #		ID#	
Process(es) / Type(s)	GTAW Manual				
Product Form	Pipe			Joint Type(s)	Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P8 to P8	
Base material thickness	.109"	
Pipe diameter (in.)	2.375"	
Base material diameter-fillet	n/a	
Base material thickness-fillet	n/a	
Welding Process # 1	gtaw manual solid	
Welding Process # 2	n/a	
Backing	n/a	
AWS Class Process # 1	ER308	-
AWS Class Process # 2	n/a	-
Filler metal Spec. (SFA) # 1	5.9	-
Filler metal Spec. (SFA) # 2	n/a	-
Filler metal F-No. Process # 1	6	
Filler metal F-No. Process # 2	n/a	
Filler metal Product Form		
Consumable insert	without	
Deposited Thickness Process # 1	.109	
3 layers minimum	n/a	
Deposited Thickness Process # 2	n/a	
3 layers minimum	n/a	-
Joint Position	5G	
Weld Progression	uphill	
Shielding Gas / Type	With	
Backing Gas / Type	with	
Welding Current / polarity # 1	dcen/ straight	
Welding Current / polarity # 2	n/a	

Guided Bend Test (QW-160)

Figure No. and Type	Results	Figure No. and Type	Results
N/A	N/A	N/A	N/A

Visual Examination Results	Satisfactory
Radiographic Test Results	N/A
Mechanical / Radiographic Tests conducted By	Maverick Testing Laboratories, Inc.

Test conducted at : **Maverick Testing Laboratories, Inc.**

Inspector : David Guerra

Lab Test # WQ18-4316-1

We certify that the statements made in this record are correct and that the test coupons were prepared , welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Industries Group, L.L.C.

Turner Represetive: Michael Rogers Sr

Date: 10/18/18

TURNER INDUSTRIES

Turner Industries Group, L.L.C.
3850 Pasadena Blvd; Pasadena Tx 77503
Phone - 713-470-1113 or 713-598-4650
Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder	Apolonio Fonseca III	SS #	6027	Test Date	10/18/2018
Test #	8151A	WPS #		ID#	
Process(es) / Type(s)	GTAW Manual				
Product Form	Pipe			Joint Type(s)	Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base material thickness	.688"	unlimited
Pipe diameter (in)	2.750" OD	1" OD minimum
Base material diameter-fillet	n/a	unlimited
Base material thickness-fillet	n/a	unlimited
Welding Process # 1	gtaw manual solid	gtaw manual solid or metal cored
Welding Process # 2	n/a	
Backing	Without	With or Without
AWS Class Process # 1	ER70S-2	-
AWS Class Process # 2	n/a	-
Filler metal Spec. (SFA) # 1	5.18	-
Filler metal Spec (SFA) # 2	n/a	-
Filler metal F-No Process # 1	6	6 only
Filler metal F-No Process # 2	n/a	
Filler metal Product Form		
Consumable insert	without	without only
Deposited Thickness Process # 1	.688"	unlimited
3 layers minimum	yes	
Deposited Thickness Process # 2	n/a	
3 layers minimum	n/a	-
Joint Position	6G	all
Weld Progression	uphill	uphill
Shielding Gas / Type	With	with only
Backing Gas / Type	without	with or without
Welding Current / polarity # 1	dcen/ straight	dcen/ straight
Welding Current / polarity # 2	n/a	

Guided Bend Test (QW-160)

Figure No. and Type	Results	Figure No. and Type	Results
QW462.2 SIDEBEND	Acceptable	QW462.2 SIDEBEND	Acceptable
QW462.2 SIDEBEND	Acceptable	QW462.2 SIDEBEND	Acceptable

Visual Examination Results: Visual Exam Satisfactory Per QW302.4 & QW194

Radiographic Test Results: N/A

Mechanical / Radiographic Tests conducted By: Maverick Testing Laboratories, Inc.

Test conducted at : **Maverick Testing Laboratories, Inc.**

Inspector : David Guerra

Lab Test #: WQ18-4316-4

We certify that the statements made in this record are correct and that the test coupons were prepared , welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Industries Group, L.L.C.

Turner Represenitive: [signature]

Date: 10/18/18

TURNER INDUSTRIES

Turner Industries Group, L.L.C.
3850 Pasadena Blvd, Pasadena Tx 77503
Phone - 713-470-1113 or 713-598-4650
Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder: Apolonio Fonseca III | SS #: 6027 | Test Date: 10/18/2018
Test #: 8151 | WPS #: | ID#:
Process(es) / Type(s): GTAW/SMAW Manual
Product Form: Pipe | Joint Type(s): Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base material thickness	688	unlimited
Pipe diameter (in)	2 750" OD	1" OD minimum
Base material diameter-fillet	n/a	unlimited
Base material thickness-fillet	n/a	unlimited
Welding Process # 1	gtaw manual solid	gtaw manual solid or metal cored
Welding Process # 2	smaw manual	smaw manual
Backing	Without	With or Without
AWS Class Process # 1	ER70S-2	-
AWS Class Process # 2	E7018	-
Filler metal Spec (SFA) # 1	5 18	-
Filler metal Spec (SFA) # 2	5 1	-
Filler metal F-No. Process # 1	6	6 Only
Filler metal F-No Process # 2	4	1 Thru 4
Filler metal Product Form		
Consumable insert	without	without only
Deposited Thickness Process # 1	188"	.376" maximum
3 layers minimum	n/a	
Deposited Thickness Process # 2	500"	unlimited
3 layers minimum	yes	
Joint Position	6G	All
Weld Progression	uphill/uphill	uphill/uphill
Shielding Gas / Type	with	with only
Backing Gas / Type	without	with or without
Welding Current / polarity # 1	dcen/ straight	dcen/ straight
Welding Current / polarity # 2	dcep/ reverse	dcep/ reverse

Guided Bend Test (QW-160)

Figure No. and Type	Results	Figure No. and Type	Results
QW462 2 SIDEBEND	Acceptable	QW462 2 SIDEBEND	Acceptable
QW462 2 SIDEBEND	Acceptable	QW462 2 SIDEBEND	Acceptable

Visual Examination Results: Visual Exam Satisfactory Per QW302 4 & QW194
Radiographic Test Results: N/A
Mechanical / Radiographic Tests conducted By: Maverick Testing Laboratories, Inc.

Test conducted at: **Maverick Testing Laboratories, Inc.**
Inspector: Daniel Guerra

Lab Test # WQ18-4316-3

We certify that the statements made in this record are correct and that the test coupons were prepared , welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Industries Group, L.L.C.

Turner Represetive: Michael Royer

Date: 10/18/18

TURNER INDUSTRIES

Turner Industries Group, L.L.C.
3850 Pasadena Blvd; Pasadena Tx 77503
Phone - 713-470-1113 or 713-598-4650
Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder: Apolonio Fonseca III — SS #: 6027 — Test Date: 10/18/2018

Test #: 5041 — WPS #: — ID#:

Process(es) / Type(s): GTAW Manual

Product Form: Pipe — Joint Type(s): Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base material thickness	218"	wps limits
Pipe diameter (in.)	2 375" OD	1" OD minimum
Base material diameter-fillet	n/a	unlimited
Base material thickness-fillet	n/a	unlimited
Welding Process # 1	gtaw manual solid	gtaw manual solid or metal cored
Welding Process # 2	n/a	n/a
Backing	Without	With or without
AWS Class. Process # 1	ERNiCr-3	-
AWS Class. Process # 2	n/a	-
Filler metal Spec. (SFA) # 1	5 14	-
Filler metal Spec. (SFA) # 2	n/a	-
Filler metal F-No. Process # 1	43	34 & 41 thru 46
Filler metal F-No. Process # 2	n/a	
Filler metal Product Form		
Consumable insert	Without	without only
Deposited Thickness Process # 1	218"	436" maximum
3 layers minimum	n/a	
Deposited Thickness Process # 2	n/a	n/a
3 layers minimum	n/a	n/a
Joint Position	6G	All
Weld Progression	uphill	uphill
Shielding Gas / Type	With	With only
Backing Gas / Type	With	With only
Welding Current / polarity # 1	dcen/straight	dcen/straight
Welding Current / polarity # 2	n/a	n/a

Guided Bend Test (QW-160)

Figure No. and Type	Results	Figure No. and Type	Results
QW462.3 (A) Facebend	ACCEPTABLE	QW462 3 (A) Rootbend	ACCEPTABLE
QW462 3 (A) Facebend	ACCEPTABLE	QW462 3 (A) Rootbend	ACCEPTABLE

Visual Examination Results: Visual Exam Satisfactory Per QW - 302 4 & QW - 194

Radiographic Test Results: NONE

Mechanical / Radiographic Tests conducted By: Maverick Testing Laboratories, Inc.

Test conducted at: **Maverick Testing Laboratories, Inc.** — Lab Test #: WQ18-4316-2

Inspector: David Guerra

We certify that the statements made in this record are correct and that the test coupons were prepared , welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Representive: **Turner Industries Group, L.L.C.** [signature]

Date: 10/18/18

TURNER INDUSTRIES

Turner Industries Group, L.L.C.
3850 Pasadena Blvd; Pasadena Tx. 77503
Phone - 713-470-1113 or 713-598-4650
Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder: Cesar V. Acuna — SS #: 1815 — Test Date: 11/7/2017
Test #: 8151A — WPS #: — ID#:
Process(es) / Type(s): GTAW Manual
Product Form: Pipe — Joint Type(s): Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base material thickness	.688"	unlimited
Pipe diameter (in.)	2.750" OD	1" OD minimum
Base material diameter-fillet	n/a	unlimited
Base material thickness-fillet	n/a	unlimited
Welding Process # 1	gtaw manual solid	gtaw manual solid or meatl cored
Welding Process # 2	n/a	
Backing	Without	With or Without
AWS Class. Process # 1	ER70S-2	-
AWS Class. Process # 2	n/a	-
Filler metal Spec. (SFA) # 1	5.18	-
Filler metal Spec. (SFA) # 2	n/a	-
Filler metal F-No. Process # 1	6	6 only
Filler metal F-No. Process # 2	n/a	
Filler metal Product Form		
Consumable Insert	without	without only
Deposited Thickness Process # 1	.688"	unlimited
3 layers minimum	yes	
Deposited Thickness Process # 2	n/a	
3 layers minimum	n/a	-
Joint Position	6G	all
Weld Progression	uphill	uphill
Shielding Gas / Type	With	with only
Backing Gas / Type	without	with or without
Welding Current / polarity #1	dcen/ straight	dcen/ straight
Welding Current / polarity #2	n/a	

Guided Bend Test (QW-160)

Figure No. and Type	Results	Figure No. and Type	Results
QW462.2 SIDEBEND	Acceptable	QW462.2 SIDEBEND	Acceptable
QW462.2 SIDEBEND	Acceptable	QW462.2 SIDEBEND	Acceptable

Visual Examination Results: Visual Exam Satisfactory Per QW302.4 & QW194
Radiographic Test Results: N/A
Mechanical / Radiographic Tests conducted By: Maverick Testing Laboratories, Inc.

Test conducted at: **Maverick Testing Laboratories, Inc.**
Inspector: Marcus Coronado
Lab Test #: WQ17-4772-4

We certify that the statements made in this record are correct and that the test coupons were prepared , welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Industries Group, L.L.C.

Turner Represenitive: ______________________ Date: ______________

TURNER INDUSTRIES

Turner Industries Group, L.L.C.
3850 Pasadena Blvd; Pasadena Tx. 77503
Phone - 713-470-1113 or 713-598-4650
Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder	Cesar V. Acuna	SS #	1815	Test Date	11/7/2017
Test #	8151	WPS #		ID#	
Process(es) / Type(s)	GTAW/SMAW Manual				
Product Form	Pipe			Joint Type(s)	Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base material thickness	.688	unlimited
Pipe diameter (in.)	2.750" OD	1" OD minimum
Base material diameter-fillet	n/a	unlimited
Base material thickness-fillet	n/a	unlimited
Welding Process # 1	gtaw manual solid	gtaw manual solid or metal cored
Welding Process # 2	smaw manual	smaw manual
Backing	Without	With or Without
AWS Class. Process # 1	ER70S-2	-
AWS Class. Process # 2	E7018	-
Filler metal Spec. (SFA) # 1	5.18	-
Filler metal Spec. (SFA) # 2	5.1	-
Filler metal F-No. Process # 1	6	6 Only
Filler metal F-No. Process # 2	4	1 Thru 4
Filler metal Product Form		
Consumable insert	without	without only
Deposited Thickness Process # 1	.188"	.376" maximum
3 layers minimum	n/a	
Deposited Thickness Process # 2	.500"	unlimited
3 layers minimum	yes	
Joint Position	6G	All
Weld Progression	uphill/uphill	uphill/uphill
Shielding Gas / Type	with	with only
Backing Gas / Type	without	with or without
Welding Current / polarity # 1	dcen/ straight	dcen/ straight
Welding Current / polarity # 2	dcep/ reverse	dcep/ reverse

Guided Bend Test (QW-160)

Figure No. and Type	Results	Figure No. and Type	Results
QW462.2 SIDEBEND	Acceptable	QW462.2 SIDEBEND	Acceptable
QW462.2 SIDEBEND	Acceptable	QW462.2 SIDEBEND	Acceptable

Visual Examination Results Visual Exam Satisfactory Per QW302.4 & QW194
Radiographic Test Results N/A
Mechanical / Radiographic Tests conducted By Maverick Testing Laboratories, Inc.

Test conducted at : **Maverick Testing Laboratories, Inc.**
Inspector : Marcus Coronado

Lab Test # WQ17-4772-3

We certify that the statements made in this record are correct and that the test coupons were prepared , welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Industries Group, L.L.C.

Turner Represenitive: ______________________ Date: ____________

TURNER INDUSTRIES

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Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder: Cesar V. Acuna   SS #: 1815   Test Date: 11/7/2017
Test #: 802   WPS #:   ID#:
Process(es) / Type(s): GTAW Manual
Product Form: Pipe   Joint Type(s): Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P8 to P8	
Base material thickness	.109"	
Pipe diameter (in.)	2.375" OD	
Base material diameter-fillet	n/a	
Base material thickness-fillet	n/a	
Welding Process # 1	gtaw manual solid	
Welding Process # 2	n/a	
Backing	n/a	
AWS Class. Process # 1	ER308	-
AWS Class. Process # 2	n/a	-
Filler metal Spec. (SFA) # 1	5.9	-
Filler metal Spec. (SFA) # 2	n/a	-
Filler metal F-No. Process # 1	6	
Filler metal F-No. Process # 2	n/a	
Filler metal Product Form		
Consumable Insert	without	
Deposited Thickness Process # 1	.109	
3 layers minimum	n/a	
Deposited Thickness Process # 2	n/a	
3 layers minimum	n/a	-
Joint Position	5G	
Weld Progression	uphill	
Shielding Gas / Type	With	
Backing Gas / Type	With	
Welding Current / polarity # 1	dcen/ straight	
Welding Current / polarity # 2	n/a	

Guided Bend Test (QW-160)

Figure No. and Type	Results	Figure No. and Type	Results
N/A	N/A	N/A	N/A

Visual Examination Results: Satisfactory
Radiographic Test Results: N/A
Mechanical / Radiographic Tests conducted By: Maverick Testing Laboratories, Inc.

Test conducted at: **Maverick Testing Laboratories, Inc.**
Inspector: Marcus Coronado

Lab Test #: WQ17-4772-1

We certify that the statements made in this record are correct and that the test coupons were prepared, welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Industries Group, L.L.C.

Turner Represenitve: ____________________   Date: ____________

TURNER INDUSTRIES

Turner Industries Group, L.L.C.
3850 Pasadena Blvd; Pasadena Tx. 77503
Phone - 713-470-1113 or 713-598-4650
Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder: Cesar V. Acuna — SS #: 1815 — Test Date: 11/7/2017
Test #: 5041 — WPS #: — ID#:
Process(es) / Type(s): GTAW Manual
Product Form: Pipe — Joint Type(s): Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base material thickness	.218"	wps limits
Pipe diameter (in.)	2.375" OD	1" OD minimum
Base material diameter-fillet	n/a	unlimited
Base material thickness-fillet	n/a	unlimited
Welding Process # 1	gtaw manual solid	gtaw manual solid or metal cored
Welding Process # 2	n/a	n/a
Backing	Without	With or without
AWS Class. Process # 1	ERNiCr-3	-
AWS Class. Process # 2	n/a	-
Filler metal Spec. (SFA) # 1	5.14	-
Filler metal Spec. (SFA) # 2	n/a	-
Filler metal F-No. Process # 1	43	34 & 41 thru 46
Filler metal F-No. Process # 2	n/a	
Filler metal Product Form		
Consumable Insert	Without	without only
Deposited Thickness Process # 1	.218"	.436" maximum
3 layers minimum	n/a	
Deposited Thickness Process # 2	n/a	n/a
3 layers minimum	n/a	n/a
Joint Position	6G	All
Weld Progression	uphill	uphill
Shielding Gas / Type	With	With only
Backing Gas / Type	With	With only
Welding Current / polarity # 1	dcen/straight	dcen/straight
Welding Current / polarity # 2	n/a	n/a

Guided Bend Test (QW-160)

Figure No. and Type	Results	Figure No. and Type	Results
QW462.3 (A) Facebend	ACCEPTABLE	QW462.3 (A) Rootbend	ACCEPTABLE
QW462.3 (A) Facebend	ACCEPTABLE	QW462.3 (A) Rootbend	ACCEPTABLE

Visual Examination Results: Visual Exam Satisfactory Per QW - 302.4 & QW - 194
Radiographic Test Results: NONE
Mechanical / Radiographic Tests conducted By: Maverick Testing Laboratories, Inc.

Test conducted at: **Maverick Testing Laboratories, Inc.**
Inspector: Marcus Coronado

Lab Test # WQ17-4772-2

We certify that the statements made in this record are correct and that the test coupons were prepared, welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Industries Group, L.L.C.

Turner RepresENTive: ____________________ Date: ____________

TURNER
INDUSTRIES

WQ19-0113

AUTHORIZATION FOR WELD TEST

187009

DATE: 12-6-19 JOB #: 11102091980/
TO: Republic PO #: 90114352

THIS FORM, IF SIGNED BY OUR REPRESENTATIVE, IS YOUR AUTHORIZATION TO RENDER AN A.S.M.E. WELD TEST TO THE FOLLOWING EMPLOYEE:

Dion Tucker
EMPLOYEE NAME

~~Ascend~~ Olin
JOB DESCRIPTION

CW
CRAFT

6207
SOC. SEC. NO.

TEST THIS EMPLOYEE ON THE FOLLOWING ITEM(S) BELOW:

#8151 -Pass
#8151A-Pass Bend Only
#504-Pass NGonzalez 12/10
#538-Pass 802 Visual

EMPLOYEE ARRIVED AT________ A.M. P.M. RELEASED________ A.M. P.M.

☑ PASSED TEST
☐ FAILED TEST
☐ OTHER ________

NOTE: PLEASE RETAIN THE WHITE ORIGINAL FOR INVOICING, RETURN THE YELLOW COPY WITH THE EMPLOYEE. SUBMIT ALL ORIGINALS WITH YOUR INVOICE TO: P.O. BOX 1613, BATON ROUGE, LOUISIANA 70821

CONTRACTOR

WELD TEST INSPECTOR

52 Rev 05/12

INVOICE COPY

Welder Testing Guidelines

The following instructions shall apply to personnel when testing for Turner Industries Group LLC

Preparation of test coupon

- ✓ Internal and external surfaces 1" from the bevel end shall be clean and free of any substance that would be detrimental to either the weld or base metal when heat is applied.
- ✓ End preparation of bevel is only acceptable if the surface is reasonably smooth and true.

Alignment of test coupon

- ✓ Internal surfaces at the bevel ends shall not exceed 1/8".

Electrode Diameter

- ✓ Bare Wire and electrode size will be 3/32" and 1/8".

Tacking

Once tacked the coupon will be mounted in the test position and will not be removed or moved without instruction by the test administrator.

Interpass Cleaning

- ✓ Manual hand brushing and filing are permitted.
- ✓ Electric wire brushing and grinding are permitted.

External Re-inforcement

- ✓ Weld cover pass shall be smooth and consistent and not to exceed 1/8.
- ✓ Cleaning
- ✓ The final weld pass shall be cleaned free of all slag and any other substance that would interfere with the final visual interpretation of the weld. Hand brushing is permissible. No filling of the cap edges.

Final Visual Examination

- ✓ Performance test coupon shall show complete joint penetration, no suck back, lack of fusion, undercut, porosity or slag inclusions.

Weld Booth Responsibility

- ✓ Each welder upon completion of testing is required to thoroughly police his area and restore it back to its original condition. This is the final requirement to successfully pass your hire-on qualification.

Weld Test Time Allowed.

1. 6"/sch 80 ------- 4.0 hrs
2. 2"/sch XXH ----- 3.0 hrs
3. 2"./688" ---------4.0 hrs
4. Plate Test -------- 3.0 hrs (per position)
5. 2"/.109" ----------2.0 hrs (Visual Test 5G position, Stainless Steel Pipe)

Signature_

Date_ 12 · 6 · 2019

TURNER INDUSTRIES

Turner Industries Group, LLC
3850 Pasadena Blvd.
Pasadena, TX 77503
(713) 470-1113 / (713) 598-4650

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name	Dion Tucker	Stamp		I.D. Num.	6207
Date	12/10/2019	WPS No.	Rev.	Test No.	8151
Job No.					

Welding process(es)	GTAW	SMAW
Type(s) used	MANUAL	MANUAL
Product form	PIPE	
Joint type(s):	GROOVE WELD	

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- Number to P- Number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base metal thickness	0.625 "	WPS Limits
Pipe diameter (In.)	2.75 "	1 " OD Minimum
Welding process # 1	GTAW / MANUAL	GTAW / MANUAL
Welding process # 2	SMAW / MANUAL	SMAW / MANUAL
Backing **	Without	With or Without
AWS classification process # 1	ER70S-2	-
AWS classification process # 2	E7018	-
Filler metal specification (SFA) process # 1	5.18	-
Filler metal specification (SFA) process # 2	5.1	-
Filler metal F-No. process # 1	6	6 Only
Filler metal F-No. process # 2	4	1 thru 4
Filler metal product form	BARE (SOLID)	Solid or Metal Cored
Consumable insert	N/A	-
Deposit thickness (in.) (>=3 layers) process # 1	0.125 "	0.25 " Maximum
Deposit thickness (in.) (>=3 layers) process # 2	0.500 " Yes	WPS Limits
Position of Joint	6G	All
Weld progression	VERTICAL UP	VERTICAL UP
Shielding gas	With	With Only
Type of shielding gas	ARGON	Any
Backing gas	-	-
Type of backing gas	-	-
GTAW WELDING CURRENT POLARITY	DCEN (STRAIGHT)	DCEN (STRAIGHT)
SMAW WELDING CURRENT POLARITY	DCEP (REVERSE)	DCEP (REVERSE)

Guided Bend Test (QW - 160)

Figure Number and Type	Result	Figure Number and Type	Result
QW462.2 SIDEBEND	ACCEPTABLE	QW462.2 SIDEBEND	ACCEPTABLE
QW462.2 SIDEBEND	ACCEPTABLE	QW462.2 SIDEBEND	ACCEPTABLE

Notes:

Visual examination results:	VISUAL EXAM SATISFACTORY PER QW - 302.4 & QW - 194
Radiographic test results:	NONE
Lab Number:	WQ19-0113-4
Welding test conducted by:	Republic Testing Laboratories, LLC
Inspector Name:	JEB BAKER
Mechanical/Radiographic tests conducted by:	Republic Testing Laboratories, LLC

REPUBLIC TESTING LABORATORIES, LLC

We certify that the statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME code.

Turner Industries Group, LLC

Turner Representative: Michael Rogers Date: 12/10/19

TURNER INDUSTRIES

Turner Industries Group, LLC
3850 Pasadena Blvd.
Pasadena, TX 77503
(713) 470-1113 / (713) 598-4650

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name	Dion Tucker	Stamp		I.D. Num.	6207
Date	12/10/2019	WPS No.	Rev.	Test No.	8151A
Job No.					

Welding process(es)	GTAW	-
Type(s) used	MANUAL	-
Product form	PIPE	
Joint type(s):	GROOVE WELD	

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- Number to P- Number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base metal thickness	0.625 "	WPS Limits
Pipe diameter (in.)	2.75 "	1 " OD Minimum
Welding process # 1	GTAW / MANUAL	GTAW / MANUAL
Welding process # 2	- / MANUAL	- / MANUAL
Backing **	Without	With or Without
AWS classification process # 1	ER70S-2	-
AWS classification process # 2	-	-
Filler metal specification (SFA) process # 1	5.18	-
Filler metal specification (SFA) process # 2	-	-
Filler metal F-No. process # 1	6	6 Only
Filler metal F-No. process # 2	-	-
Filler metal product form	BARE (SOLID)	Solid or Metal Cored
Consumable insert	N/A	-
Deposit thickness (in.) [>=3 layers] process # 1	0.625 "	WPS Limits " Maximum
Deposit thickness (in.) [>=3 layers] process # 2	"	0.628 Maximum
Position of Joint	6G	All
Weld progression	VERTICAL UP	VERTICAL UP
Shielding gas	With	With Only
Type of shielding gas	ARGON	Any
Backing gas	-	-
Type of backing gas	-	-
GTAW / WELDING CURRENT / POLARITY	DCEN (STRAIGHT)	DCEN (STRAIGHT)
- / WELDING CURRENT / POLARITY	-	-

Guided Bend Test (QW - 160)

Figure Number and Type	Result	Figure Number and Type	Result
QW462.2 SIDEBEND	ACCEPTABLE	QW462.2 SIDEBEND	ACCEPTABLE
QW462.2 SIDEBEND	ACCEPTABLE	QW462.2 SIDEBEND	ACCEPTABLE

Notes:

Visual examination results:	VISUAL EXAM SATISFACTORY PER QW - 302.4 & QW - 194
Radiographic test results:	NONE
Lab Number:	WQ19-0113-3
Welding test conducted by:	Republic Testing Laboratories, LLC
Inspector Name:	JEB BAKER
Mechanical/Radiographic tests conducted by:	Republic Testing Laboratories, LLC

REPUBLIC TESTING LABORATORIES, LLC

We certify that the statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME code.

Turner Industries Group, LLC

Turner Representative: Michael Rozek   Date: 12/10/19

TURNER INDUSTRIES

Turner Industries Group, LLC
3850 Pasadena Blvd.
Pasadena, TX 77503
(713) 470-1113 / (713) 598-4650

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name	Dion Tucker	Stamp			I.D. Num.	6207
Date	12/10/2019	WPS No.		Rev.	Test No.	5041
Job No.						

Welding process(es)	GTAW	-
Type(s) used	MANUAL	-
Product form	PIPE	
Joint type(s):	GROOVE WELD	

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- Number to P- Number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base metal thickness	0.218 "	0.436
Pipe diameter (in.)	2.375 "	1 " OD Minimum
Welding process # 1	GTAW / MANUAL	GTAW / MANUAL
Welding process # 2	- / MANUAL	- / MANUAL
Backing **	Without	With or Without
AWS classification process # 1	ERNiCr-3	-
AWS classification process # 2	-	-
Filler metal specification (SFA) process # 1	5.14	-
Filler metal specification (SFA) process # 2	-	-
Filler metal F-No. process # 1	43	F34, F41 thru F46
Filler metal F-No. process # 2	-	1 thru 4
Filler metal product form	BARE (SOLID)	Solid or Metal Cored
Consumable insert	N/A	-
Deposit thickness (in.) [>=3 layers] process # 1	0.625 "	WPS Limits " Maximum
Deposit thickness (in.) [>=3 layers] process # 2	"	0.628 Maximum
Position of Joint	6G	All
Weld progression	VERTICAL UP	VERTICAL UP
Shielding gas	With	With Only
Type of shielding gas	ARGON	Any
Backing gas	-	-
Type of backing gas	-	-
GTAW / WELDING CURRENT / POLARITY	DCEN (STRAIGHT)	DCEN (STRAIGHT)
- / WELDING CURRENT / POLARITY	-	-

Guided Bend Test (QW - 160)

Figure Number and Type	Result	Figure Number and Type	Result
QW462.3(A) FACEBEND	ACCEPTABLE	QW462.3(A) ROOTBEND	ACCEPTABLE
QW462.3(B) FACEBEND	ACCEPTABLE	QW462.3(B) ROOTBEND	ACCEPTABLE

Notes:

Visual examination results:	VISUAL EXAM SATISFACTORY PER QW - 302.4 & QW - 194
Radiographic test results:	NONE
Lab Number:	WQ19-0113-2
Welding test conducted by:	Republic Testing Laboratories, LLC
Inspector Name:	JEB BAKER
Mechanical/Radiographic tests conducted by:	Republic Testing Laboratories, LLC

REPUBLIC TESTING LABORATORIES, LLC

We certify that the statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME code.

Turner Industries Group, LLC

Turner Representative: Michael Rogers Date: 12/10/19

TURNER INDUSTRIES

Turner Industries Group, LLC
3850 Pasadena Blvd.
Pasadena, TX 77503
(713) 470-1113 / (713) 598-4650

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name	Dion Tucker	Stamp		I.D. Num.	6207
Date	12/10/2019	WPS No.	Rev.	Test No.	538
Job No.					

Welding process(es)	GTAW	-
Type(s) used	MANUAL	-
Product form	PIPE	
Joint type(s):	GROOVE WELD	

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- Number to P- Number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base metal thickness	0.147 "	0.294
Pipe diameter (in.)	0.84 "	0.84 " OD Minimum
Welding process # 1	GTAW / MANUAL	GTAW / MANUAL
Welding process # 2	- / MANUAL	- / MANUAL
Backing **	Without	With or Without
AWS classification process # 1	ER70S-2	-
AWS classification process # 2	-	-
Filler metal specification (SFA) process # 1	5.18	-
Filler metal specification (SFA) process # 2	-	-
Filler metal F-No. process # 1	6	6 Only
Filler metal F-No. process # 2	-	1 thru 4
Filler metal product form	BARE (SOLID)	Solid or Metal Cored
Consumable insert	N/A	-
Deposit thickness (in.) (>=3 layers) process # 1	0.147 "	0.294 " Maximum
Deposit thickness (in.) (>=3 layers) process # 2	"	-
Position of Joint	6G	All
Weld progression	VERTICAL UP	VERTICAL UP
Shielding gas	With	With Only
Type of shielding gas	ARGON	Any
Backing gas	-	-
Type of backing gas	-	-
GTAW — WELDING CURRENT — POLARITY	DCEN (STRAIGHT)	DCEN (STRAIGHT)
- — WELDING CURRENT — POLARITY	-	-

Guided Bend Test (QW - 160)

Figure Number and Type	Result	Figure Number and Type	Result
QW462.3(A) FACEBEND	ACCEPTABLE	QW462.3(A) ROOTBEND	ACCEPTABLE
QW462.3(B) FACEBEND	ACCEPTABLE	QW462.3(B) ROOTBEND	ACCEPTABLE

Notes:

Visual examination results:	VISUAL EXAM SATISFACTORY PER QW - 302.4 & QW - 194
Radiographic test results:	NONE
Lab Number:	WQ19-0113-1
Welding test conducted by:	Republic Testing Laboratories, LLC
Inspector Name:	JEB BAKER
Mechanical/Radiographic tests conducted by:	Republic Testing Laboratories, LLC

REPUBLIC TESTING LABORATORIES, LLC

We certify that the statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME code.

Turner Industries Group, LLC

Turner Representative: Michael Rogers [signature] Date: 12/10/19

TURNER INDUSTRIES

Turner Industries Group, LLC
3850 Pasadena Blvd.
Pasadena, TX 77503
(713) 470-1113 / (713) 598-4650

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name	Dion Tucker	Stamp		I.D. Num.	6207
Date	12/10/2019	WPS No.	Rev.	Test No.	802
Job No.					

Welding process(es)	GTAW	-
Type(s) used	MANUAL	-
Product form	PIPE	
Joint type(s):	GROOVE WELD	

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- Number to P- Number	P8 to P8	P1 thru P15F, P34 and P41 thru P49
Base metal thickness	0.218 "	0.436
Pipe diameter (in.)	2.375 "	1 " OD Minimum
Welding process # 1	GTAW / MANUAL	GTAW / MANUAL
Welding process # 2	- / -	- / -
Backing **	Without	With or Without
AWS classification process # 1	ER308	-
AWS classification process # 2	N/A	-
Filler metal specification (SFA) process # 1	5.9	-
Filler metal specification (SFA) process # 2	N/A	-
Filler metal F-No. process # 1	6	6 Only
Filler metal F-No. process # 2	N/A	-
Filler metal product form	BARE (SOLID)	Solid or Metal Cored
Consumable Insert	N/A	-
Deposit thickness (in.) [>=3 layers] process # 1	0.218 "	0.436 " Maximum
Deposit thickness (in.) [>=3 layers] process # 2	- " -	-
Position of Joint	5G	Flat, Vert. & Overhead
Weld progression	VERTICAL UP	VERTICAL UP
Shielding gas	With	With Only
Type of shielding gas	ARGON	Any
Backing gas	-	-
Type of backing gas	-	-
GTAW — WELDING CURRENT — POLARITY	DCEN (STRAIGHT)	DCEN (STRAIGHT)
N/A — WELDING CURRENT — POLARITY	-	-

Guided Bend Test (QW - 160)

Figure Number and Type	Result	Figure Number and Type	Result

Notes:

Visual examination results:	VISUAL EXAM SATISFACTORY PER QW - 302.4 & QW - 194
Radiographic test results:	NONE
Lab Number:	WQ19-0113
Welding test conducted by:	Republic Testing Laboratories, LLC
Inspector Name:	JEB BAKER
Mechanical/Radiographic tests conducted by:	Republic Testing Laboratories, LLC

REPUBLIC TESTING LABORATORIES, LLC

We certify that the statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME code.

Turner Industries Group, LLC

Turner Representative: Michael Royer Date: 12/10/19

TURNER INDUSTRIES

Turner Industries Group, LLC
3850 Pasadena Blvd.
Pasadena, TX 77503
(713) 470-1113 / (713) 598-4650

J

Welder Performance Qualification (WPQ)

Welder's Name	John Morris	Stamp		I.D. Num.	8143
Date	1.15.20	WPS No.	Rev.	Test No.	5041
Job No.					

Welding process(es)	GTAW	-
Type(s) used	Manual	-
Product form	Pipe	
Joint type(s):	Groove Weld	

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- Number to P- Number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base metal thickness (in.)	0.218	WPS Limits
Pipe diameter (in.)	2.375	1 OD Minimum
Welding process # 1	GTAW / Manual	GTAW / Manual
Welding process # 2	N/A / -	N/A / -
Backing	Without	With or Without
AWS classification process # 1	ERNiCr-3	-
AWS classification process # 2	N/A	N/A
Filler metal specification (SFA) process # 1	5.14	-
Filler metal specification (SFA) process # 2	N/A	N/A
Filler metal F-No. process # 1	43	F34, F41 thru F46
Filler metal F-No. process # 2	N/A	N/A
Filler metal product form	Bare (Solid)	Solid or Metal Cored
Consumable insert	Without	Without Only
Deposit thickness (in.) [>=3 layers] process # 1	0.218	0.436 Maximum
Deposit thickness (in.) [>=3 layers] process # 2	N/A	N/A
Position of Joint	6G	All
Weld progression	Vertical Up	Vertical Up
Shielding gas	With	With Only
Type of shielding gas	Argon	Argon
Backing gas	With	With Only
Type of backing gas	Argon	Argon
GTAW / Welding Current / Polarity	DCEN (Straight)	DCEN (Straight)
- / Welding Current / Polarity	-	-

Guided Bend Test (QW - 160)

Figure Number and Type	Result	Figure Number and Type	Result
QW462.3(a) Face Bend	Acceptable	QW462.3(a) Root Bend	Acceptable
QW462.3(a) Face Bend	Acceptable	QW462.3(a) Root Bend	Acceptable

Notes: None

Visual examination results:	Visual Exam Satisfactory Per QW - 302.4 & QW - 194
Radiographic test results	None
Lab Number:	WQ20-0030-1
Welding test conducted by:	Republic Testing Laboratories, LLC / Turner Industries
Inspector Name:	JEB BAKER
Mechanical/Radiographic tests conducted by:	Republic Testing Laboratories, LLC

REPUBLIC TESTING LABORATORIES, LLC

We certify that the statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME code.

Turner Industries Group, LLC

Turner Representative: [signature] Date: 1/15/2020

TURNER INDUSTRIES

Turner Industries Group, LLC
3850 Pasadena Blvd.
Pasadena, TX 77503
(713) 470-1113 / (713) 598-4650

J

Welder or Welding Operator Performance Qualification (WPQ)

Welder's Name Date Job No.	John Morris 1/15/2020	Stamp WPS No.	Rev.	I.D. Num. Test No.	8143 5

Welding process(es) Type(s) used	SMAW MANUAL	SMAW MANUAL
Product form	PIPE	
Joint type(s):	GROOVE WELD	

Welder Variables (QW-350)	Actual Values Used	Range Qualified
P- Number to P- Number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base metal thickness	0.432 "	0.864
Pipe diameter (in.)	6.625 "	2.875 " OD Minimum
Welding process # 1	SMAW / Manual	SMAW / Manual
Welding process # 2	SMAW / Manual	SMAW / Manual
Backing **	Without	With or Without
AWS classification process # 1	E6010	-
AWS classification process # 2	E7018	-
Filler metal specification (SFA) process # 1	5.1	-
Filler metal specification (SFA) process # 2	5.1	-
Filler metal F-No. process # 1	3	1 thru 3
Filler metal F-No. process # 2	4	1 thru 4
Filler metal product form	N/A	N/A
Consumable insert	Without	Without only
Deposit thickness (in.) [>=3 layers] process # 1	0.08 "	0.16 " Maximum
Deposit thickness (in.) [>=3 layers] process # 2	0.352	0.704
Position of Joint	6G	All
Weld progression	Vertical Up	Vertical Up
Shielding gas	N/A	N/A
Type of shielding gas	N/A	N/A
Backing gas	N/A	N/A
Type of backing gas	N/A	N/A
SMAW Welding Current Polarity	DCEP (Reverse)	DCEP (Reverse)
SMAW Welding Current Polarity	DCEP (Reverse)	DCEP (Reverse)

Guided Bend Test (QW - 160)

Figure Number and Type	Result	Figure Number and Type	Result
QW462.2 Sidebend	Acceptable	QW462.2 Sidebend	Acceptable
QW462.2 Sidebend	Acceptable	QW462.2 Sidebend	Acceptable

Notes:

Visual examination results:	VISUAL EXAM SATISFACTORY PER QW - 302.4 & QW - 194
Radiographic test results	NONE
Lab Number:	WQ20-0030-2
Welding test conducted by:	Republic Testing Laboratories, LLC/Turner Industries
Inspector Name:	JEB BAKER
Mechanical/Radiographic tests conducted by:	Republic Testing Laboratories, LLC

REPUBLIC TESTING LABORATORIES, LLC

We certify that the statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME code.

Turner Industries Group, LLC

Turner Representative: [signature] Date: 1/15/2020

TURNER INDUSTRIES

Turner Industries Group, L.L.C.
3850 Pasadena Blvd; Pasadena Tx 77503
Phone - 713-470-1113 or 713-598-4650
Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder: John C. Morris III — SS #: 8143 — Test Date: 8/12/2019
Test #: 8161B — WPS #: 110 — ID#: J
Process(es) / Type(s): GTAW/SMAW Manual
Product Form: Pipe — Joint Type(s): Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base material thickness	.688	unlimited
Pipe diameter (in)	2.750" OD	1" OD minimum
Base material diameter-fillet	n/a	unlimited
Base material thickness-fillet	n/a	unlimited
Welding Process # 1	gtaw manual solid	gtaw manual solid or metal cored
Welding Process # 2	smaw manual	smaw manual
Backing	Without	With or Without
AWS Class. Process # 1	ER70S-2	-
AWS Class. Process # 2	E7018	-
Filler metal Spec. (SFA) # 1	5.18	-
Filler metal Spec. (SFA) # 2	5.1	-
Filler metal F-No. Process # 1	6	6 Only
Filler metal F-No. Process # 2	4	1 Thru 4
Filler metal Product Form		
Consumable insert	without	without only
Deposited Thickness Process # 1	.344"	.688" maximum
3 layers minimum	n/a	
Deposited Thickness Process # 2	.344"	.688" Maximum
3 layers minimum	n/a	
Joint Position	6G	All
Weld Progression	uphill/uphill	uphill/uphill
Shielding Gas / Type	with	with only
Backing Gas / Type	without	with or without
Welding Current / polarity # 1	dcen/ straight	dcen/ straight
Welding Current / polarity # 2	dcep/ reverse	dcep/ reverse

Guided Bend Test (QW-160)

Figure No. and Type	Results	Figure No. and Type	Results
QW462.2 SIDEBEND	Acceptable	QW462.2 SIDEBEND	Acceptable
QW462.2 SIDEBEND	Acceptable	QW462.2 SIDEBEND	Acceptable

Visual Examination Results: Visual Exam Satisfactory Per QW302.4 & QW194
Radiographic Test Results: None
Mechanical / Radiographic Tests conducted By: Maverick Testing Laboratories, Inc.

Test conducted at : Maverick Testing Laboratories, Inc. — Lab Test #: WQ19-2945-2
Inspector : David Guerra

We certify that the statements made in this record are correct and that the test coupons were prepared , welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Industries Group, L.L.C.
Turner Representive: [signature] Date: 8/12/19

TURNER INDUSTRIES

Turner Industries Group, L.L.C.
3850 Pasadena Blvd; Pasadena Tx. 77503
Phone - 713-470-1113 or 713-598-4650
Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder: John C. Morris III SS #: 8143 Test Date: 8/9/2019
Test #: 802 WPS #: ID#: J
Process(es) / Type(s): GTAW Manual
Product Form: Pipe Joint Type(s): Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P8 to P8	
Base material thickness	.109"	
Pipe diameter (in.)	2.375"	
Base material diameter-fillet	n/a	
Base material thickness-fillet	n/a	
Welding Process # 1	gtaw manual solid	
Welding Process # 2	n/a	
Backing	n/a	
AWS Class. Process # 1	ER308	-
AWS Class. Process # 2	n/a	-
Filler metal Spec. (SFA) # 1	5.9	-
Filler metal Spec. (SFA) # 2	n/a	-
Filler metal F-No. Process # 1	6	
Filler metal F-No. Process # 2	n/a	
Filler metal Product Form		
Consumable insert	without	
Deposited Thickness Process # 1	.109	
3 layers minimum	n/a	
Deposited Thickness Process # 2	n/a	
3 layers minimum	n/a	-
Joint Position	5G	
Weld Progression	uphill	
Shielding Gas / Type	With	
Backing Gas / Type	with	
Welding Current / polarity # 1	dcen/ straight	
Welding Current / polarity # 2	n/a	

Guided Bend Test (QW-160)			
Figure No. and Type	Results	Figure No. and Type	Results
N/A	N/A	N/A	N/A

Visual Examination Results: Satisfactory
Radiographic Test Results: N/A
Mechanical / Radiographic Tests conducted By: Maverick Testing Laboratories, Inc.

Test conducted at: Maverick Testing Laboratories, Inc. Lab Test #: WQ19-2945
Inspector: David Guerra

We certify that the statements made in this record are correct and that the test coupons were prepared, welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Industries Group, L.L.C.
Turner Represenitive: [signature] Date: 8/9/19

TURNER INDUSTRIES

Turner Industries Group, L.L.C.
3850 Pasadena Blvd; Pasadena Tx. 77503
Phone - 713-470-3111 or 713-598-4650
Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder: Rupert Etienne | SS #: 2382 | Test Date: 2/12/2016

Test #: 5 | WPS #: | ID#: ~~OU~~ E

Process(es) / Type(s): SMAW Manual

Product Form: Pipe | Joint Type(s): Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P1 to P1	P1 thru P15F, P34 & P41 thru 49
Base material thickness	.432"	wps limits
Pipe diameter (in.)	6.625" OD	2.875" OD minimum
Base material diameter-fillet	n/a	unlimited
Base material thickness-fillet	n/a	unlimited
Welding Process # 1	smaw manual	smaw manual
Welding Process # 2	smaw manual	smaw manual
Backing	without	with or without
AWS Class. Process # 1	E6010	-
AWS Class. Process # 2	E7018	-
Filler metal Spec. (SFA) # 1	5.1	-
Filler metal Spec. (SFA) # 2	5.1	-
Filler metal F-No. Process # 1	3	1 thru 3
Filler metal F-No. Process # 2	4	1 thru 4
Filler metal Product Form		
Consumable Insert	n/a	
Deposited Thickness Process # 1	.125"	.250" maximum
3 layers minimum	n/a	
Deposited Thickness Process # 2	.307"	.614" maximum
3 layers minimum	n/a	
Joint Position	6G	all
Weld Progression	uphill/ uphill	uphill/ uphill
Shielding Gas / Type	n/a	
Backing Gas / Type	n/a	
Welding Current / polarity # 1	dcep/ reverse	dcep/ reverse
Welding Current / polarity # 2	dcep/ reverse	dcep/ reverse

Guided Bend Test (QW-160)

Figure No. and Type	Results	Figure No. and Type	Results
QW462.2 Sidebend	ACCEPTABLE	QW462.2 Sidebend	ACCEPTABLE
QW462.2 Sidebend	ACCEPTABLE	QW462.2 Sidebend	ACCEPTABLE

Visual Examination Results: Visual Exam Satisfactory Per QW - 302.4 & QW - 194

Radiographic Test Results: NONE

Mechanical / Radiographic Tests conducted By: Maverick Testing Laboratories, Inc.

Test conducted at: Maverick Testing Laboratories, Inc.

Inspector: David Guerra

Lab Test #: WQ16-0643-1

We certify that the statements made in this record are correct and that the test coupons were prepared, welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Industries Group, L.L.C.

Turner Representive: [signature]

Date: 2016.02.15

AWS® Jeffrey Bedgood
CWI 09040771
QC1 EXP. 4/1/2018

Sten, E

TURNER INDUSTRIES

Turner Industries Group, L.L.C.
3850 Pasadena Blvd, Pasadena Tx 77503
Phone - 713-470-1113 or 713-598-4650
Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder: Rupert Etienne | SS #: 2382 | Test Date: 9/25/2019
Test #: 802 | WPS #: | ID#: E
Process(es) / Type(s): GTAW Manual
Product Form: Pipe | Joint Type(s): Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P8 to P8	
Base material thickness	.109"	
Pipe diameter (in.)	2.375"	
Base material diameter-fillet	n/a	
Base material thickness-fillet	n/a	
Welding Process # 1	gtaw manual solid	
Welding Process # 2	n/a	
Backing	n/a	
AWS Class. Process # 1	ER308	
AWS Class. Process # 2	n/a	-
Filler metal Spec. (SFA) # 1	5.9	-
Filler metal Spec. (SFA) # 2	n/a	-
Filler metal F-No. Process # 1	6	-
Filler metal F-No. Process # 2	n/a	
Filler metal Product Form		
Consumable insert	without	
Deposited Thickness Process # 1	.109	
3 layers minimum	n/a	
Deposited Thickness Process # 2	n/a	
3 layers minimum	n/a	-
Joint Position	5G	
Weld Progression	uphill	
Shielding Gas / Type	With	
Backing Gas / Type	with	
Welding Current / polarity # 1	dcen/ straight	
Welding Current / polarity # 2	n/a	

Guided Bend Test (QW-160)

Figure No. and Type	Results	Figure No. and Type	Results
N/A	N/A	N/A	N/A

Visual Examination Results: Satisfactory
Radiographic Test Results: N/A
Mechanical / Radiographic Tests conducted By: Maverick Testing Laboratories, Inc.

Test conducted at : Maverick Testing Laboratories, Inc.
Inspector : Daniel Guerra

Lab Test #
WQ19-3489-1

We certify that the statements made in this record are correct and that the test coupons were prepared , welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Industries Group, L.L.C.

Turner Representive: [signature]

Date: 9/25/2019

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TURNER INDUSTRIES

Turner Industries Group, L.L.C.
3850 Pasadena Blvd; Pasadena Tx. 77503
Phone - 713-470-1113 or 713-598-4650
Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder: Rupert Etienne — SS #: 2382 — Test Date: 9/25/2019
Test #: 5041 — WPS #: — ID#: E
Process(es) / Type(s): GTAW Manual
Product Form: Pipe — Joint Type(s): Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base material thickness	.218"	wps limits
Pipe diameter (in.)	2.375" OD	1" OD minimum
Base material diameter-fillet	n/a	unlimited
Base material thickness-fillet	n/a	unlimited
Welding Process # 1	gtaw manual solid	gtaw manual solid or metal cored
Welding Process # 2	n/a	n/a
Backing	Without	With or without
AWS Class. Process # 1	ERNiCr-3	-
AWS Class. Process # 2	n/a	-
Filler metal Spec. (SFA) # 1	5.14	-
Filler metal Spec. (SFA) # 2	n/a	-
Filler metal F-No. Process # 1	43	34 & 41 thru 46
Filler metal F-No. Process # 2	n/a	
Filler metal Product Form		
Consumable insert	Without	without only
Deposited Thickness Process # 1	.218"	.436" maximum
3 layers minimum	n/a	
Deposited Thickness Process # 2	n/a	n/a
3 layers minimum	n/a	n/a
Joint Position	6G	All
Weld Progression	uphill	uphill
Shielding Gas / Type	With	With only
Backing Gas / Type	With	With only
Welding Current / polarity # 1	dcen/straight	dcen/straight
Welding Current / polarity # 2	n/a	n/a

Guided Bend Test (QW-160)

Figure No. and Type	Results	Figure No. and Type	Results
QW462.3 (A) Facebend	ACCEPTABLE	QW462.3 (A) Rootbend	ACCEPTABLE
QW462.3 (A) Facebend	ACCEPTABLE	QW462.3 (A) Rootbend	ACCEPTABLE

Visual Examination Results: Visual Exam Satisfactory Per QW - 302.4 & QW - 194
Radiographic Test Results: NONE
Mechanical / Radiographic Tests conducted By: Maverick Testing Laboratories, Inc.

Test conducted at: Maverick Testing Laboratories, Inc. — Lab Test #: WQ19-3489-2
Inspector: Daniel Guerra

We certify that the statements made in this record are correct and that the test coupons were prepared, welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Industries Group, L.L.C.
Turner Representive: [signature] — Date: 9/25/2019

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TURNER INDUSTRIES

Turner Industries Group, L.L.C.
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Phone - 713-470-1113 or 713-598-4650
Fax - 713-472-6863

Welder Performance Qualification (WPQ)

Welder: Rupert Etienne | SS #: 2382 | Test Date: 9/25/2019
Test #: 8151B | WPS #: | ID#: E
Process(es) / Type(s): GTAW/SMAW Manual
Product Form: Pipe | Joint Type(s): Groove

Welding Variables (QW-350)	Actual Values	Range Qualified
P-number to P-number	P1 to P1	P1 thru P15F, P34 and P41 thru P49
Base material thickness	.688	unlimited
Pipe diameter (in.)	2.750" OD	1" OD minimum
Base material diameter-fillet	n/a	unlimited
Base material thickness-fillet	n/a	unlimited
Welding Process # 1	gtaw manual solid	gtaw manual solid or metal cored
Welding Process # 2	smaw manual	smaw manual
Backing	Without	With or Without
AWS Class. Process # 1	ER70S-2	-
AWS Class. Process # 2	E7018	-
Filler metal Spec. (SFA) # 1	5.18	-
Filler metal Spec. (SFA) # 2	5.1	-
Filler metal F-No. Process # 1	6	6 Only
Filler metal F-No. Process # 2	4	1 Thru 4
Filler metal Product Form		
Consumable Insert	without	without only
Deposited Thickness Process # 1	.344"	.688" maximum
3 layers minimum	n/a	
Deposited Thickness Process # 2	.344"	.688" Maximum
3 layers minimum	n/a	
Joint Position	6G	All
Weld Progression	uphill/uphill	uphill/uphill
Shielding Gas / Type	with	with only
Backing Gas / Type	without	with or without
Welding Current / polarity # 1	dcen/ straight	dcen/ straight
Welding Current / polarity # 2	dcep/ reverse	dcep/ reverse

Guided Bend Test (QW-160)

Figure No. and Type	Results	Figure No. and Type	Results
QW462.2 SIDEBEND	Acceptable	QW462.2 SIDEBEND	Acceptable
QW462.2 SIDEBEND	Acceptable	QW462.2 SIDEBEND	Acceptable

Visual Examination Results: Visual Exam Satisfactory Per QW302.4 & QW194
Radiographic Test Results: None
Mechanical / Radiographic Tests conducted By: Maverick Testing Laboratories, Inc.

Test conducted at: Maverick Testing Laboratories, Inc.
Inspector: Daniel Guerra
Lab Test #: WQ19-3489-3

We certify that the statements made in this record are correct and that the test coupons were prepared, welded & tested in accordance with the requirements of the Latest Edition of ASME Section IX welding code

Turner Industries Group, L.L.C.
Turner Represenitive: [signature]
Date: 9/25/2019

CERTIFICATION OF MODIFICATION OF PUMP CONNECTION TO RCRA LINE

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX E: INSPECTION REPORTS ON PIPING MODIFICATION

TURNER INDUSTRIES
PRESSURE TEST FORM

SYSTEM; LINE OR EQUIPMENT INDENIFICATION		LINE SPECIFICATION
WO# 13529967		B6SD.2D1
REQUIRED TEST PRESURE	ACTUAL TEST PRESURE	CHECK ONE
900 PSIG	900 PSIG	(X) A. = HYDRO
REQUIRED TEST TIME	ACTUAL TEST TIME	( ) B = PNEUMATIC
10 MIN	10 min	( ) C = SERVICE ( ) D = OTHER
REQUIRED LIQUID TEMP.	ACTUAL TEST TEMPERATURE	AMBIANT TEMPERATURE
MIN: 60 F MAX: 100 F	80 F	80 F
TEST GAUGE NUMBER	DATE OF CALIBRATION	TEST GAUGE RANGE
PROJ 1	2/4/20	0-3000 PSIG

FROM: TO:

WELDS: 1 THRU 18 & 19A DRWG# 332-15-00101-001

TEST ACCEPTANCE

TURNER QC	DATE:
JOSEPH BRANTLEY	5/7/2020
PLANT REPRESENTIVE	DATE:

REMARKS:

TURNER INDUSTRIES
PRESSURE TEST FORM

SYSTEM; LINE OR EQUIPMENT INDENIFICATION		LINE SPECIFICATION
WO# 13529967		R2CV1
REQUIRED TEST PRESURE	ACTUAL TEST PRESURE	CHECK ONE
338 PSIG	350 PSIG	(X) A. = HYDRO ( ) B = PNEUMATIC
REQUIRED TEST TIME	ACTUAL TEST TIME	( ) C = SERVICE
10 MIN	10 min	( ) D = OTHER
REQUIRED LIQUID TEMP.	ACTUAL TEST TEMPERATURE	AMBIANT TEMPERATURE
MIN: 60 F MAX: 100 F	AMBIANT	90 F
TEST GAUGE NUMBER	DATE OF CALIBRATION	TEST GAUGE RANGE
N/A	N/A	0-800 PSIG

FROM:	TO:
DWG: 332P1-00004-001	

TEST ACCEPTANCE

TURNER QC	DATE:
JEFF HAINES	6/30/2020
PLANT REPRESENTIVE	DATE:

REMARKS:

TURNER INDUSTRIES
PRESSURE TEST FORM

SYSTEM; LINE OR EQUIPMENT INDENIFICATION		LINE SPECIFICATION
WO# ~~13721136~~ 13529967		R2CV1
REQUIRED TEST PRESURE	ACTUAL TEST PRESURE	CHECK ONE
337 PSIG	450 PSIG	(X) A. = HYDRO ( ) B = PNEUMATIC
REQUIRED TEST TIME	ACTUAL TEST TIME	( ) C = SERVICE ( ) D = OTHER
10 MIN	10 min	
REQUIRED LIQUID TEMP.	ACTUAL TEST TEMPERATURE	AMBIANT TEMPERATURE
MIN: 60 F MAX: 100 F	82 F	82 F
TEST GAUGE NUMBER	DATE OF CALIBRATION	TEST GAUGE RANGE
N/A	N/A	0-1000

FROM:	TO:
WELDS: 19 THRU 23	Drwg. 332-P1-00004-001

TEST ACCEPTANCE

TURNER QC	DATE:
JEFF HAINES	5/4/2020
PLANT REPRESENTIVE	DATE:

REMARKS:

TURNER INDUSTRIES
PRESSURE TEST FORM

SYSTEM; LINE OR EQUIPMENT INDENIFICATION		LINE SPECIFICATION
WO# 13529967		R2CV1&B6SD.2D1
REQUIRED TEST PRESURE	ACTUAL TEST PRESURE	CHECK ONE
450 PSIG	470 PSIG	(X) A. = HYDRO
REQUIRED TEST TIME	ACTUAL TEST TIME	( ) B = PNEUMATIC ( ) C = SERVICE
10 MIN	10 min	( ) D = OTHER
REQUIRED LIQUID TEMP.	ACTUAL TEST TEMPERATURE	AMBIANT TEMPERATURE
MIN: 60 F MAX: 100 F	AMBIANT	90 F
TEST GAUGE NUMBER	DATE OF CALIBRATION	TEST GAUGE RANGE
N/A	N/A	0-800 PSIG

FROM: TO:

DWG: B-332PP-154
332P15-00100-001

TEST ACCEPTANCE

TURNER QC	DATE:
JEFF HAINES	6/29/2020
PLANT REPRESENTIVE	DATE:

REMARKS:

TURNER INDUSTRIES

Liquid Penetrant Examination Report

Date: 5/5/20 WO# 13529967 Client: ASCEND Page: 1 of 1

Item Inspected: 332P1-00004-001 Location: IWPF

Inspector: JEFF HAINES Certification / Grade: Lvl. II

Method

Flourescent Penetrant [ ] Visible Penetrant [X]

Surface Condition and Preparation: Clean&Dry

Material Type: 316L **Material Thickness:** .148 .165 .113

Application

Penetrant Used: ARDROX P6R Dwell Time: 10 Minutes

Water Washable [X] Solvent Removable [ ] Solvent Type:

Developer Used: ARDROX 9D1B Developer Time: 10 Minutes

Pump Sprayer [ ] Spray Can [X] Brush [ ] Other

Time of inspection: 9:15 Ambient Temperature: 83 °F

Equipment

Blacklight Used: [ ] (s/n) Output:

Visable light Used: X

Light Meter Used: z379099 (s/n) Calibration Date: 10/21/2019 Reading:

Procedure Penetrant Procedure as per ASME V

Accept / Reject Criteria: ASME B31.3 N/S

Identification	STENCIL	Interpretation		Repairs		Sketches attached: YES [ ] No [X]
		Accept	Reject	Accept	Reject	Remarks /Sketch No.
W-19 THRU W-23	J	YES				

INSPECTORS SIGNATURE: JEFF HAINES

TURNER INDUSTRIES

Liquid Penetrant Examination Report

Date: 6/2/20 WO# 13529967 Client: ASCEND Page: 1 of 1

Item Inspected: RCRA LINE C ST. DITCH Location: DIST

Inspector: JEFF HAINES Certification / Grade: Lvl. II

Method

Flourescent Penetrant [ ] Visible Penetrant [X]

Surface Condition and Preparation: Clean&Dry

Material Type: C/S **Material Thickness:** .594 .154

Application

Penetrant Used: ARDROX P6R Dwell Time: 10 Minutes

Water Washable [X] Solvent Removable [ ] Solvent Type:

Developer Used: ARDROX 9D1B Developer Time: 10 Minutes

Pump Sprayer [ ] Spray Can [X] Brush [ ] Other

Time of inspection: 18:30 Ambient Temperature: 89 °F

Equipment

Blacklight Used: [ ] (s/n) Output:

Visable light Used: X

Light Meter Used: z379099 (s/n) Calibration Date: 10/21/2019 Reading:

Procedure Penetrant Procedure as per ASME V

Accept / Reject Criteria: ASME B31.3

Identification	STENCIL	Interpretation		Repairs		Sketches attached: YES [ ] No [X]
		Accept	Reject	Accept	Reject	Remarks /Sketch No.
W-1A	T-3	YES				10" SCH 80
W-2A	J/E	YES				10" SCH 80
W-3A	A3/A2	YES				10" SCH 80
(2)3/4" SW	T-3	YES				HIGH & LOW POINT BLEED

INSPECTORS SIGNATURE: JEFF HAINES

TURNER INDUSTRIES

Liquid Penetrant Examination Report

Date: 5/7/20 WO# 13529967 Client: ASCEND Page: 1 of 1

Item Inspected: RCRA PIPING Location: IWPF

Inspector: JEFF HAINES Certification / Grade: Lvl. II

Method

Flourescent Penetrant [ ] Visible Penetrant [X]

Surface Condition and Preparation: Clean&Dry

Material Type: 316L **Material Thickness:** 0.28

Application

Penetrant Used: ARDROX P6R Dwell Time: 10 Minutes

Water Washable [X] Solvent Removable [ ] Solvent Type:

Developer Used: ARDROX 9D1B Developer Time: 10 Minutes

Pump Sprayer [ ] Spray Can [X] Brush [ ] Other

Time of inspection: 8:55 Ambient Temperature: 75 °F

Equipment

Blacklight Used: [ ] (s/n) Output:

Visable light Used: X

Light Meter Used: z379099 (s/n) Calibration Date: 10/21/2019 Reading:

Procedure Penetrant Procedure as per ASME V

Accept / Reject Criteria: ASME B31.3

Sketches attached: YES [ ] No [X]

Identification	STENCIL	Interpretation Accept	Interpretation Reject	Repairs Accept	Repairs Reject	Remarks /Sketch No.
W-17	J	X				

INSPECTORS SIGNATURE: JEFF HAINES

TURNER INDUSTRIES

Liquid Penetrant Examination Report

Date: 5/7/20 WO# 13529967 Client: ASCEND Page: 1 of 1

Item Inspected: RCRA PIPING Location: IWPF

Inspector: JEFF HAINES Certification / Grade: Lvl. II

Method

Flourescent Penetrant [ ] Visible Penetrant [X]

Surface Condition and Preparation: Clean&Dry

Material Type: 316L **Material Thickness:** 0.134

Application

Penetrant Used: ARDROX P6R Dwell Time: 10 Minutes

Water Washable [X] Solvent Removable [ ] Solvent Type:

Developer Used: ARDROX 9D1B Developer Time: 10 Minutes

Pump Sprayer [ ] Spray Can [X] Brush [ ] Other

Time of inspection: 14:55 Ambient Temperature: 85 °F

Equipment

Blacklight Used: [ ] (s/n) Output:

Visable light Used: X

Light Meter Used: z379099 (s/n) Calibration Date: 10/21/2019 Reading:

Procedure Penetrant Procedure as per ASME V

Accept / Reject Criteria: ASME B31.3

Identification	STENCIL	Interpretation Accept	Interpretation Reject	Repairs Accept	Repairs Reject	Sketches attached: YES [ ] No [X] Remarks /Sketch No.
W-18	J	X				

INSPECTORS SIGNATURE: JEFF HAINES

TURNER INDUSTRIES

Liquid Penetrant Examination Report

Date: 5/8/20 WO# 13529967 Client: ASCEND Page: 1 of 1

Item Inspected: RCRA Location: IWPF

Inspector: JEFF HAINES Certification / Grade: Lvl. II

Method

Flourescent Penetrant [ ] Visible Penetrant [X]

Surface Condition and Preparation: Clean&Dry

Material Type: 316L **Material Thickness:** 0.134

Application

Penetrant Used: ARDROX P6R Dwell Time: 10 Minutes

Water Washable [X] Solvent Removable [ ] Solvent Type:

Developer Used: ARDROX 9D1B Developer Time: 10 Minutes

Pump Sprayer [ ] Spray Can [X] Brush [ ] Other

Time of inspection: 8:00 Ambient Temperature: 74 °F

Equipment

Blacklight Used: [ ] (s/n) Output:

Visable light Used: X

Light Meter Used: z379099 (s/n) Calibration Date: 10/21/2019 Reading:

Procedure Penetrant Procedure as per ASME V

Accept / Reject Criteria: ASME B31.3

Identification	STENCIL	Interpretation		Repairs		Sketches attached: YES [ ] No [X]
		Accept	Reject	Accept	Reject	Remarks /Sketch No.
W-19-A	J	X				

INSPECTORS SIGNATURE: JEFF HAINES

TURNER INDUSTRIES

Liquid Penetrant Examination Report

Date: 5/5/20 WO# 13529967 Client: ASCEND Page: 1 of 1

Item Inspected: RCRA PIPING Location: IWPF

Inspector: JEFF HAINES Certification / Grade: Lvl. II

Method

Flourescent Penetrant [ ] Visible Penetrant [X]

Surface Condition and Preparation: Clean&Dry

Material Type: CS **Material Thickness:** .594 .432

Application

Penetrant Used: ARDROX P6R Dwell Time: 10 Minutes

Water Washable [X] Solvent Removable [ ] Solvent Type:

Developer Used: ARDROX 9D1B Developer Time: 10 Minutes

Pump Sprayer [ ] Spray Can [X] Brush [ ] Other

Time of inspection: 13:00 Ambient Temperature: 85 °F

Equipment

Blacklight Used: [ ] (s/n) Output:

Visable light Used: X

Light Meter Used: z379099 (s/n) Calibration Date: 10/21/2019 Reading:

Procedure Penetrant Procedure as per ASME V

Accept / Reject Criteria: ASME B31.3

Identification	STENCIL	Interpretation Accept	Interpretation Reject	Repairs Accept	Repairs Reject	Sketches attached: YES [ ] No [X] Remarks /Sketch No.
W-1,2,3,5,&6	E	X				

INSPECTORS SIGNATURE: JEFF HAINES

TURNER INDUSTRIES

Liquid Penetrant Examination Report

Date: 5/4/20 **WO#** 13529967 **Client:** ASCEND **Page:** 1 **of** 1

Item Inspected: RCRA PIPING **Location:** IWPF

Inspector: JEFF HAINES **Certification / Grade:** **Lvl.** II

Method

Flourescent Penetrant [ ] Visible Penetrant [X]

Surface Condition and Preparation: Clean&Dry

Material Type: 316 L **Material Thickness:** 0.28

Application

Penetrant Used: ARDROX P6R Dwell Time: 10 Minutes

Water Washable [X] Solvent Removable [ ] Solvent Type:

Developer Used: ARDROX 9D1B Developer Time: 10 Minutes

Pump Sprayer [ ] Spray Can [X] Brush [ ] Other

Time of inspection: 14:35 Ambient Temperature: 85 °F

Equipment

Blacklight Used: [ ] (s/n) Output:

Visable light Used: X

Light Meter Used: z379099 (s/n) Calibration Date: 10/21/2019 Reading:

Procedure Penetrant Procedure as per ASME V

Accept / Reject Criteria: ASME B31.3

Sketches attached: YES [ ] No [X]

Identification	STENCIL	Interpretation Accept	Interpretation Reject	Repairs Accept	Repairs Reject	Remarks /Sketch No.
W-7 THRU 12	E	Y				

INSPECTORS SIGNATURE: JEFF HAINES

TURNER INDUSTRIES

Liquid Penetrant Examination Report

Date: 5/5/20 WO# 13529967 Client: ASCEND Page: 1 of 1

RCRA PIPING Location: IWPF

Inspector: JEFF HAINES Certification / Grade: Lvl. II

Method

Flourescent Penetrant [ ] Visible Penetrant [X]

Surface Condition and Preparation: Clean&Dry

Material Type: 316 L **Material Thickness:** 0.28

Application

Penetrant Used: ARDROX P6R Dwell Time: 10 Minutes

Water Washable [X] Solvent Removable [ ] Solvent Type:

Developer Used: ARDROX 9D1B Developer Time: 10 Minutes

Pump Sprayer [ ] Spray Can [X] Brush [ ] Other

Time of inspection: 10:00 Ambient Temperature: 78 °F

Equipment

Blacklight Used: [ ] (s/n) Output:

Visable light Used: X

Light Meter Used: z379099 (s/n) Calibration Date: 10/21/2019 Reading:

Procedure Penetrant Procedure as per ASME V

Accept / Reject Criteria: ASME B31.3

Identification	STENCIL	Interpretation		Repairs		Sketches attached: YES [ ] No [X]
		Accept	Reject	Accept	Reject	Remarks /Sketch No.
W-13 THRU 16	J	X				

INSPECTORS SIGNATURE: JEFF HAINES

TURNER INDUSTRIES

Liquid Penetrant Examination Report

Date: 6/11/20 WO# 13529967 Client: ASCEND Page: 1 of 1

Item Inspected: 332p15-00100-001 Location: IWPF

Inspector: JEFF HAINES Certification / Grade: Lvl. II

Method

Flourescent Penetrant [ ] Visible Penetrant [X]

Surface Condition and Preparation: Clean&Dry

Material Type: 316L **Material Thickness:** .154 .145

Application

Penetrant Used: ARDROX P6R Dwell Time: 10 Minutes

Water Washable [X] Solvent Removable [ ] Solvent Type:

Developer Used: ARDROX 9D1B Developer Time: 10 Minutes

Pump Sprayer [ ] Spray Can [X] Brush [ ] Other

Time of inspection: 14:25 Ambient Temperature: 90 °F

Equipment

Blacklight Used: [ ] (s/n) Output:

Visable light Used: X

Light Meter Used: z379099 (s/n) Calibration Date: 10/21/2019 Reading:

Procedure Penetrant Procedure as per ASME V

Accept / Reject Criteria: ASME B31.3 N/S

Identification	STENCIL	Interpretation		Repairs		Sketches attached: YES [ ] No [X]
		Accept	Reject	Accept	Reject	Remarks /Sketch No.
W55,56,58,&59	E	YES				
W-60 THRU 68	J	YES				
W-75&76	J	YES				
W-69 THRU 74	E	YES				
W57	J	YES				

INSPECTORS SIGNATURE: JEFF HAINES

TURNER INDUSTRIES

Liquid Penetrant Examination Report

Date: 6/23/20 WO# 13529967 Client: ASCEND Page: 1 of 1

Item Inspected: 332P1-00004-001 Location: IWPF

Inspector: JEFF HAINES Certification / Grade: Lvl. II

Method

Flourescent Penetrant [ ] Visible Penetrant [X]

Surface Condition and Preparation: Clean&Dry

Material Type: 316 **Material Thickness:**

Application

Penetrant Used: ARDROX P6R Dwell Time: 10 Minutes

Water Washable [X] Solvent Removable [ ] Solvent Type:

Developer Used: ARDROX 9D1B Developer Time: 10 Minutes

Pump Sprayer [ ] Spray Can [X] Brush [ ] Other

Time of inspection: 9:50 Ambient Temperature: 88 °F

Equipment

Blacklight Used: [ ] (s/n) Output:

Visable light Used: X

Light Meter Used: z379099 (s/n) Calibration Date: 10/21/2019 Reading:

Procedure Penetrant Procedure as per ASME V

Accept / Reject Criteria: ASME B31.3 N/S

Identification	STENCIL	Interpretation Accept	Interpretation Reject	Repairs Accept	Repairs Reject	Sketches attached: YES [ ] No [X] Remarks /Sketch No.
W-24 THRU W-35	J	YES				
W-40 THRU W-49	E	YES				
W-36&37	J	YES				
W-38&39	E	YES				

INSPECTORS SIGNATURE: JEFF HAINES

714 Wade St. Clute, Tx. 77531
(979) 265-3342

PHASED ARRAY ULTRASONIC INSPECTION REPORT

For: Ascend Performance Materials

Date: 5/7/2020
PO# 4504515929
Plant: AN7
Equipment Name: 332P15 Tie-in

Ultrasonic Inspection Report

Procecure No.	QC103.0 PAUT Weld Inspection
Accept. Criteria	B31.3 Normal
Costumer	Ascend Perfomance Materials
Test Date	5/7/2020

PA Instrument	Olympus	Model	Omniscan-MX2
Serial No.	QC-003442	Calibration Date	1/24/2019

Probe Type	5L16-A10	Part/Serial No.	HEB798
Frequency	5 MHz	No. of Elements	16
Active size		Pitch	.5mm
Cable/Connector	OmniScan Standard Gen 2	Cable Length	6Ft

Wedge	SA-10-N55S-A06.625	Size	N/A
Wedge Angles	40-70		

Scanner System	N/A	Serial No.	
Band Bracket Size		Encocded	
Cable Type		Cable Length	

Reference Block	PACS BLOCK	Reference Block Thickness	2"
Ref Block Mat'l	304SS	Ref Block Serial No.	53510
Reflector Type	HOLE	Amplitude	80%
DAC/TCG	TCG		

Calibration Block	PACS BLOCK	Cal Block Mat'l	304SS
Cal Block Serial No.	53510	Cal Time / Cal Check	

Reference Gain	21.2	Scanning Gain	27.2

Probe to Wedge Couplant	Sonotech Ultragel II	Batch No.	16M004
Wedge to Pipe Couplant	Sonotech Ultragel II	Batch No.	16M004

Notes: (3) 6" Standard wall welds were inspected in "C" St. ditch to show no rejectable indications at the time of inspection. Weld 11 was inspected from one side due to pipe to fitting make-up.

Name of Operator	Brandon Wordekemper
Qualification Level	UTSW Lvl II/ PAUT Lvl II
Name of Operator	
Qualification Level	

SOUTHERN SERVICES INC.
INSPECTION & ADVANCED NDT SERVICES

Ultrasonic Inspection Report

Costumer	Ascend Performance Materials		
Test Date	5/7/2020		
Test Identification	W-11	**Material Thickness**	.280"
Test Material	304 SS	**Joint Type**	Single V
Surface Condition	As Welded		
Welder Stencil	E		

Indication #	**From X**	**From Y**	**Depth**	**Length**	**Type**	**Accept**	**Reject**
1							
2							
				FINAL		X	

Weld was scanned from one side.

Name of Operator	Brandon Wordekemper	
Qualification Level	UTSW Lvl II/ PAUT Lvl II	
Name of Operator		
Qualification Level		

Ultrasonic Inspection Report

Costumer	Ascend Performance Materials		
Test Date	5/7/2020		
Test Identification	W-12	**Material Thickness**	.280"
Test Material	304 SS	**Joint Type**	Single V
Surface Condition	As Welded		
Welder Stencil	E		

Indication #	**From X**	**From Y**	**Depth**	**Length**	**Type**	**Accept**	**Reject**
1							
2							
				FINAL		X	

Name of Operator	Brandon Wordekemper
Qualification Level	UTSW Lvl II/ PAUT Lvl II
Name of Operator	
Qualification Level	

Southern Services Inc.
INSPECTION & ADVANCED NDT SERVICES

Ultrasonic Inspection Report

Costumer	Ascend Performance Materials		
Test Date	5/7/2020		
Test Identification	W-17	**Material Thickness**	.280"
Test Material	304 SS	**Joint Type**	Single V
Surface Condition	As Welded		
Welder Stencil	J		

Indication #	From X	From Y	Depth	Length	Type	Accept	Reject
1	4"	-0.125	.216"	.125"	Fussion	X	
2							
				FINAL		X	

Name of Operator	Brandon Wordekemper
Qualification Level	UTSW Lvl II/ PAUT Lvl II
Name of Operator	
Qualification Level	

Southern Services Inc.
INSPECTION & ADVANCED NDT SERVICES

SOUTHERN SERVICES INC.
INSPECTION & ADVANCED NDT SERVICES

714 Wade St. Clute, Tx. 77531
(979) 265-3342

SHEAR WAVE ULTRASONIC INSPECTION REPORT

For: ASCEND
Date: 6/2/2020
WO#13529967
Plant: Distribution
Equipment Name: WELD 1A, 2A, 3A

Ultrasonic Inspection Report

Costumer	REPCON/ASCEND		
Test Date	6/2/2020		
Test Identification	W# 1A,2A,3A	Material Thickness	0.600"
Test Material	Carbon Steel	Joint Type	BUTT WELD
Surface Condition	BUFFED		
Welder Stencil			

Indication #	From X	From Y	Depth	Length	Type	Accept	Reject
1	0.2	0.3	0.1	0.5	LOF		X
2							
3							
				FINAL		X	

The indication was found and repaired right away. The repair was then shear waved to determine the indication had been removed. The other two welds were good and had no rejectable indications.

Name of Operator	SIMON URIE	
Qualification Level	LVL II	
Name of Operator		
Qualification Level		

Southern Services Inc.
Inspection & Advanced NDT Services

SOUTHERN SERVICES INCORPORATED

S.T.S.

P.O. BOX 423 LAKE JACKSON, TEXAS 77566

(979) 265-3342 FAX (979) 265-1112

RADIOGRAPHIC INSPECTION REPORT

DATE:	6-15-2020	ACCEPTANCE CRITERIA:	B31.3 NFS
CUSTOMER:	Ascend - Turner	WORK ORDER #:	13529967
LOCATION:	ECU	ACCOUNT #:	
P.O. NUMBER:		CAPITOL NUMBER:	

LINE #	PIECE #	WELD #	EXPOSURE #	WELDER STENCIL	ACCEPT	REJECT	CRACK	LACK OF PENETRATION	I.P. DUE TO HI/LO	LACK OF FUSION	BURN THROUGH	INTERNAL UNDERCUT	EXTERNAL UNDERCUT	POROSITY	CLUSTER POROSITY	INTERNAL CONCAVITY	SLAG INCLUSIONS	OTHER DEFECTS	MATERIAL DIMENSIONS	NOMINAL WALL THICKNESS	PENTRAMETER	SOURCE TO FILM DISTANCE	EXPOSURE TIME	SINGLE WALL VIEW	DOUBLE WALL VIEW	SINGLE WALL EXPOSURE	DOUBLE WALL EXPOSURE
		63	1	J	✓														2"	.154	15	18					
			2		✓																						
		64	1		✓																						
			2		✓																						
		65	1		✓																						
			2		✓																						
		66	1		✓																						
			2		✓																						
		70	1	F	✓																						
			2		✓																						
		71	1		✓																						
			2		✓																						
		72	1		✓									✓													
			2		✓																						
		73	1		✓																						
			2	J	✓																						

Notes:

SOURCE:	Ir 192	% X-RAY:	%
CURIES:	29	PROFILES:	
FOCAL SPOT:	.129	100% X-RAY:	
FILM / TYPE:	Agfa D4	SPOT X-RAY:	

TOTAL FILM USED & SIZE: 16 3½x10

RADIOGRAPHER LEVEL II: G. D. Dean

RT ASSISTANT: T Reed

FILM INTERPRETED BY: [signature]

SSI-202

GSI Job No. 6193

ATTACHMENT V.4
ENGINEERING REPORT FOR
IWPF TANKS (PERMIT UNITS 08 AND 09)

Hazardous Waste Permit Renewal Application

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX V.4.9

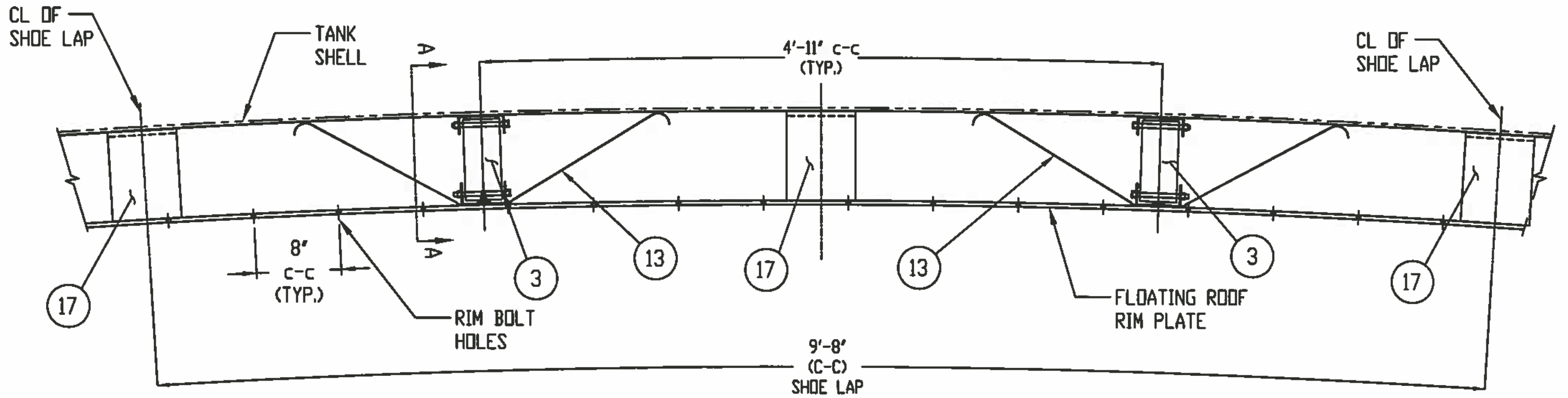
Appendix V.4.9 Design and Procedural Information for Replacement of Primary Floating Roof Tank Seal for Tank 332T1-1 (Permit Unit 08)

DIRECTANK
ENVIRONMENTAL PRODUCTS

FLOATING ROOF SEALS
82'-0" DIA. OPEN TOP TANK NO. 332T1-2
FHG, INC.
ASCEND
ALVIN, TX
PROJECT NO. 194-2022

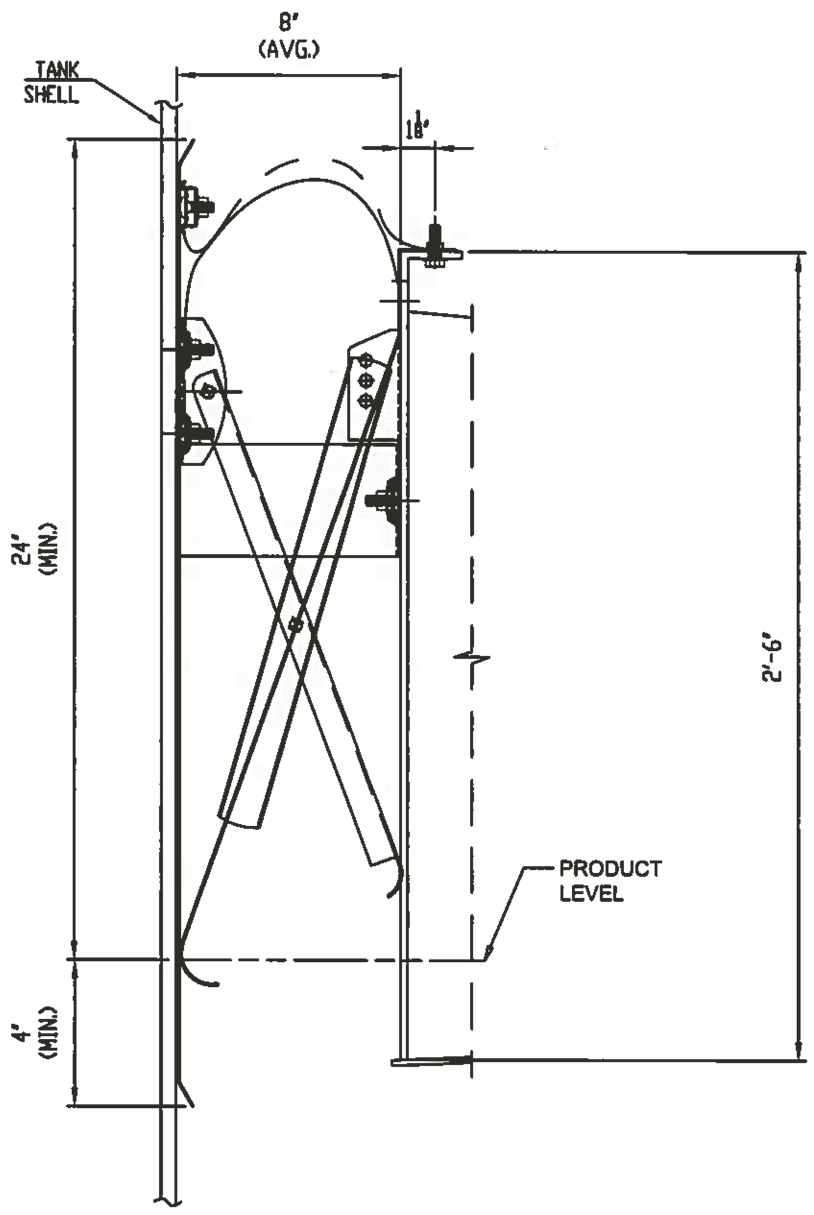
ITEM NO.	DWG NO.	DESCRIPTION	REVISION NO.
1	DT194-2022-01	DIRECT X PRIMARY MECHANICAL SHOE SEAL	1
2	DT194-2022-02	PRIMARY SEAL CONNECTION DETAILS	0
3	DT194-2022-03	PRIMARY SEAL SHOE HOLD-DOWN CONNECTION DETAILS	0
4	DT194-2022-04	DIRECTFLEX SECONDARY METALLIC WIPER SEAL	1
5	DT194-2022-05	ENGINEERING LAYOUT	0

STATE OF TEXAS
MICHAEL J. DOXEY
91519
LICENSED
PROFESSIONAL ENGINEER

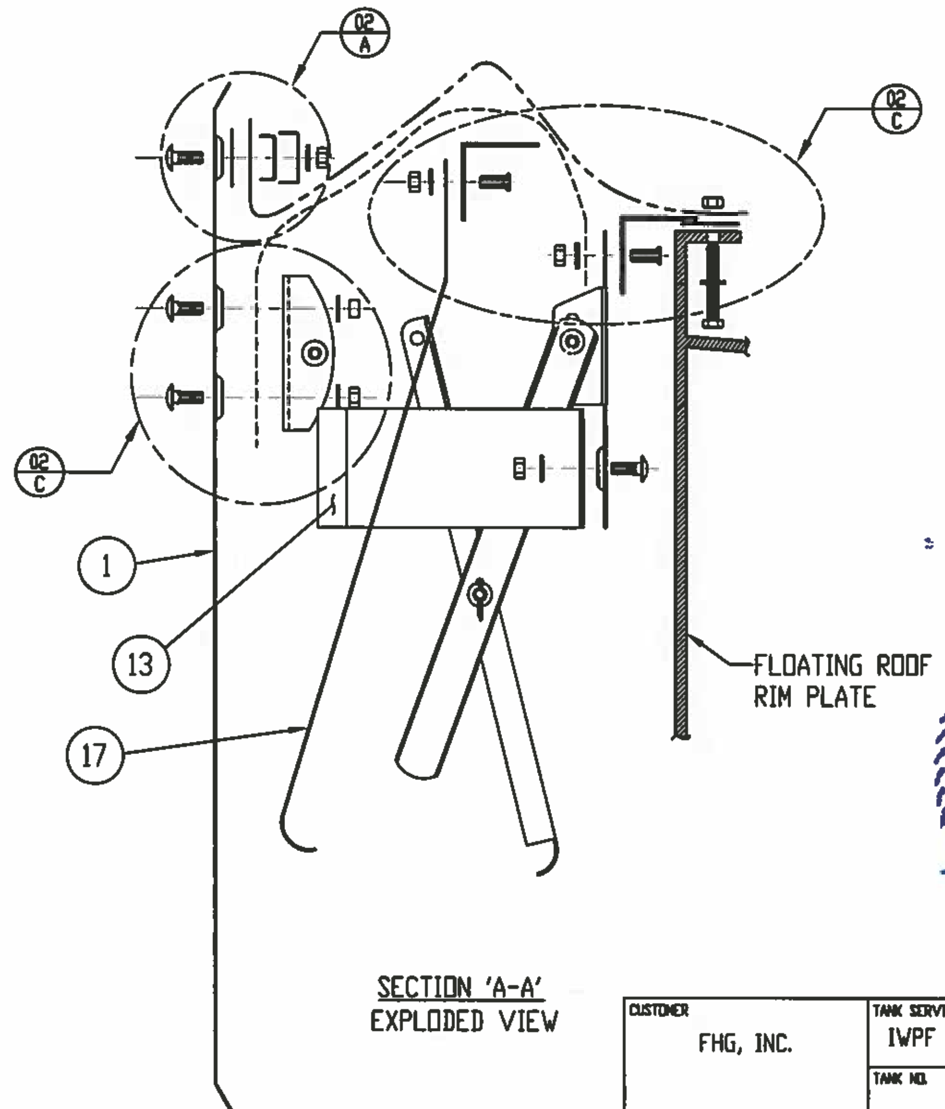


SECTION PLAN VIEW

PARTS LIST			
PM	QTY	PART	MATERIAL
1	29	SHOE PLATE, 18 GA. x 40" x 118"	304 S.S.
2	58	SHOE BRACKET, 14 GA.	304 S.S.
3	58	RIM HANGER ASSEMBLY, 14 GA.	304 S.S.
4	58	FABRIC SUPPORT STRAP, 65-MIL	HDPE
5	295 LF	FABRIC, 10-MIL X 20" WIDE	TEFLON
6	195	SHOE HD CHANNEL 'A', 20 GA.	304 S.S.
7A	58	SHOE HD SPLICE CHANNEL 'A' (LH), 20 GA.	304 S.S.
7B	29	SHOE HD SPLICE CHANNEL 'A' (RH), 20 GA.	304 S.S.
8	700	CARRIAGE BOLT, 3/8"-16 X 1"	18-8 S.S.
9	500	STUD BOLT, 3/8"-16 X 3"	18-8 S.S.
10	68	CLEVIS PIN, 3/8" DIA. X 5" (w/HITCH PIN)	18-8 S.S.
11	1800	FLAT WASHER, 3/8"	304 S.S.
12	119	ADAPTER PLATE 'CUSTOM', 14 GA.	304 S.S.
13	58	COMPRESSION BAR 'B', 16 GA.	301-1/4H S.S
14	6	FOAM TAPE, 1/8" x 2" X 100'	POLYETHYLENE
15	500	JAM NUT, 3/8"-16	18-8 S.S.
16	1200	HEX NUT (FIN.), 3/8"-16	18-8 S.S.
17	58	COMPRESSION PLATE 'B', 16 GA.	301-1/2H S.S
18	300	PEM STUD, 3/8"-16 X 1"	18-8 S.S.



SECTION A-A



SECTION 'A-A' EXPLODED VIEW

NOTES:

1. THIS SEAL HAS BEEN DESIGNED PER THE SPECIFICATIONS PROVIDED AND PER THE LATEST EDITION OF API STANDARD 650.
2. DESIGN RIM SPACE IS THE NOMINAL VALUE SHOWN IN SECTION 'A-A' WITH A WORKING RANGE OF ± 4".
3. SHOE PLATES SHOULD BE OVERLAPPED 1 TO 2 INCHES UNIFORMLY ALONG THE ENTIRE HEIGHT OF THE PLATE AND IN THE SAME DIRECTION AROUND THE CIRCUMFERENCE OF THE TANK (REFER TO DRAWING NO. 02, DETAIL 'D').
4. FOR SHOE HOLD-DOWN CONNECTION DETAILS (INCLUDING THE SHOE OVERLAP AND HOLD-DOWN SPLICE DETAILS) REFER TO DRAWING NO. 03.
5. REFER TO THE INSTALLATION INSTRUCTIONS FOR FURTHER DETAILS.

STATE OF TEXAS
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91519
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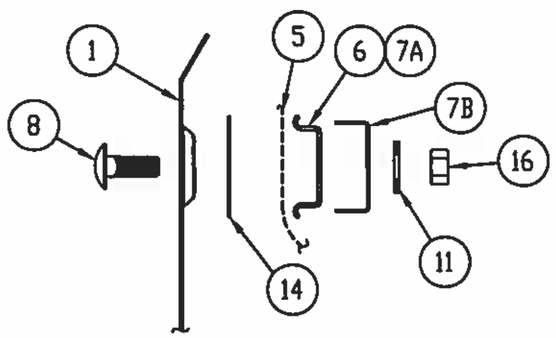
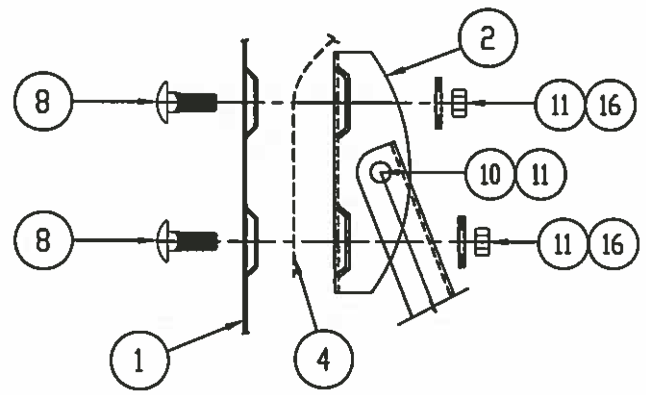
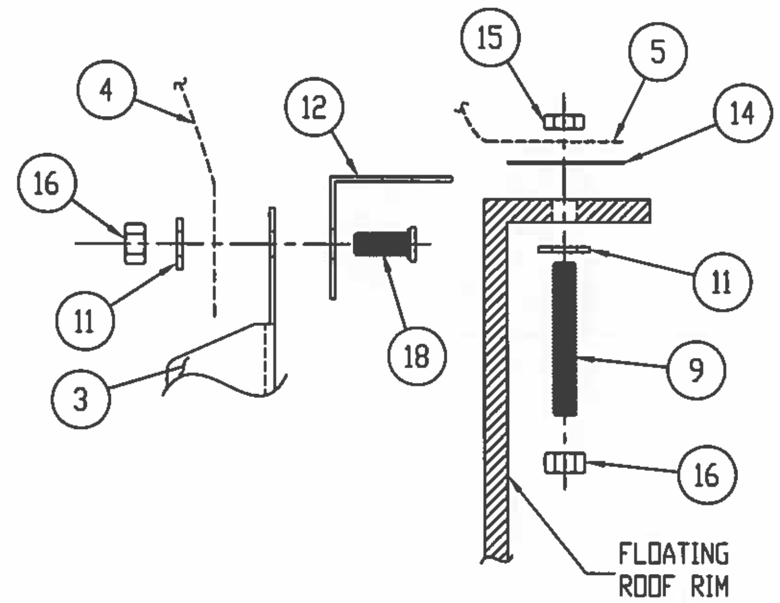
CUSTOMER	TANK SERVICE	TANK OWNER		
FHG, INC.	IWPF WASTE WATER	ASCEND		DIRECTANK ENVIRONMENTAL PRODUCTS
	TANK NO. 332T1-2	PREPARED BY MQ	DATE 10/06/22	
PROJECT LOCATION ALVIN, TX	TANK DIAMETER (FT) 82'-0"	CHECKED BY BA	DATE 10/06/22	DESCRIPTION DIRECT X PRIMARY MECHANICAL SHOE SEAL
The information contained herein is the property of DirecTank and may not be disclosed without the express written consent of DirecTank.	PAPER SIZE LEDGER	APPROVED BY BA	DATE 10/06/22	
	DIMENSIONS FT-IN	LAST MODIFIED BY TB	DATE 03/29/2023	DRAWING NO. DT194-2022-01 / REV 1 / SHEET 1 of 5



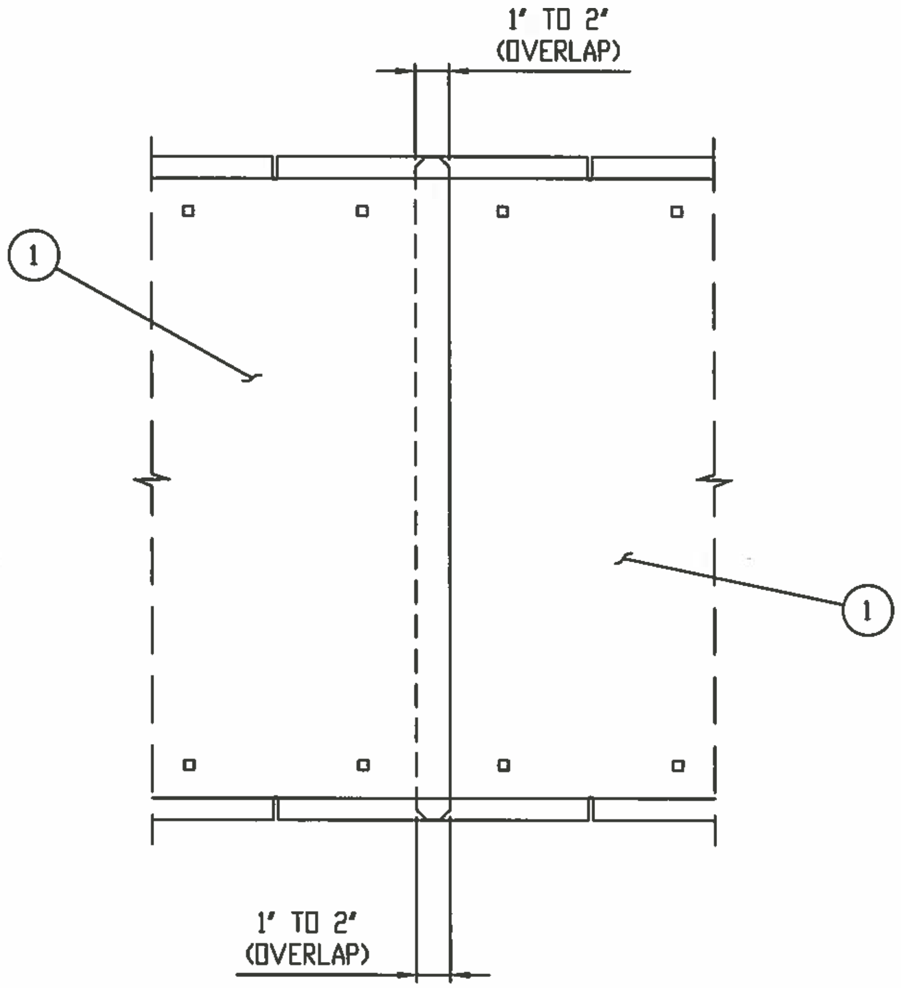
DETAIL 'A'



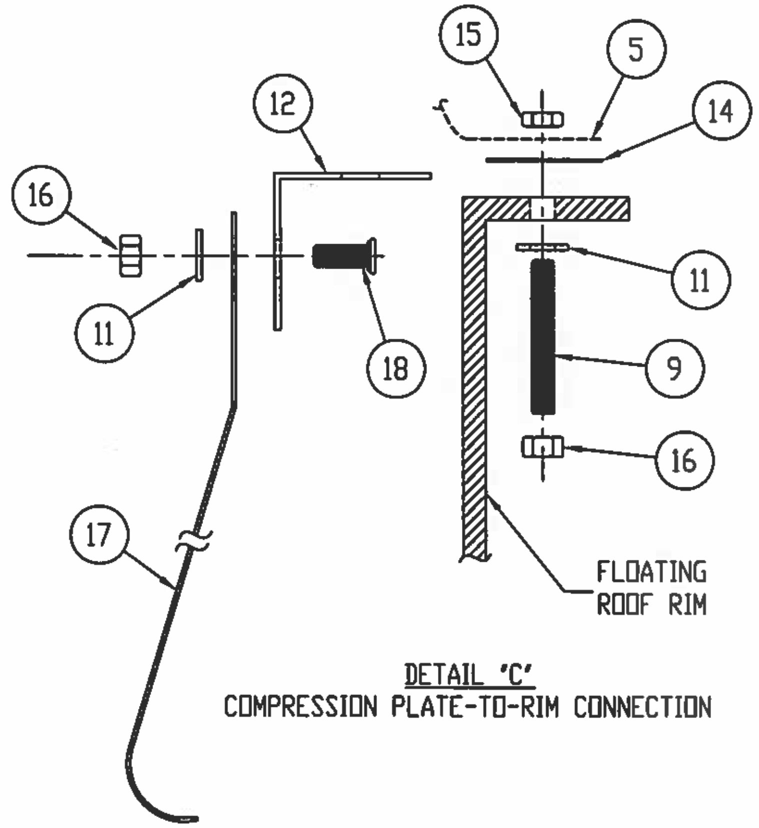
DETAIL 'B'



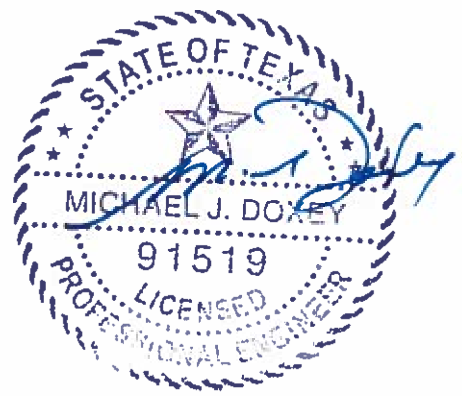
DETAIL 'C'
HANGER ASSEMBLY-TO-RIM CONNECTION



DETAIL 'D'

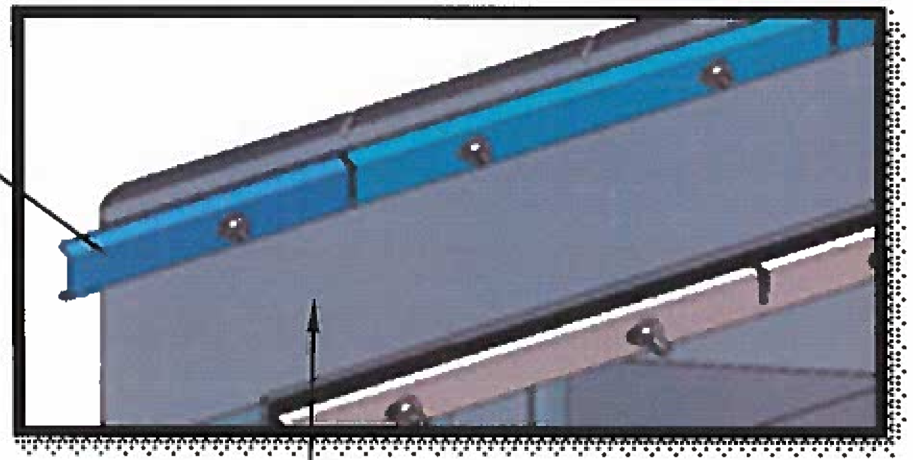


DETAIL 'C'
COMPRESSION PLATE-TO-RIM CONNECTION



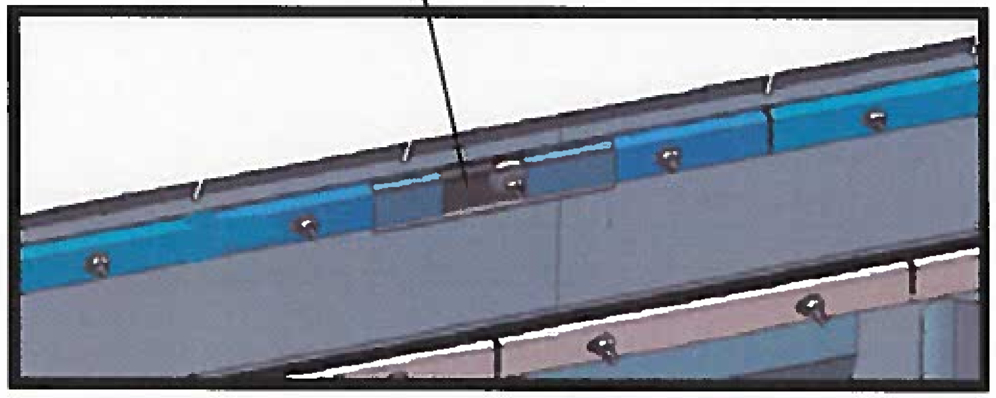
CUSTOMER FHG, INC.	TANK SERVICE IWPF WASTE WATER	TANK OWNER ASCEND		DIRECTANK ENVIRONMENTAL PRODUCTS
	TANK NO. 332T1-2	PREPARED BY MQ	DATE 10/06/22	
PROJECT LOCATION ALVIN, TX	TANK DIAMETER (FT) 82'-0"	CHECKED BY BA	DATE 10/06/22	DESCRIPTION PRIMARY MECHANICAL SHOE SEAL CONNECTION DETAILS
The information contained herein is the property of DirecTank and may not be disclosed without the express written consent of DirecTank.	PAPER SIZE LEDGER	APPROVED BY BA	DATE 10/06/22	
	DIMENSIONS FT-IN	LAST MODIFIED BY MQ	DATE 10/06/22	DRAWING NO. DT194-2022-02 · REV 0 · SHEET 2 of

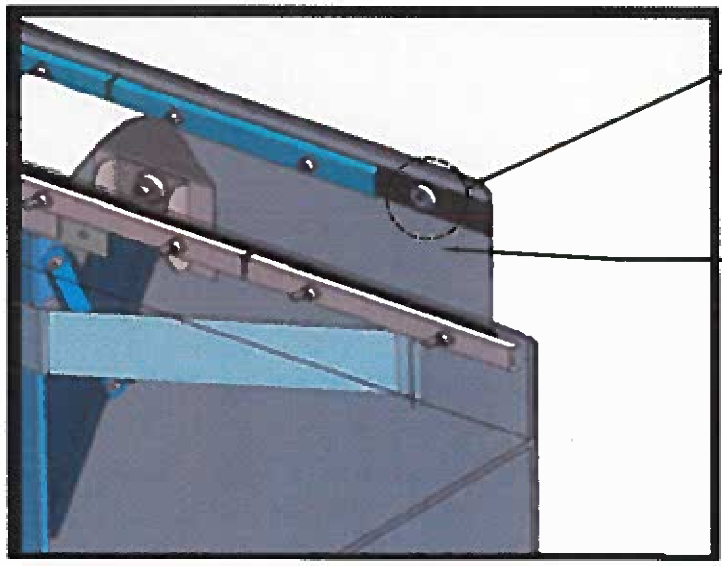
7A



LH SIDE
SHOE PLATE

7B





INSTALL
PM '7B'
HERE

RH SIDE
SHOE PLATE

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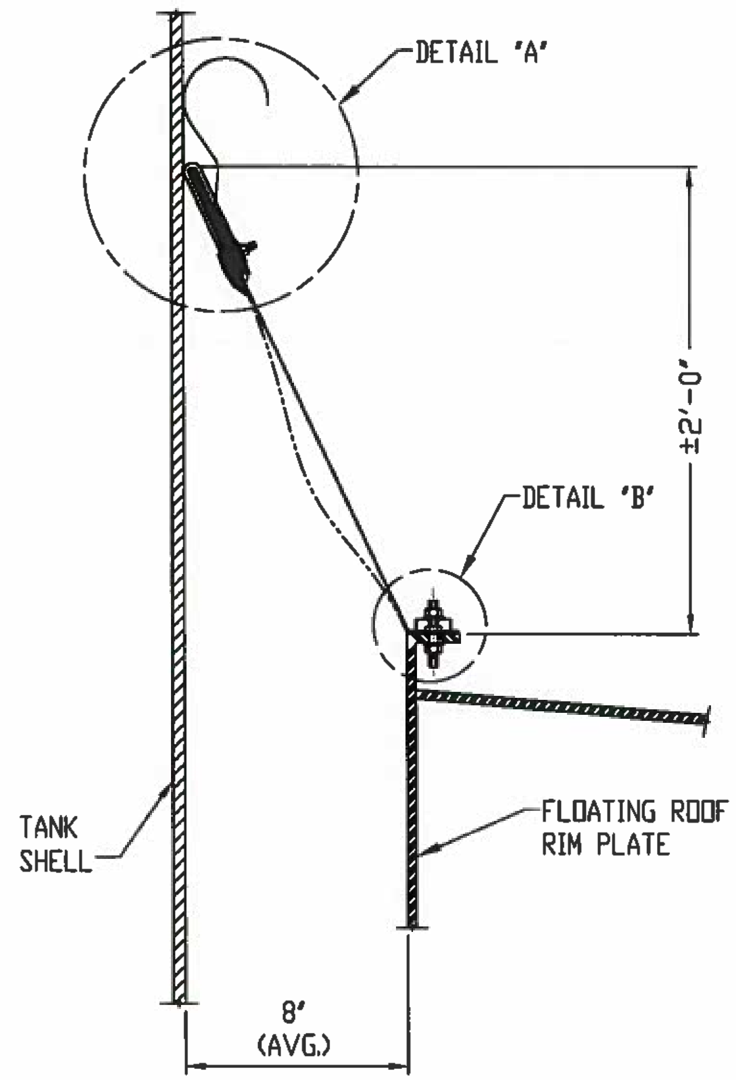
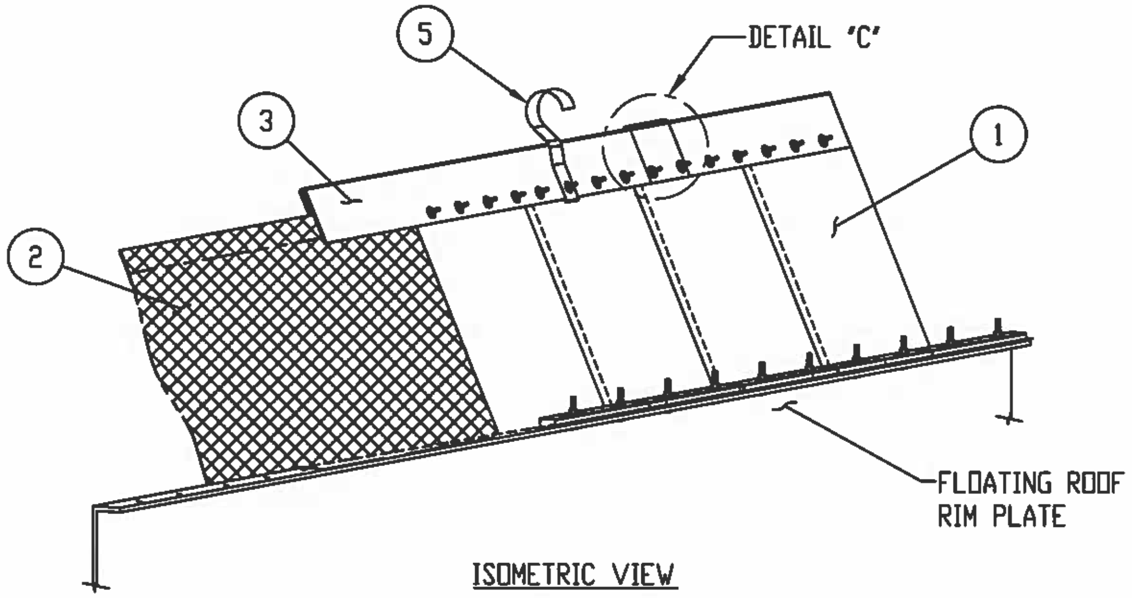
CUSTOMER	TANK SERVICE	TANK OWNER				DIRECTANK ENVIRONMENTAL PRODUCTS		
FHG, INC.	IWPF WASTE WATER	ASCEND						
	TANK NO. 332T1-2	PREPARED BY	MQ	DATE	10/06/22			
PROJECT LOCATION ALVIN, TX	TANK DIAMETER (FT) 82'-0"	CHECKED BY	BA	DATE	10/06/22	DESCRIPTION PRIMARY MECHANICAL SHOE SEAL SHOE HOLD-DOWN CONNECTION DETA		
The information contained herein is the property of DirecTank and may not be disclosed without the express written consent of DirecTank.	PAPER SIZE LEDGER	APPROVED BY	BA	DATE	10/06/22			
	DIMENSIONS FT-IN	LAST MODIFIED BY	MQ	DATE	10/06/22	DRAWING NO. DT194-2022-03	REV 0	SHEET 3 of

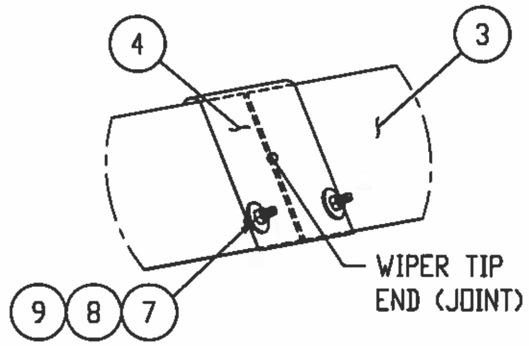


PROFILE VIEW

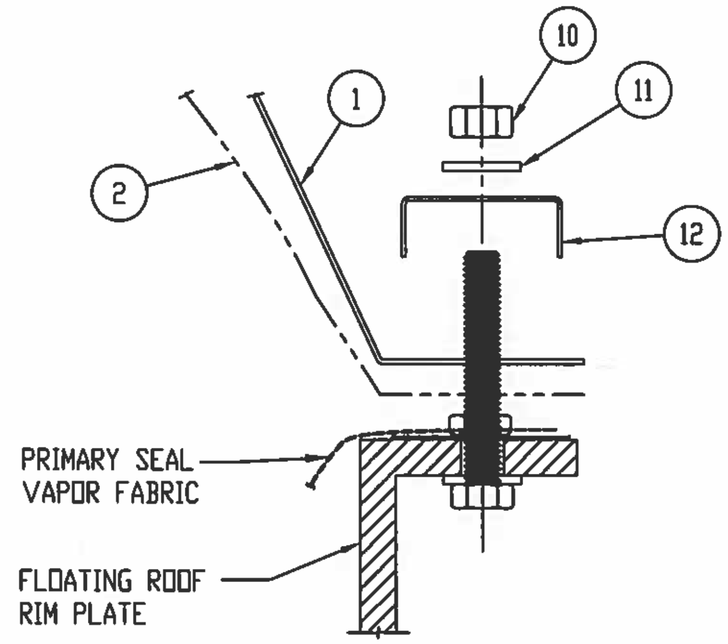


ISOMETRIC VIEW

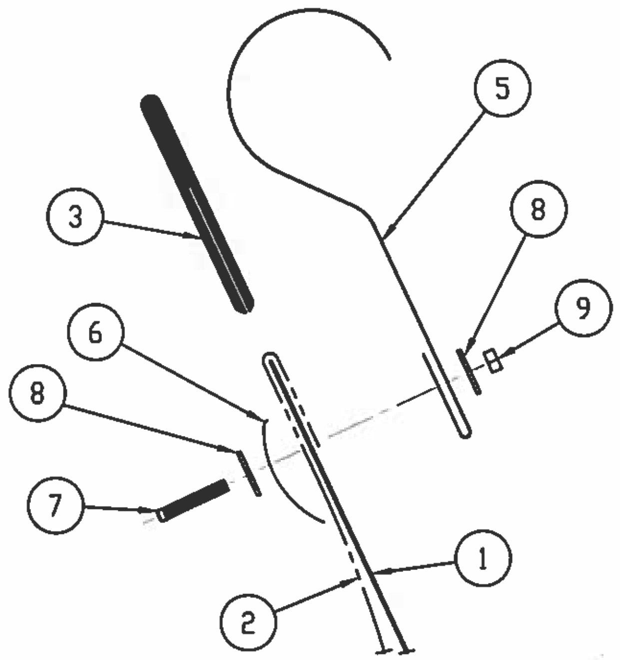
PARTS LIST			
PM	QTY.	PART	MATERIAL
1	185	COMPRESSION PLATE, 18 GA. X 20" X 25"	301-1/2H SS
2	285 LF	FABRIC, 10-MIL X 30" WIDE	TEFLON
3	300 LF	WIPER TIP 'A', 5" (FLAT)	NITRILE / PV BLEND
4	6	WIPER TIP SPLICE	304-1/2H SS
5	28	SHUNT 'A', 26 GA.	304-1/2H SS
6	800	PROTECTOR CLIP 'B'	304 SS
7	800	MACH. SCREW, #10-24 x 1 1/2"	18-8 SS
8	1600	FENDER WASHER, #10	304 SS
9	800	HEX NUT, #10-24	18-8 SS
10	500	HEX NUT (FIN.), 3/8"-16	18-8 SS
11	500	FLAT WASHER, 3/8"	304 SS
12	210	RIM HD CHANNEL, 14 GA. X 8" C-C (DS)	304 SS



DETAIL C
WIPER TIP SLICE



DETAIL 'B'

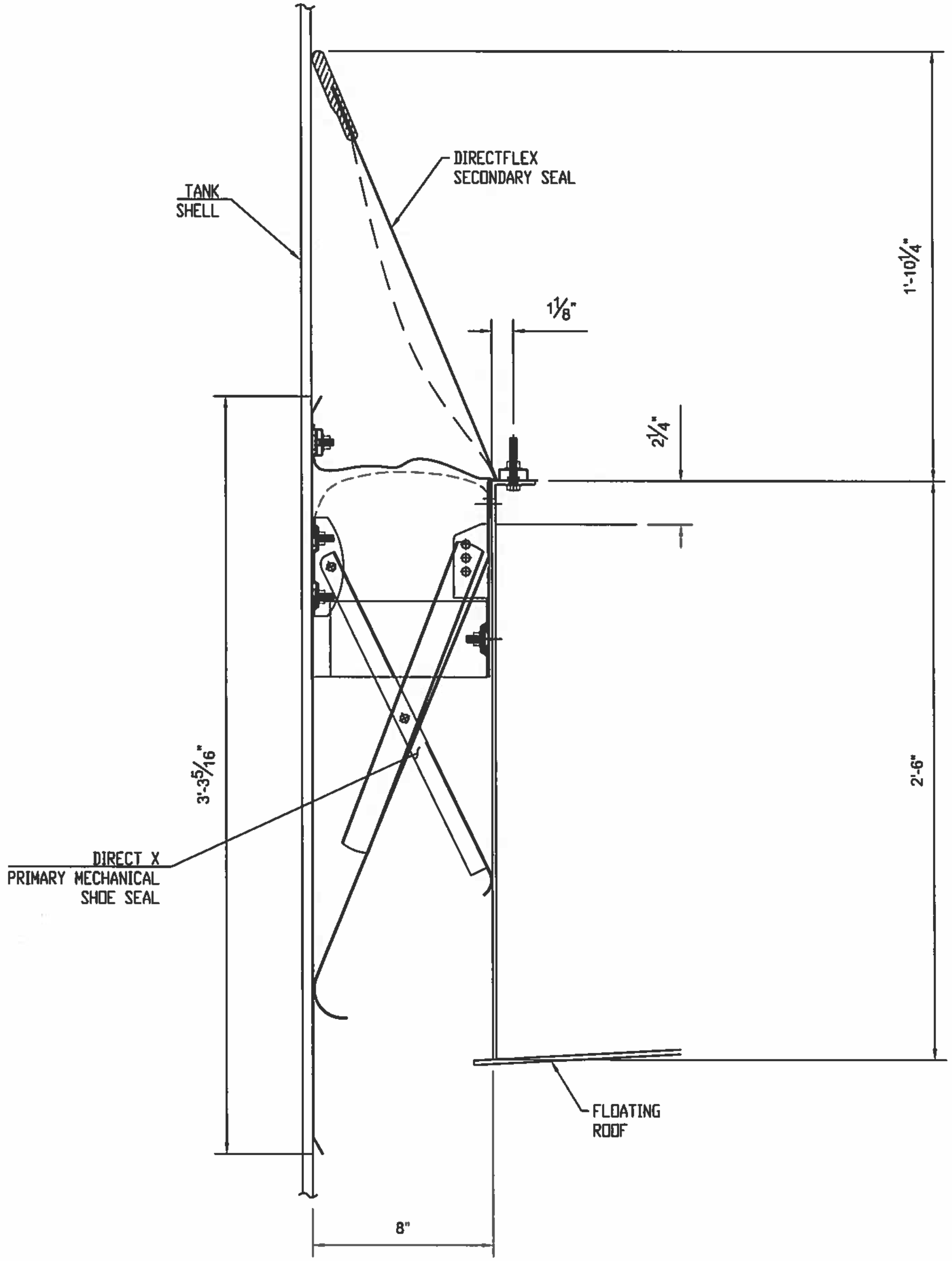


DETAIL 'A'

NOTES:

1. THIS SEAL HAS BEEN DESIGNED PER THE SPECIFICATIONS PROVIDED AND PER THE LATEST EDITION OF API STANDARD 650.
2. DESIGN RIM SPACE IS THE NOMINAL VALUE SHOWN IN 'PROFILE VIEW' WITH A WORKING RANGE OF ± 4".
3. INSTALL SHUNTS (PM #5) AT 10'-0" SPACING (MAXIMUM)..
4. REFER TO THE INSTALLATION INSTRUCTIONS FOR FURTHER DETAILS.

CUSTOMER: FHG, INC.	TANK SERVICE: IWPF WASTE WATER	TANK OWNER: ASCEND		DIRECTANK ENVIRONMENTAL PRODUCTS
	TANK NO.: 332T1-2	PREPARED BY: MQ	DATE: 10/06/22	
PROJECT LOCATION: ALVIN, TX	TANK DIAMETER (FT): 82'-0"	CHECKED BY: BA	DATE: 10/06/22	DESCRIPTION: DIRECTFLEX SECONDARY METALLIC WIPER SEAL
The information contained herein is the property of DirecTank and may not be disclosed without the express written consent of DirecTank.	PAPER SIZE: LEDGER	APPROVED BY: BA	DATE: 10/06/22	
	DIMENSIONS: FT-IN	LAST MODIFIED BY: TB	DATE: 03/29/23	DRAWING NO.: DT194-2022-04 / REV: 1 / SHEET: 4 of 5



STATE OF TEXAS
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CUSTOMER FHG, INC.	TANK SERVICE IWPF WASTE WATER	TANK OWNER ASCEND		DIRECTANK ENVIRONMENTAL PRODUCTS
	TANK NO. 332T1-2	PREPARED BY MQ	DATE 10/06/22	
PROJECT LOCATION ALVIN, TX	TANK DIAMETER (FT) 82'-0"	CHECKED BY BA	DATE 10/06/22	DESCRIPTION ENGINEERING LAYOUT
The information contained herein is the property of DirecTank and may not be disclosed without the express written consent of DirecTank.	PAPER SIZE LEDGER	APPROVED BY BA	DATE 10/06/22	
	DIMENSIONS FT-IN	LAST MODIFIED BY MQ	DATE 10/06/22	DRAWING NO. DT194-2022-05 · REV 0 · SHEET 5 of

Annex C
(normative)

External Floating Roofs

• C.1 Scope

C.1.1 This Annex provides minimum requirements that, unless otherwise qualified in the text, apply to single-deck pontoon-type and double-deck-type floating roofs. See Section 3 for the definition of these roof types. This Annex is intended to limit only those factors that affect the safety and durability of the installation and that are considered to be consistent with the quality and safety requirements of this standard. Numerous alternative details and proprietary appurtenances are available; however, agreement between the Purchaser and the Manufacturer is required before they are used.

C.1.2 The type of roof and seal to be provided shall be as specified on the Data Sheet, Line 30. If the type is not specified, the Manufacturer shall provide a roof and seal that is cost-effective and suitable for the specified service. Pan-type floating roofs shall not be used.

C.1.3 The Purchaser is required to provide all applicable jurisdictional requirements that apply to external floating roofs (see 1.3).

C.1.4 See Annex W for bid requirements pertaining to external floating roofs.

C.2 Material

The material requirements of Section 4 shall apply unless otherwise stated in this Annex. Castings shall conform to any of the following specifications:

a) ASTM A27M, grade 405-205 (ASTM A27, grade 60-30), fully annealed;

b) ASTM A27M, grade 450-240 (ASTM A27, grade 65-35), fully annealed or normalized and tempered, or quenched and tempered;

c) ASTM A216M (ASTM A216) WCA, WCB, or WCC grades annealed and normalized, or normalized and tempered.

C.3 Design

C.3.1 General

• **C.3.1.1** The roof and accessories shall be designed and constructed so that the roof is allowed to float to the maximum design liquid level and then return to a liquid level that floats the roof well below the top of the tank shell without damage to any part of the roof, tank, or appurtenances. During such an occurrence, no manual attention shall be required to protect the roof, tank, or appurtenances. If a windskirt or top-shell extension is used, it shall contain the roof seals at the highest point of travel. The Purchaser shall provide appropriate alarm devices to indicate a rise of the liquid in the tank to a level above the normal and overfill protection levels (see NFPA 30 and API 2350). Overflow slots shall not be used as a primary means of detecting an overfill incident. If specified by the Purchaser (Table 4 of the Data Sheet), emergency overflow openings may be provided to protect the tank and floating roof from damage.

• **C.3.1.2** The application of corrosion allowances shall be a matter of agreement between the Purchaser and the Manufacturer. Corrosion allowance shall be added to the required minimum thickness or, when no minimum thickness is required, added to the minimum thickness required for functionality.

C.3.1.3 Sleeves and fittings that penetrate the single deck or lower decks of annular pontoons or lower decks of double-deck roofs, except for automatic bleeder vents, rim space vents, and leg sleeves, shall have a minimum wall thickness of "Standard Wall" for pipe NPS 6 and larger and 6 mm ($^1/_4$ in.) for all other pipe and plate construction unless otherwise specified on the Data Sheet, Table 5. Such penetrations shall extend into the liquid.

C.3.1.4 The annular space between the roof outer rim of the floating roof and the product side of the tank shell shall be designed for proper clearance of the peripheral seal (see C.3.13). All appurtenances and internal components of the tank shall have adequate clearance for the proper operation of the completed roof assembly.

● **C.3.1.5** For tanks greater than 60 m (200 ft) in diameter, the deck portion of single-deck pontoon floating roofs shall be designed to avoid flexural fatigue failure caused by design wind loads. Such designs shall be a matter of agreement between the Purchaser and the Manufacturer, using techniques such as underside stitch welding.

C.3.1.6 All conductive parts of the external floating roof shall be electrically interconnected and bonded to the outer tank structure. Bonding (grounding) shunts shall be provided on the external floating roof and shall be located above the uppermost seal. Shunts shall be 50-mm (2-in.) wide by 28-gauge (0.4-mm [$^1/_{64}$-in.] thick) austenitic stainless steel as a minimum, or shall provide equivalent corrosion resistance and current carrying capacity as stated in API 2003. Shunt spacing shall be no more than 3 m (10 ft). All movable cover accessories (hatches, manholes, pressure relief devices, and other openings) on the external floating roof shall be electrically bonded to the external floating roof to prevent static electricity sparking when they are opened.

9.14 Repair or Replacement of Floating Roof Perimeter Seals

9.14.1 Primary Seals

Rim-mounted primary shoe seals and toroidal seal systems can be removed, repaired, or replaced. To minimize evaporation losses and reduce potential hazard to the workers, no more than one-fourth of the roof seal system should be out of an in-service tank at one time. Temporary spacers to keep the roof centered shall be used during the repairs. Primary seal systems mounted partly or fully below the bolting bar or top of the rim usually cannot be reached to allow removal in service. In this case, in-service repairs are limited to replacement of the primary seal fabric.

9.14.2 Secondary Seals

Rim-mounted and shoe-mounted secondary seals may be readily installed, repaired, or replaced while the tank is in service.

9.14.3 Seal-to-shell Gap

Repair and other corrective actions to maintain seal-to-shell gap requirements, include the following.

a) Adjusting the hanger system on primary shoe seals, and adding foam filler in toroidal seals.

b) Increasing the length of rim mounted secondary seals in the problem area.

c) Replacing all or part of the primary seal system along with possible installation of a rim extension for a secondary seal. This step shall be taken only after checking the annular space variation at several levels from low pump out to high liquid level.

9.14.4 Mechanical Damage

Damaged parts shall be repaired or replaced. Prior to taking this action, the cause of the damage shall be identified and corrected. Buckled parts shall be replaced, not straightened. Torn seal fabric shall be replaced.

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Mint Hill, NC 28227
p: 704-567-9548
f: 704-567-1848

EFR In-Service Seal Replacement Procedure

1) **Scope**

   a) The procedure addresses the replacement of external floating roof primary and secondary seal replacement.

   b) This procedure is relevant to external floating roofs.

      i) In-service seal replacements should be performed with the product level filled to as near to tank top as possible to limit product vapor settlement on roof as much as possible.

   c) This procedure does not address any type of internal floating roof seal replacement nor any out of service seal replacement or repairs.

2) **Equipment**

   a) Crane (provided by others)

      i) To set and remove material atop of tank

   b) Air Compressor

      i) Used to provide power to air tools needed to remove/install of the bolting hardware of the seal

   c) Non- Sparking Tools

      i) Incudes but not limited to hand wrenches, sockets, and hammers.

   d) Breathing Air/Bottle Trailer

      i) Full face breathing air masks to be utilized while any employee is atop of roof, whether working or not working.

      ii) Bottle trailer with bottle watch to be staged near tank to allow for faster communication between bottle attendant and holewatch.

   e) AFFF Foam Extinguisher

      i) Used to apply layer of foam atop of product once primary seal material is used

      ii) If at any time foam is starting to dilute atop of product during primary seal replacement a new layer of foam shall be added to provide a new layer of protection.

   f) Decontamination Station

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f: 704-567-1848

i) Decontamination station to be placed outside of tank as near as possible to spiral stairway to allow for quick access when needed.

ii) Workers are not to wear any clothing away from plant that has been wore under there Zytron 400 suit and must be left behind to wash at decontamination station.

g) Minimum Tank Entry Clothing

i) Zytron 400 hooded suits

ii) Rubber gloves

iii) Rubber Boots

2) Safety

a) All workers shall participate in JSA meeting prior to start of work daily

b) All workers shall review Safety Data Sheet prior to start of project.

c) AFFF foam shall be used during any exposing of product in rim space

d) Bottle watch and hole watch shall be required during confirmed space entry

e) All workers are to utilize decontamination station to wash any personal clothing that has been wore inside tank for work

f) All debris shall be placed in dumpster immediately upon removal from tank or decontamination station

g) All workers performing entry shall have 40-hour hazwoper training

h) All workers that enter tank must shower in decontamination station prior to leaving tank area

i) Only air tools and non-sparking tools are allowed inside of tank

j) All entrants shall comply with medical evaluations if required (e.g., urine testing) to determine possible exposure

3) Work Sequence

a) Set up jobsite

i) Setup work equipment

ii) Receive permit, discuss daily work scope, and review JSA daily

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Mint Hill, NC 28227
p: 704-567-9548
f: 704-567-1848

b) Build primary shoe hangers and prep primary shoes on ground prior to setting on roof

  i) Set hangers back in original shipping crate and use crane to set on roof

  ii) Apply foam tape to primary shoes and restack on pallet to set on roof

c) Remove secondary seal and primary foam log seal in tandem daily

  i) Only remove as much as can be replaced in one day

  ii) Foam logs and fabric will be placed in jumbo bags for removal from top of the tank and placed in dumpster (provided by others)

  iii) Secondary seal will remain off until after entire primary has been reinstalled

d) Spray AFFF Foam in rim space to dampen fumes and help prevent fire hazard

e) Install primary mechanical shoe seal utilizing adapter plates to prevent the need to drill holes in rim angle

  i) Adaptor plates are 10” long and should stay above abandoned studs of the original foam log seal install

  ii) Install primary fabric

f) Repeat steps A, B, and C until complete primary has been installed

g) Install secondary seal

  i) Full PPE still required at this point

h) Clean up and demob from site

  i) Remove all work-related tools and debris from atop of tank

  ii) Clean all work tools prior to loading back into work trailer

  iii) Demob from site

Safe Work Plan

Company: BBB Tank Services, LLC	Superintendent: Jonathan Wells	Foreman: Antonio Deleon	Start Date: TBD
Specify Job Location: Ascend Performance Materials – Chocolate Bayou		Unit Area: Tank Farm	Job Number:
Tank: T-332T1	Tank Type: 82' Diameter EFR Open Roof Top		☐ New JSA ☒ Revised JSA Revision Date:

Detailed Description of Job Scope: Mobilize Job site, make confined space entry, load all seal material onto EFR by crane, remove secondary Seal using air tools and non-sparking hand tools, Build primary seal, Replace 50-60' of primary seal at a time, Install Secondary Seal, Offload all old seal material by crane, demobilize job site

Each member of the field management team is required to sign the JSA before any work is performed

Title	Print Name	Signature	Date
Division Manager	Jonathan Wells		
Operations Manager	Antonio Deleon		
Safety Contact	Jesus Bravo		

CONTACT INFORMATION

Company	Name	Title	Phone Number
BBB Tank Services LLC	Jonathan Wells	Division Manager	(832) 707-4583
BBB Tank Services LLC	Antonio Reyes	Operations Manager	(713) 876-8116
BBB Tank Services LLC	Antonio DeLeon	Site Supervisor	(361) 765-0219
BBB Tank Services LLC	Jesus Bravo	Safety Supervisor	(832) 512 2266
Ascend Performance	Jim Duke	Planner/Coordinator	(918)-271-8138
Ascend Performance	John Macpherson	ECU	(832)-524-4958

BBB TANK SERVICES

Safe Work Plan

JOB SCOPE	ACTION	EXECUTION
1. IDENTIFY AND VERIFY PERSONNEL TRAINING / CERTIFICATION	1. Craft Certification.	1.a) Request and field verify certification, Repairman, and attendants.
	2. Training requirements *(Safety Council)*	2.a) 19ACSHRP, 19APMECU, 19APMPR, Hazwoper 40, Basic Plus/Refresher, fit test, Confined Space Entry, first aid and cpr.
2. EMPLOYEE MANAGEMENT	1. Number of Employees and Craft needed for the job -9 *(Subject to Change)*	1.a) Superintendent – 1 1.b) Safety person-(site visits) – 1 1.c) Repairman - 5 1.d) Confined Space Attendant – 1 1.e) Bottle Watch– 1
	2. At Risk Workers -At Risk Workers- Those who are new to company, new to craft or new to the site -Employees involved in an incident or accident may be placed in the At-Risk Worker program.	1.a)All Ascend Performance Materials policies will be strictly followed.

JOB SCOPE	ACTION	EXECUTION
	3. Work Schedule	3.a) 6 Days a week 3.b) 10 Hours Shifts. (6:30 – 5:30)
3. PERMITS & SAFETY DOCUMENTATION	1. Permit (s) Needed *(Ex. Safe Work Permit, Hot Work, and Confined Space, vehicle entry)*	1.a) A permit will be needed to begin work
	2. Obtain Work Permit	2.a) All required permits shall be obtained prior to starting work.
	3. Identify Permit Receivers (*By Name*)	3.a) Jonathan Wells, Antonio Deleon, Dumas Ranzy
	4. Standard Operating Procedures (SOP)	4.a) Request and follow all client's and BBB's Standard Operating procedures. 4.b) Consult BBB's Safety and Engineering departments for further support.
	6. Job Safety Analysis –*Report all incidents immediately to your supervisor/Ascend*	6.a) Job Safety Analysis is to be completed by the crew. 6.b) The JSA shall be reviewed by the site supervisor and signed by each crew member before work begins and when work is completed for the day. 6.c) Re-visit the JSA/Safe work permit and update if there are any job scope changes.

Safe Work Plan

JOB SCOPE	ACTION	EXECUTION
4. PPE REQUIREMENTS	1. Contractor Minimum PPE	1.a)Hard hat, ear plugs, cut proof gloves, leather steel toed shoes, FRC (outer most clothing), safety glasses, mono-goggles (on Hardhat).
	2. Required for work location	2.a) Full face supplied air respirator with 5 min. escape pack 2.b) Zytron 400 Chemical Suits 2.c) Chemical Gloves with Chemical tape 2.d)Rubber Boots
PPE REQUIREMENTS (continued)	3. Task associated PPE	3. a) Cut Proof impact resistant chemical Gloves
	4. PPE Training	4.a) Each Employee has been trained on the proper use of: 4.b) Fall protection 4.c) Respiratory protection
	5. Medical Certification (*Ex. Fit Testing*)	5.a) Medical evaluation with clearance and a fit test is required for all personnel 5.b) The correct respirator size that you were fit tested for must be worn.
	6. PPE for Environmental Conditions *(Ex. Low Light, Rain, Wind)* Cell Phones	6.a) Rain gear allowed for light rain situation outside of tank 6.b) Seek shelter during severe weather conditions. 6.c) If lightning is detected in the area go to a pre-approved safe shelter. No outdoor work, elevated work or work inside a steel structure shall be conducted. 6.d) Ascend has two lightening alerts, Alter sounds – First 15-mile, no elevated work, second 7-miles, shelter. After no lightening for 30 minutes, clear to go back to work. 6.e) No cell phones allowed inside the tank.

Safe Work Plan

JOB SCOPE	ACTION	EXECUTION
5. MOBILIZING ON JOBSITE	1.Company Trucks 2.Cell Phones	3.a)All drivers shall be qualified by BBB and must have a current driver's license on person while driving company vehicles. 3.b)Seat belts shall be worn by driver and all passengers. 3.c)Follow all speed limits, give right of way to pedestrians or employees riding bikes. 3.d)Cell phone use (handheld or hands free), are not allowed while driving in the plant. Pull over to an approved area and park the vehicle if phone use is necessary. 3.e) No cell phones allowed inside the tank. 3.f) All tools and materials shall be secured to prevent them from moving around or falling out of flatbed trucks.
	1.Security Escorts	5.a) All visitors shall be approved through security at main gate before entering
	2.Vendors/ Delivery personnel	6.a) Vendors/Delivery personnel shall comply with all PPE requirements or must remain in their vehicle.

Safe Work Plan

JOB SCOPE	ACTION	EXECUTION
6. MOVE ALL EQUIPMENT AND TOOLS INTO PLACE BEFORE WORK IS TO BEGIN	1. Lift equipment onto the Ladder Platform and setup –*Ensure work permit is in place prior to starting work* –*Lift all tools, hoses, fresh air equipment onto the Ladder Platform* –*Inspect all fresh air and equipment*	1.a) Spotter always when equipment is moving in the area 1.b) Lift fresh air equipment, and tools onto the ladder platform 1.c) Barricade area where lifting is to take place. 1.d) No one to stand under loads being lifted 1.e) cut proof gloves to be worn always while working 1.f) Inspect all equipment before use. 1.g) Inspect all fresh air hoses, masks, escape packs, and gauges before use. 1.h) Connect high pressure air line from 12-pack of fresh air to manifold on Ladder Platform 1.i) Connect all low-pressure air lines to manifold 1.j) Ensure all equipment has containment

TANK SERVICES

Safe Work Plan

JOB SCOPE	ACTION	EXECUTION
7.VERIFY TANK IS READY FOR CONFINED SPACE ENTRY	1. Ensure All controls are in place to safely enter tank –*Ensure all readings are at acceptable limits for confined space entry* –*Ensure tank is locked out* –*Ensure Floating roof is at the proper height (not on its legs)*	3.a) Confined Space Attendant will take reading from ladder Platform with Air monitor supplied by BBB Tank with 10' long hose and 3.b) LEL working levels must remain between 0%-10% If LEL goes above 10% the work must stop, and work must be revaluated before work can resume. 3.c) Supervisor shall walk the LOTO with operator to ensure the tank is static 3.d) Employees shall place their locks on the lock box and sign onto the LOTO. 3.e) Temperature to be monitored inside of confined space before work begins

BBB TANK SERVICES

Safe Work Plan

JOB SCOPE	ACTION	EXECUTION
8. MAKE CONFINED SPACE ENTRY	1. Descend rolling stairs onto floating roof –*Ensure Confined Space permit is in place and hole watch, and bottle watch,* –*Ensure all readings are at acceptable limits for confined space entry* –*Walk down rolling ladder onto floating roof* 2. Exiting rolling stairs when leaving tank –*Use Decon before Exiting the confined space*	1.a) PPE Shall consist of, chemical cut proof impact resistant gloves, full face supplied air respirator that is fitted to each individual, 5 min. escape packs, rubber boots, Zytron 400 Chemical suits, personal 4 gas monitors and full body harness. 1.b) All gloves and boots are to be sealed with chemical resistant seam tape 1.c) Bottle watch to be in place before employees don fresh air equipment 1.d) Bottle watch to notify employees in the confined space to begin to exit if pressure gauge reads 600lbs so that bottles may be changed. 1.e) Employee will descend/ascend stairs maintaining 3 points of contact at all time 1.f)Stairs are the only means of egress on tank and will remain clear of debris, hoses, or personnel while work is in progress. 1.g) attendant to be on constant stand by for the duration of the work. If for any reason, they must leave the confined space, entrants will be notified to exit the tank by air horn or voice. 1.h) When exiting the confined space employee will enter decon pool at base of rolling ladder stairs and rinse boots and suit off before exiting the tank 1.i) Before employees leaves dike area at base of stairs they shall enter second decon and remove all contaminated PPE . 1.j) Employees shall be helped out of their PPE by an attendant and all PPE shall be placed in Proper Containment 1.k) Any person helping someone remove Contaminated PPE shall be wearing proper PPE 1.l) Attendant to have plant radio for communication 1.m) Rubber Boots with defined heels and steel toe to be worn at all times.

Safe Work Plan

JOB SCOPE	ACTION	EXECUTION
9.LOAD NEW SEAL MATERIAL ONTO FLOATING ROOF BY CRANE	1. Load seal material onto floating roof by crane – *Mobilize crane* – *Visual inspection of all rigging and crane* – *Proper rigging to be used for the load* – *Fly material onto floating roof*	1.a) Ensure crane is not setup close to power lines 1.b) Preform inspection of crane and all rigging to be used on the lift 1.c) Ensure the rigging is suited to the load to be lifted 1.d) Tag line to be on all loads being lifted 1.e) Barricade area where lifting is to be taken place with red barricade 1.f) Absolutely no personnel to walk under a load while it is being lifted 1.g) Spotter to always have radio and visual contact with the crane operator 1.h) Fly pallets of seal material onto external floating roof 1.i) Watch hand placement when landing material, pinch points under load when landing and also on rigging while lifting 1.j) If winds are over 20mph lifts are to be stopped 1.k) Spotter while crane is being escorted from the job site

Safe Work Plan

JOB SCOPE	ACTION	EXECUTION
10.REMOVE SECONDARY SEAL	1.Remove Secondary Seal from tank – *Using Air and Hand Tools Remove the hold down bars holding the secondary seal* – *Remove Stainless shields from wiper tip with air and hand tools* – *Remove all stainless secondary parts from inside of tank*	1.a) All employees must be signed on to the lock box tag prior to entering the tank. 1.b) Everyone will have full knowledge and understanding of the daily Job Safety Analysis (JSA) prior to beginning any work. 1.c) Employee shall always have msa Air monitor in the vicinity of the work area 1.d) LEL working levels must remain between 0 & 10% If LEL goes above 10% the work must stop, and work must be revaluated before work can resume. 1.e) Employees to be wearing personal 4 gas monitors 1.f) Employees will wear cut resistant chemical gloves that are clean and in good condition when working with this material. 1.g) Employees shall ensure that while using the utility knife, all cuts will be made away from the body, and others. 1.h) Remove fasteners from hold down bars using air and non-sparking hand tools 1.i) Remove Secondary shields from rim angle and lay on deck 1.j) Separate secondary seal into manageable/liftable section 1.k) Place all secondary material into a skid pan to be flown out of the tank by crane 1.l) Make sure to use team lifting when carrying seal material and bend at the knees while lifting

JOB SCOPE	ACTION	EXECUTION
10.REPLACE PRIMARY SEAL All Cutting Tools To be Selected Via the Ascend procedure for Cutting Tools	1.**Remove primary seal in 50-60' Sections.** –*Remove primary foam log from rim angle using air tools and hand tools* **2. Assemble new primary seal on deck of EFR.** – *Spread out seal parts and assemble* –*Use air tools to tighten all seal parts* **2. Install primary shoes and fabric in 50'-60' sections.** –*Drop shoes into rim space and install primary fabric*	1.a) Employees to begin removing primary seal using air and non-sparking hand tools by unbolting the hold downs that hold the fabric 1.b) All primary vapor barrier will be removed with self-retracting razor knives and placed into bags for removal from tank 1.c) When Removing Foam Logs from Rim Space, Employee Will pull up on log while keeping it at arm's length 1.d) Foam Log will be left to drain by roof drain at the middle of the floating roof until all excess liquid has been removed 1.e) All rim fabric hold down bars to be unbolted from the rim angle an placed on the deck 1.f) Attach all parts to primary shoes and tighten using air and hand tools 1.g) Assemble primary seal hanger arms and tension springs 1.h) When primary shoes are completely built three people to lower into rim space and attach to rim bolts with hanger adapter plates that slide over the rim bolts 1.i) Primary shoe to be always tied off while being lowered into rim space and another employee standing by holding the rope 1.j) Install Tension springs into rim space and connect to rim bolt, all parts being installed into rim space to be tied off 1.k) Install primary fabric to shoe and rim using a self-retracting razor knife while wearing cut resistant gloves 1.l) Fasten the primary fabric down to the seal and rim angle 1.m)While Product is exposed in the Rim Space and the Primary seal is not actively being worked on, Rim Space to be covered by using thick visqueen Plastic and attaching the plastic to the shell and to the rim Angle using Shell magnets. Reducing any excess Vapor 1.n) The remaining old primary parts to be unbolted from rim angle and removed from rim space, all parts will be held to drain before removing completely from rim space 1.o) All T-Bars and old hold down arms to be tied off before being detached from the rim angle 1.p) All personnel working over rim space to wear tool tethers always attached to hand tools to prevent tools from falling in product 1.q) Remaining primary seal part to be unbolted from rim angle and placed into skid pan on the middle of the deck

Safe Work Plan

JOB ELEMENT	ACTION	EXECUTION
11. INSTALL SECONDARY SEAL **12.RINSE EFR WITH PRESSURE WASHERS** **13. INSTALL VACUUM BREAKER GASKETS**	**1.Install Secondary onto floating roof** – *Assemble secondary wiper and secondary shields on deck of floating roof* –*Stand assembled secondary seal onto rim angle and apply hold down clamps to seal* –*Tighten hold down clamps with Air tools* **2.Rinse EFR with Pressure washer** – Rinse EFR with water pushing all standing water to the roof drain **3.Install Vacuum Breaker Gaskets** – *Install Trim Seal around the edge of the Vacuum Breaker Well*	2.a) stand secondary shields onto rim angle and cut secondary fabric to place over rim bolts with a self-retracting razor knife 2.b) Install wiper on the secondary shields and drill wiper with air drills, insert bolting and tighten 2.c) Place spacers behind wiper and be careful of hand placement where the drill is going through the wiper tip 2.d) Continue process until seal is installed completely and then splice the secondary fabric together with a mechanical fabric splice 2.e) Install new stainless ground shunts onto secondary every 10' feet 2.f) Reinstall all stainless hold down bars to the rim angle with nuts and washers 2.g) Tighten all bolting on rim and secondary shields using air and hand tools 2.h) When rinsing EFR surfaces will be slippery, walk slowly. 2.i) Do not use the pressure washer if anyone is in the line of Fire 2.j) Leave no sheen on floating roof all water is to be rinsed and squeegeed to the roof drain 2.k) Press edge gasket onto vacuum breaker well all the way around by hand to install.

Safe Work Plan

JOB SCOPE	ACTION	EXECUTION
14.REMOVE ALL MATERIAL FROM FLOATING ROOF BY SKID AND CRANE	1.Load all material into skid that is placed on floating roof by crane – *crane to unload seal material off EFR* – *Skid to be used to unload all old material* – *Skid to be placed by side of tank and all material unloaded into Ascend provided bins*	1.a) Constant communication shall be maintained between the rigger and operator. 1.b)If communication is lost at any point the lift should be stopped. 1.c) Only qualified and certified riggers are allowed to attach rigging devices to material. 1.d)All rigging equipment shall be inspected prior to use. 1.e) Any rigging equipment found to be defective or damaged shall be tagged out of service and removed from the jobsite. 1.f) The operator shall sound the horn before swinging the load in order to notify personnel in the area, and to allow sufficient time to move away to a safe distance. 1.g) Hand load all damaged material into empty skid to be sent to the ground next to the tank 1.h) Employees will stand clear of the area while lifts are being made 1.i) One wooden pallet of shoes and one wooden crate of secondary parts will be removed from the floating roof 1.j) Operator shall keep alert to others that are working in the near-by vicinity and use a spotter to guide the operator and control traffic in the area as needed. 1.k) Riggers should ensure that during the lift, personnel have not entered the swing radius. No loads shall be swung over any person's head. 1.l)Tag line(s) shall be used to help guide load into place. 1.m)Tag lines shall be free of knots and loops 1.n)Lifting material with crane shall be suspended if wind speed exceeds twenty (20) mph. A reassessment of conditions must be completed and reviewed with client operator and client safety to decide if it is safe to continue with the lift.

Safe Work Plan

JOB ELEMENT	ACTION	EXECUTION
15.DEMOBILIZE TANK AND OFFLOAD ALL EQUIPMENT AND TOOLS.	**1.Remove all equipment and tools from tank** – *Clean all tools and equipment before lowering off EFR* – *Lower all hoses, tools, and equipment to the ground using safety rope and a pulley for assistance* – *Place any contaminated material into drums to be disposed of (Tyveks, Gloves, Rags)* –*Check entire area for cleanliness before leaving site*	1.a) Only approved clear, indoor/outdoor safety glasses should be used when working outside 1.b) All employees on site will wear approved hard hats and PPE at all times on job site. 1.c) No employees to stand under a load at any times 1.d) No employee will lift 50lbs or greater without assistance. 1.e) Tools and Air Hoses will be Loaded out of tank via Crane and Skid Plan 1.f) Employees will wear gloves always handling materials. 1.g) All employees will maintain awareness of hand placement at all times loading and unloading material to avoid pinch points 1.h) All crew members will maintain strong communication of actions to eliminate possible line of fire (LOF) issues. 1.i) Site will be inspected before leaving to ensure housekeeping has been upkept. 1.j) All locks to be removed from LOTO box and signed off before leaving site

Additional Tools and Equipment Needed

TOOLS AND EQUIPMENT	TASK TO BE PERFORMED
20-(12) pack of fresh air bottles, 100’ high pressure hose, 1 manifold, 1600’ of low-pressure hose, 6 full face respirators, 6 (5) Minute escape packs,	Fresh air setup will be required to make entry into the tank,
Decon Trailer Supplies	Soap, Detergent, Towels, Cleaning Supplies
Individual 4 gas monitors	To be worn on employee’s person
2-MSA 4-Gas Monitors,	For use to monitor atmosphere
Kiddie Pools and Visqueen	To be used for Decon When Removing the Tank Or Removing PPE
1 crane	To load/unload material onto tank – Supplied By Ascend
1 compressor on site to run air tools	Replace seals on tank -Supplied By BBB Tank
Site Vehicles	1) Site supervisor 1) Site Safety 2) Company Trucks for Crew
Brass Sockets, Pneumatic Impact, Pneumatic Drill, Brass Wrenches, Brass Pliers, Brass Hammers, Drill Bits	To Remove Bolting and Tighten bolting on the new shoe seal, Impacts are to use only brass sockets when loosening or tightening bolts, wrenches to use as a backup to tighten or loosen bolts, Pneumatic Drill to drill holes in the Neoprene wiper tip on the secondary seal, no drilling over live product, brass hammers to tap primary shoes into place. Drill bits for the holes on the wiper tip

Safe Work Plan

- **Tools shall be used as their design was intended and shall not be modified.**
- **Tools and Equipment must be inspected prior to use**
- **Ensure all personnel are trained on proper use of tools and equipment**

JSA Reviewed With

	Print Names of Workers that Reviewed the JSA	Workers Signatures	Date
1			
2			
3			
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Hazardous Waste Permit Renewal Application
Ascend Performance Materials Texas Inc., Alvin, Texas

Hazardous Waste Permit No. 50189

Part B, Section V: Appendix V.C.2 – Engineering Report for Solids Handling Unit Tanks

Note: The Engineering Report for Solids Handling Unit Tanks, originally issued 28 June 2019, in the previous hazardous waste permit renewal application, is submitted along with the information from the Class 1 Permit Modification submitted 22 October 2021. Therefore, the original Engineering Report and the modifications are submitted.

GSI Job No. 5106

GSI ENVIRONMENTAL

ATTACHMENT V.11
ENGINEERING REPORT FOR
SOLIDS HANDLING UNIT TANKS

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No. 5106

ATTACHMENT V.11
ENGINEERING REPORT FOR
SOLIDS HANDLING UNIT TANKS

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

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GSI Job No. 5106

CERTIFICATION OF ENGINEERING REPORT FOR SOLIDS HANDLING UNIT TANKS

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

I, Elaine A. Higgins, a registered professional engineer in the State of Texas, certify that the Engineering Report issued on 19 September 2019 for Decant Tank 1; Filtrate Tank 2; and Mix Tanks 3, 4, 5, and 6 on the Ascend Performance Materials Texas Inc. facility in Alvin, Texas, has been prepared in accordance with the requirements of 40 CFR 264.190-200 for Tank Systems.

19 September 2019

Elaine A. Higgins, P.E.
State of Texas Registration No. 85482
GSI Environmental Inc.
Registered Engineering Firm No. F-01198

ENGINEERING REPORT FOR
SOLIDS HANDLING UNIT TANKS

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

1.0 DESCRIPTION OF SOLIDS HANDLING UNIT

1.1 Basis for the Engineering Report

The Solids Handling Unit includes a system of permitted hazardous waste management tanks and permit exempt tanks, containers, and appurtenant equipment to be employed for dewatering and/or treating hazardous waste solids generated by manufacturing and waste processes on the Ascend Chocolate Bayou Plant in Alvin, Texas. The Unit has been designed and will be constructed in accordance with applicable regulations under 40 CFR 264 Subpart J for tanks and 40 CFR 265 Subpart J for interim status tanks. The location of the Solids Handling Unit is shown on Figure V.11.1

Additional detail regarding the Solids Handling Unit is provided in this Engineering Report which has been organized to generally follow the regulations as set forth in 40 CFR 264 Subpart J.

1.2 Hazardous Wastes to Be Managed in the Solids Handling Unit

Two waste streams will be managed in the Solids Handling Unit, both consisting of a slurry of solids and water.

- ***Solids from Department 331:*** Prior to routing to the Solids Handling Unit, wastewater generated by the Acrylonitrile manufacturing units on the Ascend Chocolate Bayou Plant (i.e., AN Unit 2/3 and AN Unit 7) is processed in Department 331. Department 331 separates solids from process waste water: solids are collected in Tanks 331T5-1 and 331T5-2 and water is disposed via the on-site permitted injection wells. On an as-needed basis, solids are transferred via piping from Department 331 to the Solids Handling Unit for further processing.

- ***Solids from IWPF Tanks:*** The permitted IWPF Tanks 332T1-1 and 332T1-2 (Permit Units 08 and 09, respectively) are used for the storage and processing of hazardous wastewater and sludge prior to disposal in the on-site permitted injection wells (see Attachment V.4 in Part B Section V). On an as-needed basis, solids which accumulate in the tanks are transferred via piping to the Solids Handling Unit for further processing.

EPA waste codes associated with the wastes described above are listed on Table IV.B - Wastes Managed in Permitted Units and waste stream numbers are listed on Table V.C - Tanks and Tank Systems.

1.3 Overview of Waste Management Procedures

The principal components of the Solids Handling Unit will include six permitted tanks (i.e., Decant Tank 1, Filtrate Tank 2, and Mix Tanks 3, 4, 5, and 6). Ancillary, permit exempt equipment will include the following major elements: i) tanks for additives such as diatomaceous earth, coagulant, caustic, and acid; ii) granular activated carbon units; iii) a filter press; and iv) roll-off boxes for transfer of processed solids. A process flow diagram (PFD) for the Unit is provided on Figure V.11.2. The layout of permitted tanks, permit exempt tanks, and ancillary equipment is depicted on Figures V.11.3 and V.22.4. Processing of the waste streams to be managed in the Solids Handling Unit will be conducted as described below.

1.3.1 Processing of Solids from Department 331

Solids will be slurried with water in Department 331 and piped to Mix Tanks 3, 4, 5, and 6 on an as-needed (i.e., campaign) basis approximately 2-3 times per year. Caustic will be added to the sludge in the Mix Tanks after which the solids will be allowed to settle and the supernatant liquid will be decanted. Supernatant liquid will be pumped to Decant Tank 1 and thence to the IWPF Tanks. Sufficient water will be added to the settled solids to facilitate pumping the filter press. Diatomaceous earth and/or coagulant may be added as necessary to facilitate removal of water in the filter press. Liquid from the filter press will be pumped to Filtrate Tank 2 and thence to the IWPF Tanks.

Filter cake which is produced by the filter press will be conveyed to roll-off boxes. The roll-off boxes will be stored temporarily in a permit exempt (i.e., less than 90-day) storage area while laboratory testing is being conducted to ensure that the solids meet applicable Land Disposal Restrictions (LDR). After sampling confirms that LDR requirements have been met, the solids will be then be transferred to a permitted landfill for disposal.

1.3.2 Processing of Solids from IWPF Tanks

Solids will be slurried with water at the IWPF Tanks and piped to Mix Tanks 3, 4, 5, and 6 on an as-needed basis. The slurry will be routed to the filter press for separation of liquids and solids. Liquids from the filter press will be returned to the IWPF Tanks.

Filter cake will be transferred to roll-off boxes and mixed with cement for the immobilization of antimony. The roll-off boxes will be stored temporarily in a permit exempt (i.e., less than 90-day) storage area while laboratory testing is being conducted to ensure that the solids meet applicable Land Disposal Restrictions (LDR). After sampling confirms that LDR requirements have been met, the solids will be then be transferred to a permitted landfill for disposal.

2.0 DESIGN AND INSTALLATION OF THE SOLIDS HANDLING UNIT (264.192)

2.1 Design of the Solids Handling Unit (264.192(a))

2.1.1 Design Standards for Tanks (264.192(a)(1))

In accordance with 40 CFR 264.192, the foundation, structural support, seams, and connections of the Solids Handling Unit tanks have been designed and materials will be selected in order to i) possess sufficient structural strength, ii) be compatible with the hazardous and non-hazardous materials managed, and iii) prevent corrosion so that Solids Handling Unit tanks will be protected from collapse, rupture, or failure. Tanks have been designed in accordance with API 650.

- ***Decant Tank 1*** is a vertical cylindrical tank with a cone bottom with a diameter of 10 ft and an overall height of approximately 22 ft, including the cone bottom and spherical head having a maximum capacity of 7,000 gallons (see Appendix V.11.1).

- ***Filtrate Tank 2*** is a vertical cylindrical tank approximately 9 ft diameter and 22 ft tall having a maximum capacity of 7,000 gallons (see Appendix V.11.2).

- ***Mix Tanks 3, 4, 5, and 6*** will be horizontal cylindrical tanks 36 ft long and 11 ft wide, each having a capacity of 25,500 gallons (see Appendix V.11.3).

2.1.2 Hazardous Characteristics of Wastes (264.192(a)(2))

The Solids Handling Unit will manage both characteristically hazardous waste (i.e., corrosive, reactive, and toxic) and listed hazardous wastes which were listed owing to toxicity and or ignitability and reactivity, as follows:

Hazard Code/ Reason for Listing	EPA Hazardous Waste Nos.
Ignitability	D001*
Corrosivity	D002
Reactivity	D003
Toxic	D004, D005, D006, D007, D008, D010, D018, D026, D035, D038, F003, F039, U188
Acutely toxic	P003, P030, P036, P063, P101, P106
Toxic and reactive	K011, K013, K014

Note: * = Waste has less than 10% TOC.

2.1.3 Tanks in Contact with Soil or Water (264.192(a)(3))

No corrosion protection is required, as all tanks are located above ground on concrete bases within secondary containment.

2.1.4 Traffic Protection (264.192(a)(4))

No traffic protection is required, as all tanks are located above ground and no vehicles will be driving over the tanks.

2.1.5 Other Design Considerations (264.192(a)(5))

- *Tank Foundations (264.192(a)(5)(i):* Tanks will be placed directly on the base of the reinforced concrete secondary containment which will provide sufficient support for the tanks and capable of maintaining the load of the tanks when full. The foundation for the tanks will be resistant to pressure gradients above and below the system, and will be capable of preventing failure due to settlement, compression, and/or uplift.

- *Tank Anchoring (264.192(a)(5)(ii):* Tanks will be secured, as necessary, to prevent flotation or dislodgement. Alvin, Texas, is located within a zone having a seismic risk approaching zero; therefore, tanks are not required to be secured to prevent damage during a seismic event (USGS, 2018).

- *Frost Heave (264.192(a)(5)(iii):* No protection against frost heave is required, as all tanks are located above ground and the ground in Alvin, Texas, is not subject to freezing owing to the mild climate.

2.2 Construction and Installation (264.192(b)-(g))

2.2.1 Procedures to Prevent Damage During Construction and Installation (264.192(b))

Tanks and ancillary equipment will be installed in accordance with standard engineering practices for quality control and testing and applicable provisions of 40 CFR 264.192(b). The tanks will be handled in a manner to prevent damage during installation.

2.2.2 Backfill and Corrosion Protection (264.192(c) and (f))

No tanks will be installed subgrade; therefore, requirements for backfill are not applicable. No corrosion protection is required, as all tanks are located above ground on concrete bases within secondary containment.

2.2.3 Tightness Testing (264.192(d))

Tanks and piping will be tested after installation and prior to being placed into service to verify a properly functioning and leak-free condition. Any defects indicated by the testing will be remedied and verified prior to placing the tank system into service.

2.2.4 Ancillary Equipment (264.192(e))

Ancillary piping will be constructed of carbon steel with welded, flanged connections, and tie-downs designed to accommodate possible expansion and contraction. Piping and equipment will be supported to prevent damage due to excessive stress due to settlement, vibration, expansion, or contraction.

2.2.5 Installation Certification (264.192(g))

Following installation of Decant Tank 1, Filtrate Tank 2, and Mix Tanks 3, 4, 5, and 6, a professional engineer registered in the State of Texas will review information regarding installation of the tanks, ancillary equipment, and piping for evidence of potential weld breaks, punctures, scrapes, cracks, corrosion, or other structural damage, and a Certification of RCRA Tank Installation will be submitted to the TCEQ.

3.0 CONTAINMENT AND DETECTION OF RELEASES (264.193)

3.1 Secondary Containment Description (264.193(a), (b), (d), (e))

As required by 40 CFR 264.193, potential releases to the environment will be prevented by locating tanks and ancillary equipment associated with the tank system (i.e., piping, pumps, valves, etc.) within a sealed concrete secondary containment area. The secondary containment has a containment volume of 34,943 gallons (see Table V.11.1). This volume accounts for displacement of i) equipment, ii) proposed tanks, and iii) precipitation from a 24-hr, 25-yr rainfall event. Calculations are based on the equipment layout and dimensions depicted on Figure V.11.3. The total available secondary containment (i.e., 34,943 gallons) is sufficient to contain the volume of any of the largest tanks in the Unit (i.e., 25,500 gallons for Mix Tanks 3, 4, 5, or 6).

3.2 Collection of Releases (264.193(c))

The base of the secondary containment will be sloped so that fluid flows to the sump located along the northern wall (see Figure V.11.3). Precipitation, wash water, and/or potential leaks from the tanks will be removed from the sump within 24 hours, as required by 40 CFR 264.193(c)(4). Water will be routed to other storm water or wastewater management units within the Ascend plant, depending on whether treatment is required. If no leaks or releases have occurred, storm water will be managed with storm water from other manufacturing portions of the facility. If a leak or release has occurred, wastewater will be managed with wastewater from the facility, ensuring that no incompatible wastes are mixed.

3.3 Secondary Containment Description (264.193(f))

Ancillary equipment and piping is either located within the secondary containment area or visually inspected on a daily basis in accordance with 40 CFR 264(f).

3.4 Prevention of Run-On/Run-Off

The Solids Handling Unit has been designed and will be constructed, operated, and maintained so as to prevent physical transport of any hazardous waste by a 100-year flood event as required by 30 TAC 335.204(a)(1). The above-ground tanks in the Solids Handling Unit are located in an area where the predicted depth of the 100-yr flood is less than 1 ft (see Figure II.1 in Part B Section II). The reinforced concrete secondary containment dike surrounding the tanks will be 2 ft high, thereby providing a minimum freeboard of 1 ft in the event of a 100-yr flood event.

4.0 GENERAL OPERATING REQUIREMENTS (264.194)

4.1 Suitability of Materials of Construction (264.194 (a))

Hazardous wastes and additives (i.e., caustic, diatomaceous earth, coagulant) have been evaluated as to suitability for use in the tanks in Solids Handling Unit and have been found to cause no potential for failure of the tanks, ancillary equipment, or containment system via rupture, leakage, corrosion, or other mechanism.

4.1 Prevention of Spills and Overflows (264.194 (b))

Personnel are present to monitor system operation and tank levels whenever waste is being processed, thereby preventing the potential for spills or overfills. Tanks are closed; therefore, monitoring is not required to maintain sufficient freeboard to prevent overtopping by wave or wind action or by precipitation.

5.0 INSPECTIONS (264.195)

A schedule for inspections required under 40 CFR 264.195 is provided on Table III.D - Inspection Schedule in Part B Section III.

6.0 RESPONSE TO LEAKS OR SPILLS (264.196)

Provisions of 40 CFR 264.196 specify response activities to be conducted in the event of a release or spill from the Solids Handling Unit tanks. In the event of a release from the tanks, Ascend will implement the following applicable procedures:

- *Flow Cessation*: Upon notification of a release, Ascend will immediately discontinue the flow of hazardous waste into the secondary containment area.

- *Waste Removal*: Within 24 hours of release, Ascend will remove spilled waste from the secondary containment system to be either disposed of on-site or stored in another permitted tank. If removal of waste cannot be completed in 24 hours (i.e., because of force majeure), Ascend will complete waste removal at the earliest possible time to prevent harm to human health or the environment.

- *Notifications*: Notifications regarding a release to the environment will be completed in accordance with specifications in 40 CFR 264.196(d).

- *Return to Service*: If the integrity of any tank is not damaged during the spill, the Solids Handling Unit will be returned to service upon completion of necessary repairs, removal of waste, and adherence to applicable provisions of 40 CFR 264.196(e) and

40 CFR 264.196(f). If the integrity of any tank is damaged during the release, the tank will be repaired as required to meet the requirements of 40 CFR 264 Subpart J, and re-certified by a registered professional engineer in the State of Texas prior to returning to service in accordance with 40 CFR 264.196(f).

7.0 TANK CLOSURE (264.197)

Closure of the Solids Handling Unit tanks is addressed in Attachment VII.1 - Closure and Post Closure Plan in Part B Section VII.

8.0 SPECIAL REQUIREMENTS FOR CERTAIN WASTES (264.198 AND 264.199)

8.1 Ignitable and/or Reactive Wastes (264.198)

The Solids Handling Unit will manage wastes classified as ignitable and/or reactive. Therefore, the tanks will be installed and operated according to provisions of 40 CFR 264.198(a)(2). Wastes will be stored and treated so as to be protected from any material or conditions that may cause the waste to ignite or react.

8.2 Incompatible Wastes (264.199)

Unit operating procedures will require that all newly generated wastes are evaluated to determine compatibility with existing wastes. As required by 40 CFR 264.17(b) for management of incompatible wastes, precautions will be taken to prevent adverse reactions which may produce violent reactions, produce uncontrolled quantities of toxic vapors or fumes, damage the structural integrity of the tanks, or otherwise threaten human health or the environment as required by 40 CFR 264.17(b).

9.0 AIR EMISSIONS (264.200)

A low pressure flow of air or nitrogen will be introduced into the head space of Mix Tanks 3, 4, 5, and 6 to displace volatile organics potentially present in the tank head space. Tank head spaces will be jointly connected to two granular activated carbon units connected in series to prevent the emission of volatile organic compounds during waste processing. Pressure protection will be provided by a pressure/vacuum relief valve (PVRV) device on each tank.

Any permits required for the tanks will be obtained under Ascend's existing New Source Review permit.

GSI Job No. 5106

ENGINEERING REPORT FOR
SOLIDS HANDLING UNIT TANKS

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

TABLES

GSI ENVIRONMENTAL

TABLE V.1.1
CALCULATION OF SECONDARY CONTAINMENT VOLUME: SOLIDS HANDLING UNIT TANKS
Ascend Performance Materials Texas, Inc., Alvin, Texas
Hazardous Waste Permit No. 50189

Item	Length (ft)	Width or Diameter (ft)	Area (sq ft)	Height/ Depth (ft)	Volume (cu ft)	Conversion from cu ft to Gallons	Volume (gallons)	Notes
Containment Area and Volume								
Secondary containment	103.0	100.0	10,300	2.00	20,600	7.48	154,088	Dimensions taken from Figure V.11.3, assuming 6-in (0.5-ft) thick concrete dike
Sump	6.0	4.0	24	6.00	144	7.48	1,077	
						Total Containment Volume	***155,165***	
Displacement Area and Volume								
Tank T-1 Filtrate Tank	—	9.0	63.6	2.0	127	7.48	950	Dimensions taken from Figure V.11.3; all items assumed to be at least as tall as dike.
Tank T-2 Decant Tank	—	9.0	63.6	2.0	127	7.48	950	
Mix Tank T-3	40.0	11.0	440.0	2.0	880	7.48	6,582	Dimensions of skid; tank itself is 36 ft long.
Mix Tank T-4	40.0	11.0	440.0	2.0	880	7.48	6,582	Dimensions of skid; tank itself is 36 ft long.
Mix Tank T-5	40.0	11.0	440.0	2.0	880	7.48	6,582	Dimensions of skid; tank itself is 36 ft long.
Mix Tank T-6	40.0	11.0	440.0	2.0	880	7.48	6,582	Dimensions of skid; tank itself is 36 ft long.
Activated Carbon Drum	—	2.8	6.2	2.0	12	7.48	90	
Activated Carbon Drum	—	2.8	6.2	2.0	12	7.48	90	
Tank T-100 Coagulant Tank	—	8.0	50.3	2.0	101	7.48	755	
Dilute Coagulant Pump Skid	8.8	8.8	77.4	2.0	155	7.48	1,159	
Filter Press Pump Skid	8.0	13.0	104.0	2.0	208	7.48	1,556	
Pump P-114 DE Transfer Pump	5.5	1.7	9.4	2.0	19	7.48	142	
Tank T-101 DE Mix Tank	4.0	4.0	16.0	2.0	32	7.48	239	
Tank T-130 Air Tank	6.5	6.5	42.3	2.0	85	7.48	636	
Pump P-10 Decant Pump	5.5	1.7	9.4	2.0	19	7.48	142	
Pump P-6 Filtrate Pump	5.5	1.7	9.4	2.0	19	7.48	142	
Tank T-105 Precoat Tank	—	12.0	113.1	2.0	226	7.48	1,690	
Mixer M-135 Precoat Eductor	5.0	5.0	25.0	2.0	50	7.48	374	
Pump P-9 Sump Pump	5.5	1.7	9.4	2.0	19	7.48	142	
Filter F-100 Filter Press	47.0	9.0	423.0	2.0	846	7.48	6,328	Area within secondary containment; maximum conservative estimate owing to skeleton base.
Tank T-XX3 Acid Tank	—	7.0	38.5	2.0	77	7.48	576	
DE Storage	8.0	8.0	64.0	2.0	128	7.48	957	
Pump P-XX7	5.0	1.7	8.5	2.0	17	7.48	127	
Pump P-XX8	5.0	1.7	8.5	2.0	17	7.48	127	
Pump P-XX11	5.5	1.7	9.4	2.0	19	7.48	142	
						Total Displacement Volume	***43,642***	
Volume Available for Containment								
Containment Volume							155,165	Equal to total volume of containment area.
Less Displacement Volume							43,642	Equal to total volume of displacement equipment.
Less Rainfall Event	--	--	10,324	0.99	10,238	7.48	76,580	11.9 in, corresponding to a 25-year, 24-hour rain event (NOAA, 2019)
						Total Available Volume for Containment	***34,943***	
Required Volume for Secondary Containment Area								
Largest Tank Volume							25,500	Mix Tanks 3, 4, 5, and 6
						Total Required Volume	***25,500***	
Volume Over/(Under)								
Available Volume							34,943	Equal to total available volume for containment
Total Required Volume							25,500	Equal to total required volume
						Volume Over/(Under)	***9,443***	Conclusion: Sufficient containment volume available

Notes:

1. NOAA, 2019. NOAA Atlas 14 Point Precipitation Frequency Estimates: TX, Hydrometeorological Design Studies Center, Precipitation Frequency Data Server, NOAA's National Weather Service, https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=tx.
2. DE = Diotomaceous earth.

GSI Job No. 5106

GSI ENVIRONMENTAL

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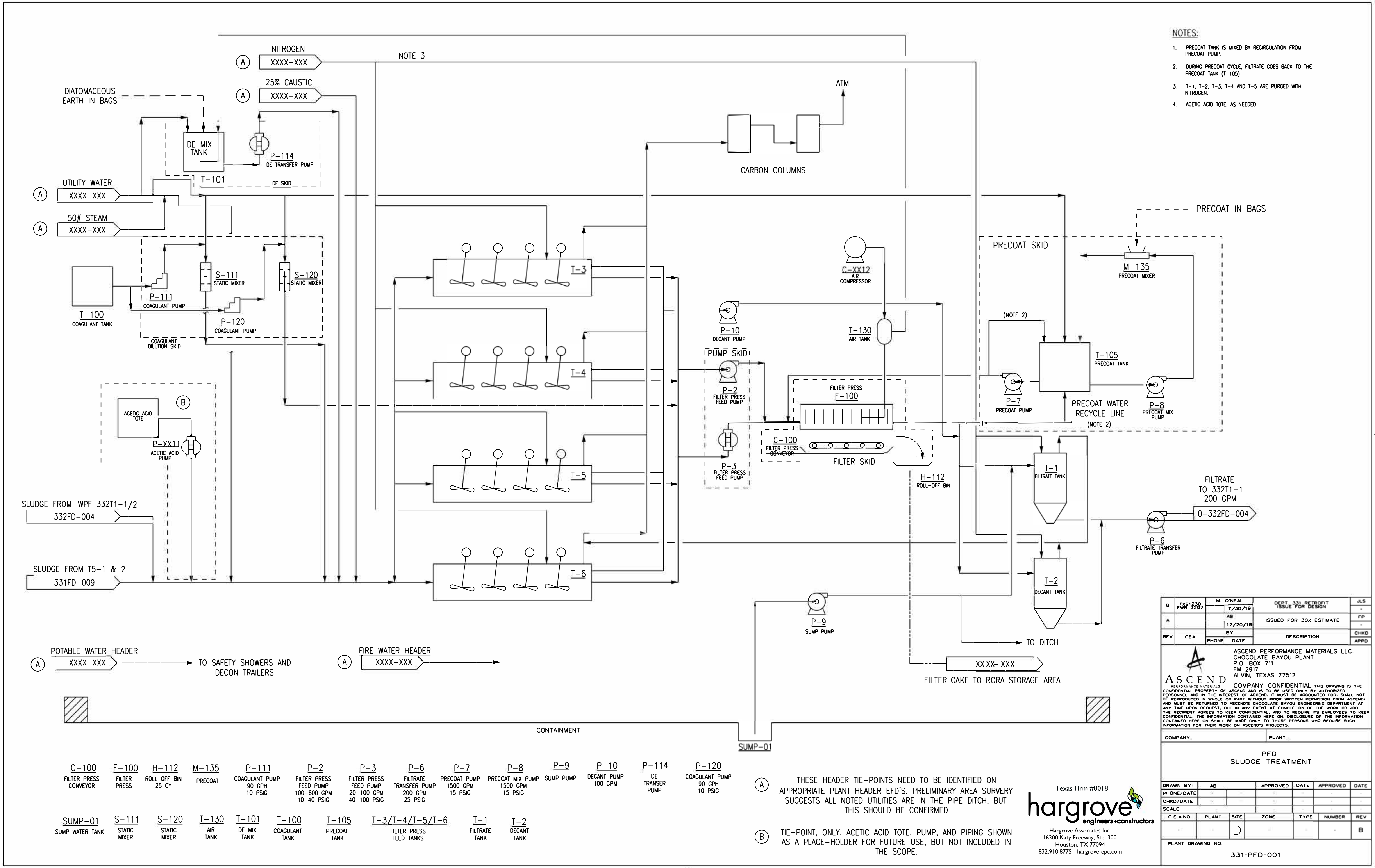
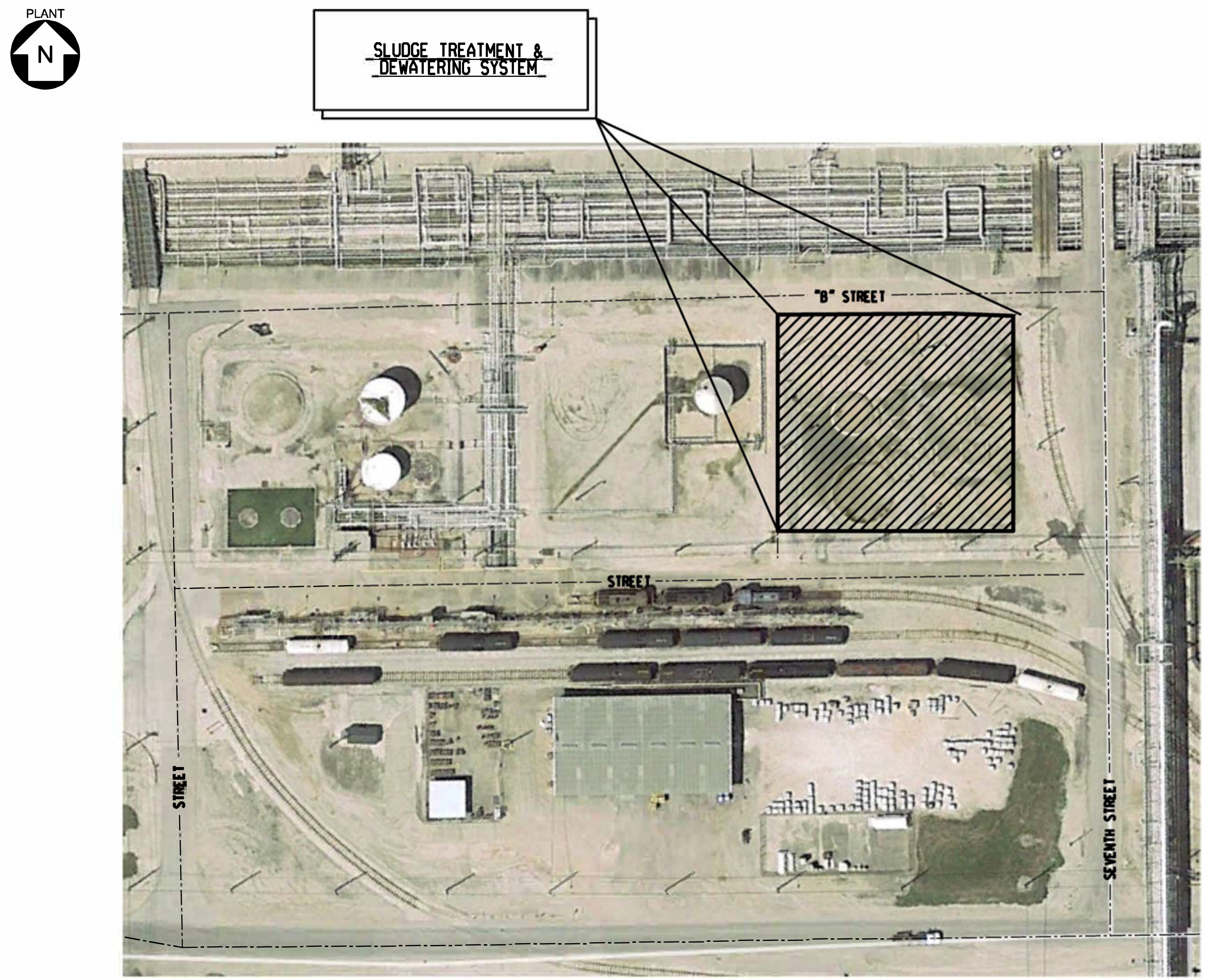
SOLIDS HANDLING UNIT TANKS

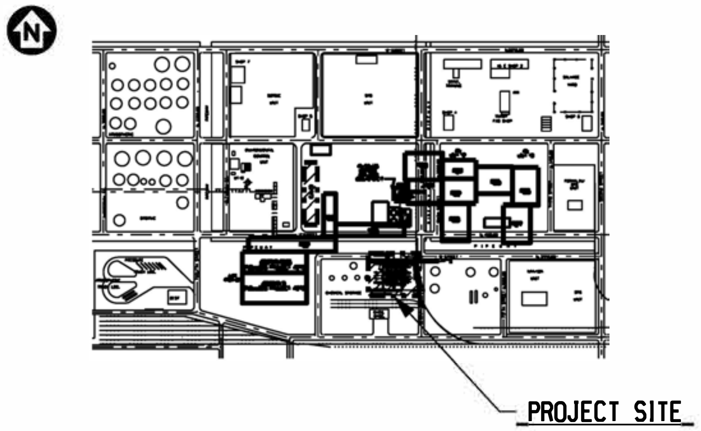
Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

FIGURES


NOTES:
1. PRECOAT TANK IS MIXED BY RECIRCULATION FROM PRECOAT PUMP.
2. DURING PRECOAT CYCLE, FILTRATE GOES BACK TO THE PRECOAT TANK (T-105)
3. T-1, T-2, T-3, T-4 AND T-5 ARE PURGED WITH NITROGEN.
4. ACETIC ACID TOTE, AS NEEDED
NITROGEN
XXXX-XXX
NOTE 3
25% CAUSTIC
XXXX-XXX
DIATOMACEOUS EARTH IN BAGS
DE MIX TANK
T-101
P-114
DE TRANSFER PUMP
DE SKID
UTILITY WATER
XXXX-XXX
50# STEAM
XXXX-XXX
T-100
COAGULANT TANK
S-111
STATIC MIXER
S-120
STATIC MIXER
P-111
COAGULANT PUMP
P-120
COAGULANT PUMP
COAGULANT DILUTION SKID
ACETIC ACID TOTE
P-XX11
ACETIC ACID PUMP
SLUDGE FROM IWPF 332T1-1/2
332FD-004
SLUDGE FROM T5-1 & 2
331FD-009
T-3
T-4
T-5
T-6
CARBON COLUMNS
ATM
C-XX12
AIR COMPRESSOR
P-10
DECANT PUMP
T-130
AIR TANK
PUMP SKID
P-2
FILTER PRESS FEED PUMP
P-3
FILTER PRESS FEED PUMP
FILTER PRESS
F-100
C-100
FILTER PRESS CONVEYOR
FILTER SKID
H-112
ROLL-OFF BIN
PRECOAT IN BAGS
PRECOAT SKID
M-135
PRECOAT MIXER
(NOTE 2)
T-105
PRECOAT TANK
P-7
PRECOAT PUMP
P-8
PRECOAT MIX PUMP
PRECOAT WATER RECYCLE LINE
(NOTE 2)
T-1
FILTRATE TANK
T-2
DECANT TANK
FILTRATE TO 332T1-1 200 GPM
0-332FD-004
P-6
FILTRATE TRANSFER PUMP
P-9
SUMP PUMP
TO DITCH
XX XX- XXX
FILTER CAKE TO RCRA STORAGE AREA
POTABLE WATER HEADER
XXXX-XXX
TO SAFETY SHOWERS AND DECON TRAILERS
FIRE WATER HEADER
XXXX-XXX
CONTAINMENT
SUMP-01
C-100 FILTER PRESS CONVEYOR
F-100 FILTER PRESS
H-112 ROLL OFF BIN 25 CY
M-135 PRECOAT
P-111 COAGULANT PUMP 90 GPH 10 PSIG
P-2 FILTER PRESS FEED PUMP 100-600 GPM 10-40 PSIG
P-3 FILTER PRESS FEED PUMP 20-100 GPM 40-100 PSIG
P-6 FILTRATE TRANSFER PUMP 200 GPM 25 PSIG
P-7 PRECOAT PUMP 1500 GPM 15 PSIG
P-8 PRECOAT MIX PUMP 1500 GPM 15 PSIG
P-9 SUMP PUMP
P-10 DECANT PUMP 100 GPM
P-114 DE TRANSER PUMP
P-120 COAGULANT PUMP 90 GPH 10 PSIG
SUMP-01 SUMP WATER TANK
S-111 STATIC MIXER
S-120 STATIC MIXER
T-130 AIR TANK
T-101 DE MIX TANK
T-100 COAGULANT TANK
T-105 PRECOAT TANK
T-3/T-4/T-5/T-6 FILTER PRESS FEED TANKS
T-1 FILTRATE TANK
T-2 DECANT TANK
A THESE HEADER TIE-POINTS NEED TO BE IDENTIFIED ON APPROPRIATE PLANT HEADER EFD'S. PRELIMINARY AREA SURVERY SUGGESTS ALL NOTED UTILITIES ARE IN THE PIPE DITCH, BUT THIS SHOULD BE CONFIRMED
B TIE-POINT, ONLY. ACETIC ACID TOTE, PUMP, AND PIPING SHOWN AS A PLACE-HOLDER FOR FUTURE USE, BUT NOT INCLUDED IN THE SCOPE.
Texas Firm #8018
hargrove engineers+constructors
Hargrove Associates Inc.
16300 Katy Freeway, Ste. 300
Houston, TX 77094
832.910.8775 - hargrove-epc.com
B TX21230 EWR 3297 M. O'NEAL 7/30/19 DEPT. 331 RETROFIT ISSUE FOR DESIGN JLS
A AB 12/20/18 ISSUED FOR 30% ESTIMATE FP
REV CEA BY PHONE DATE DESCRIPTION CHKD APPD
ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
P.O. BOX 711
FM 2917
ALVIN, TEXAS 77512
COMPANY CONFIDENTIAL THIS DRAWING IS THE CONFIDENTIAL PROPERTY OF ASCEND AND IS TO BE USED ONLY BY AUTHORIZED PERSONNEL AND IN THE INTEREST OF ASCEND. IT MUST BE ACCOUNTED FOR; SHALL NOT BE REPRODUCED IN WHOLE OR PART WITHOUT PRIOR WRITTEN PERMISSION FROM ASCEND; AND MUST BE RETURNED TO ASCEND'S CHOCOLATE BAYOU ENGINEERING DEPARTMENT AT ANY TIME UPON REQUEST, BUT IN ANY EVENT AT COMPLETION OF THE WORK OR JOB. THE RECIPIENT AGREES TO KEEP CONFIDENTIAL, AND TO REQUIRE ITS EMPLOYEES TO KEEP CONFIDENTIAL, THE INFORMATION CONTAINED HERE ON. DISCLOSURE OF THE INFORMATION CONTAINED HERE ON SHALL BE MADE ONLY TO THOSE PERSONS WHO REQUIRE SUCH INFORMATION FOR THEIR WORK ON ASCEND'S PROJECTS.
COMPANY
PLANT
PFD
SLUDGE TREATMENT
DRAWN BY: AB
PHONE/DATE
CHKD/DATE
SCALE
C.E.A.NO. PLANT SIZE ZONE TYPE NUMBER REV
D B
PLANT DRAWING NO.
331-PFD-001
PLOTTED BY:
PLOTTED ON AND AT:
DESIGN FILE NAME:
PRINTS ISSUED TO FIELD BY
DATE
REV



PLOT PLAN
SCALE: NTS



KEY PLAN
SCALE: NTS

DRAWING INDEX

FOUNDATION LOCATION PLAN ______________ D-331FOLOCATION PLAN

THIS DRAWING NOT VALID WITHOUT THE DATED SIGNATURE AND SEAL OF A TEXAS LICENSED ENGINEER.

TEXAS LICENSED ENGINEER:
KENNETH W. HEISNER, PE
LICENSE NUMBER: 115722

Texas Firm #8018
hargrove engineers+constructors
4005 Technology Dr Ste. 2000
Angleton, TX 77515
979.291.2080 - hargrove-epc.com

A	TX27...	JL SOLIS / 2315 08-14-19	ISSUED FOR PERMITTING	RG / KWH
		BY / PHONE DATE	DESCRIPTION	CHKD / APPD

ASCEND PERFORMANCE MATERIALS
ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
P.O. BOX 711
FM 2917
ALVIN, TEXAS 77512

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COMPANY ASCEND | PLANT CHOCOLATE BAYOU

SLUDGE TREATMENT & DEWATERING SYSTEM
EXISTING TANK FOUNDATION PLAN
PROJECT LOCATION PLAN

DRAWN BY:	JL SOLIS		APPROVED	DATE	APPROVED	DATE
PHONE/DATE	2315	08/13/14				
CHKD/DATE						
SCALE	AS NOTED					

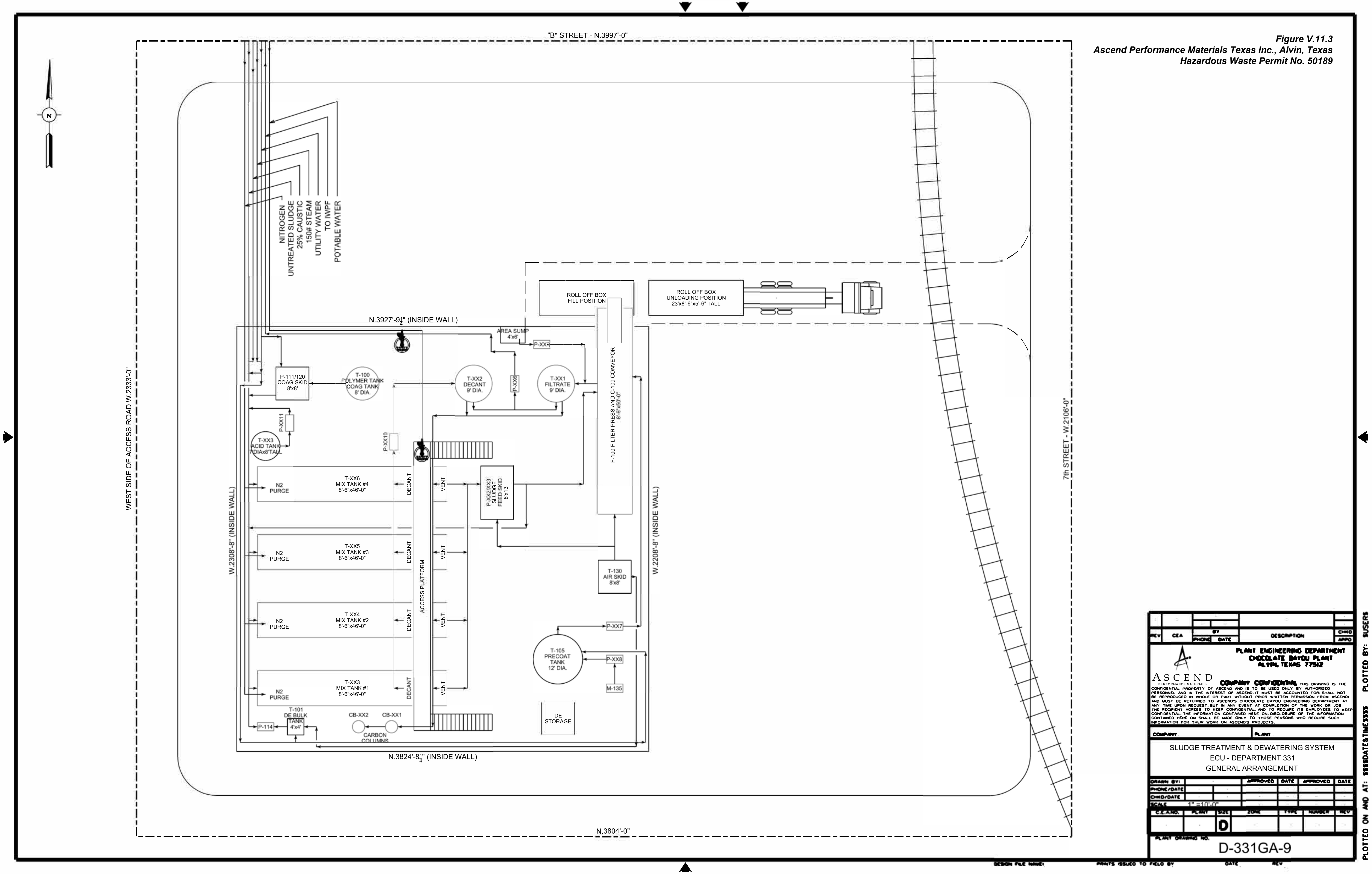
C.E.A.NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	REV
TX21230	46	D	331	FO	XXX	A

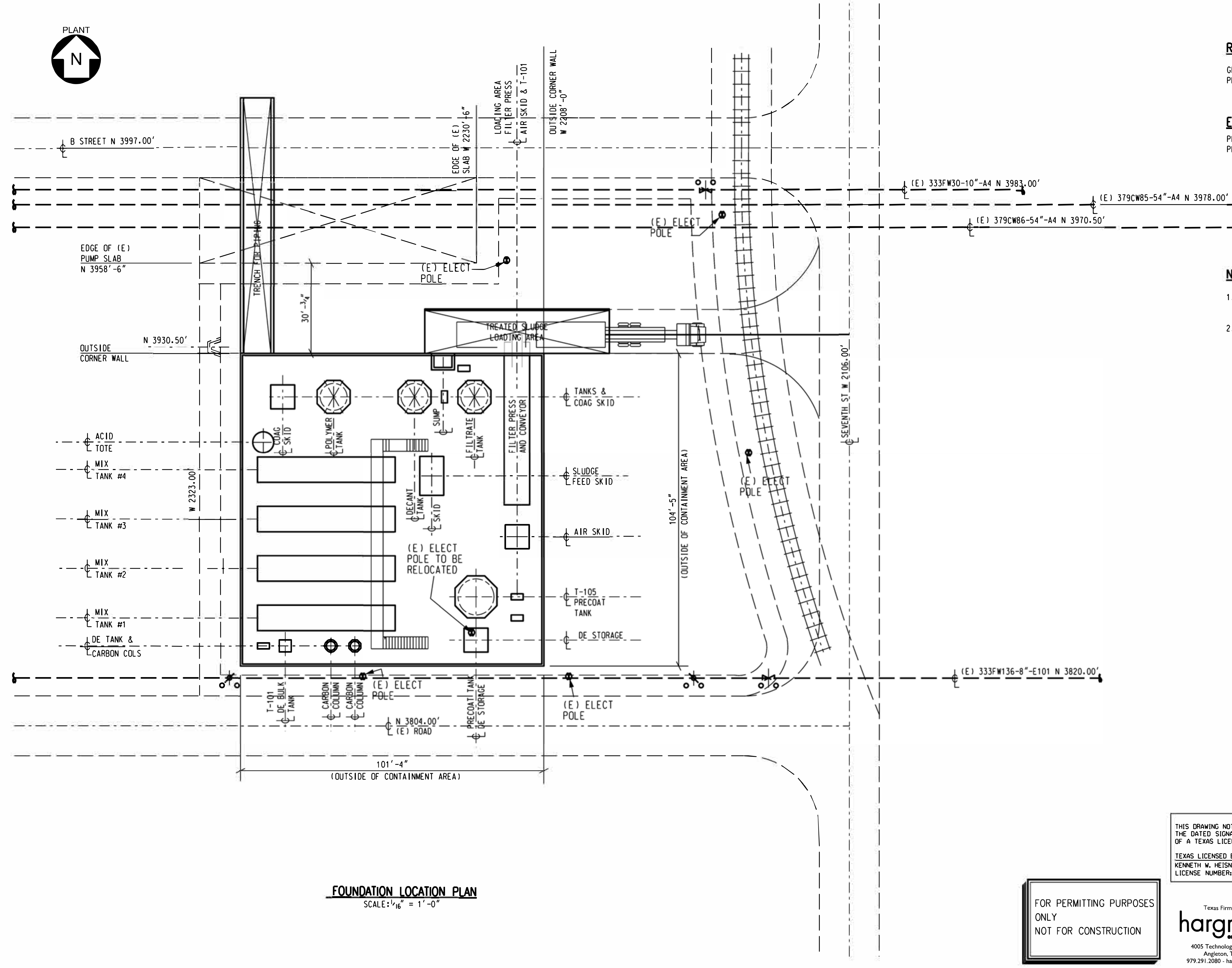
PLANT DRAWING NO.
D331–FO–PLOTPLAN

DESIGN FILE NAME: PRINTS ISSUED TO FIELD BY DATE REV

PLOTTED ON AND AT: $$$DATE&TIME$$$ PLOTTED BY: $USER$

Figure V.11.3
Ascend Performance Materials Texas Inc., Alvin, Texas
Hazardous Waste Permit No. 50189





REFERENCE DRAWINGS

GENERAL ARRANGEMENT —— D331-GA-9
PROJECT LOCATION PLAN —— D331-FO-PLOTPLAN

EXISTING REFERENCE DRAWINGS

PHENOL STORAGE AREA ADDITIONS —— D-320 GP 63
PLOT PLAN CHEMICAL LOADING AND UNLOADING AREA —— D-323 GP 3

NOTES

1. THE OVERALL THICKNESS OF THE SLAB SHALL BE SUFFICIENT TO SUPPORT ALL OF THE SKIDS AND EQUIPMENT.
2. ALL EQUIPMENT AND SKIDS SHALL BE ANCHORED USING "HILTI" HIT-HY 200 ADHESIVE ANCHORING SYSTEM PER MANUFACTURER'S RECOMMENDATIONS OR EQUAL APPROVED.

FOR PERMITTING PURPOSES ONLY
NOT FOR CONSTRUCTION

THIS DRAWING NOT VALID WITHOUT THE DATED SIGNATURE AND SEAL OF A TEXAS LICENSED ENGINEER.

TEXAS LICENSED ENGINEER:
KENNETH W. HEISNER, P.E.
LICENSE NUMBER: 115722

Texas Firm #8018
hargrove engineers+constructors
4005 Technology Dr Ste. 2000
Angleton, TX 77515
979.291.2080 - hargrove-epc.com

REV	CEA	BY PHONE / DATE	DESCRIPTION	RG / KWH
A	TX21230	JL SOLIS 2315 08-14-19	ISSUED FOR PERMITTING	

ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
P.O. BOX 711
FM 2917
ALVIN, TEXAS 77512

COMPANY: ASCEND — PLANT: CHOCOLATE BAYOU

SLUDGE TREATMENT & DEWATERING SYSTEM
EXISTING TANK FOUNDATION PLAN
OVERALL LOCATION PLAN

DRAWN BY: JL SOLIS
PHONE/DATE: 2315 08/12/19
CHKD/DATE:
SCALE: 1/16" = 1'-0"

C.E.A.NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	REV
TX21230	46	D	331	FO	XXXX	A

PLANT DRAWING NO.
D331-FO-LOCATIONPLAN

DESIGN FILE NAME: PRINTS ISSUED TO FIELD BY DATE REV

PLOTTED ON AND AT: $$$$DATE&TIME$$$$ PLOTTED BY: $USERS

ENGINEERING REPORT FOR
SOLIDS HANDLING UNIT TANKS

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDICES

GSI Job No. 5106

GSI ENVIRONMENTAL

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SOLIDS HANDLING UNIT TANKS

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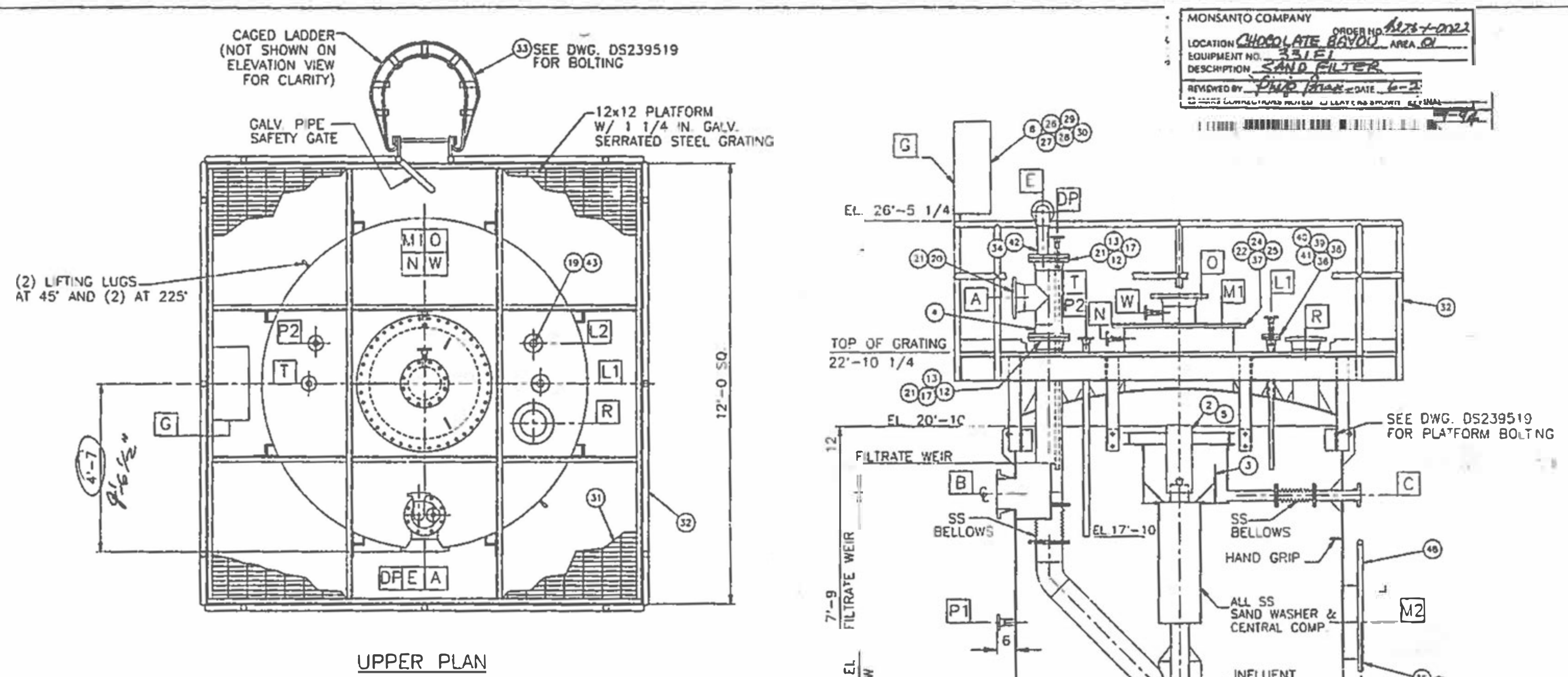
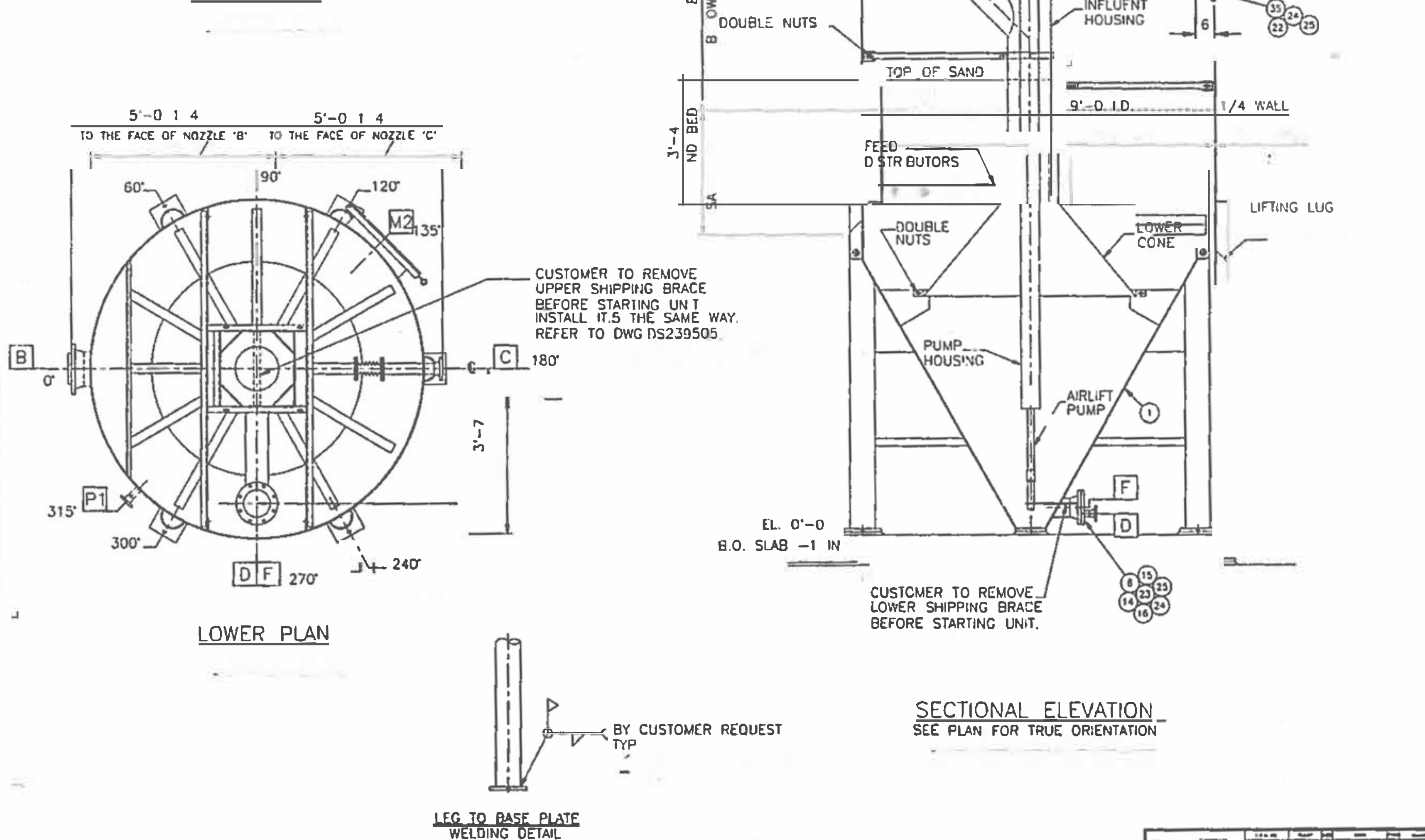
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX V.11.1: DESIGN FOR DECANT TANK 1

TANKS T-XX1, T-XX2





NOZZLE SCHEDULE

LTR	SIZE	RATING	FACE/DES.	SERVICE	REMARKS	LOCATION
A	8	150#	RFWN	INLET	FEED	EL.24'-4 1/4 @ 270°
B	10	150#	RFWN	OUTLET	FILTRATE	EL.19'-0 @ 0°
C	3	150#	RFWN	OUTLET	REJECT	EL.18'-11 3/8 @ 180°
D	1 1/2	150#	RFWN	INSIDE DRAIN		EL.5 3/4 IN. @ 270°
DP	1	150#	RFWN	DP CELL	W/1 IN.DP PIPE	EL.25'-0 5/16 @ 270°
E	3	150#	RFWN	VENT	FOR INLET	EL.26'-8 1/4 @ 270°
F	6	150#	RFWN	CLEAN OUT		EL.7 5/8 IN. @ 270°
G	1 2		MPT	CUSTOMER	N_2	EL.26'-10 1/4 @ 0°
L1		150	RFWN	LEVEL	W/1 IN.DP PIPE	EL.23'-10 3'-2 3/8 @ 180°
	1 1/2	150	RFWN	LEVEL SWITCH		EL.23'-3 1/4 3'-2 3/8 @ 160°
M1	36		FLAT	TOP MANWAY	API-650	EL 23'-7 1/4
M2	24		FLAT	SIDE MANWAY	API-650	EL.15'-6 @ 135°
N		150#	RFWN	MOTIVE GAS		EL.23'-2 3/4 @ 90°
O	10	150#	RFWN	OBSERVATION PORT	MANWAY	EL.24'-5 1/4
P1	1 1/2	150#	RFWN	PRESSURE TAP	SPARE	EL.15'-6 @ 315°
P2	1 1/2	150#	RFWN	PRESSURE TAP	SPARE	EL.23'-3 1/4 3'-2 3/8 @ 20°
R	8	150#	RFWN	CONSERVATION	VENT	EL.23'-3 1/4 3'-2 3/8 @ 200°
T	1 1/2	150#	RFWN	THERMOWELL		EL.23'-3 1/4 3'-2 3/8 @ 0°
W		150	RFWN	SPRAY WASH	WATER	EL.23'-11 1/4 @ 90°

NOTES:

1. MATERIAL OF CONSTRUCTION.

TANK	304L S.S
INTERNALS	304L S.S
AIRLIFT	304L S.S

2. WEIGHTS

TANK EMPTY:	10,000#
TANK W/WET SAND.	85,000#
TANK W/SAND & WATER:	142,000#

3. FILTER SHALL BE HYDROSTATICALLY TESTED WITH POTABLE WATER PER API 650, APPENDIX F, BY FILLING WITH WATER PLUS 12 IN OF WATER IN STAND PIPE. NO AIR TEST ON ROOF IS REQUIRED AFTER HYDROTEST IS COMPLETE. FILTER IS TO BE CLEANED AND DRIED OF ALL HYDROTEST WATER
4. FILTER SHALL BE RADIOGRAPHICALLY EXAMINED PER API 650, APPENDIX F, 10% OF ALL VERTICAL AND HORIZONTAL SEAM WELDS SHALL BE EXAMINED AT PURCHASER'S EXPENSE.
5. ACCEPTABILITY OF ALL WELDS SHALL BE PER API 650 ALL NECESSARY REPAIRS OF DEFICIENCIES, ADDITIONAL RADIOGRAPHS TO REINSPECT REPAIRS, AND PROGRESSIVE RADIOGRAPHY AS REQUIRED BY THE CODE, SHALL BE BY THE VENDOR, AT THE VENDOR'S, EXPENSE.
6. ALL WELDS SHALL BE VISUALLY EXAMINED.
7. ALL WELDS SHALL BE LIQUID DYE PENETRANT EXAMINED
8. FILL SAND ONLY TO THE LEVEL INDICATED ON DRAWING AND FOLLOW THE PROCEDURE IN THE OPERATING INSTRUCTIONS.
9. A SPREADER BAR MUST BE USED FOR A VERTICAL LIFT USING LIFTING LUGS
10. DO NOT SUPPORT PIPELINES FROM UNIT FLANGES.
11. A FLAT HORIZONTAL FOUNDATION MUST BE PROVIDED FOR THE FILTER WITH BEARING CAPACITY AS ON THE LOADING DIAGRAM DRAWING
12. ALL FASTENED INTERNAL COMPONENTS TO HAVE DOUBLE NUTS
13. ALL ITEMS ON THIS DRAWING ARE TO BE SHIPPED LOOSE FOR FIELD ASSEMBLY BY OTHERS. SHOP PREASSEMBLY WILL BE DONE TO ASSURE FIT
14. TANK SHOULD BE INSTALLED LEVEL.
15. LADDER, PLATFORM, HANDRAIL, SAFETY GATE AND RELATED HARDWARES SHIPPED LOOSE
16. USE FABRIC SLINGS TO LOAD, UNLOAD OR TURN UNIT.

Item	Qty.	Description	Reference	Mat'l	Remarks
48	1	DAVIT	DS2395016	304L S.S	M2
47					
46					
45					
44					
43	1	GASKET	SEE SPEC SHEET		IT.L2
42	1	NOZZLE ASSY.	DS239508	304L S.S.	E & DP
41	1	NOZZLE ASSY.	DS239509	304L S.S.	L1
40	8	WASHER, FLAT	5/8	SA-193 B7	IT.L1
39	4	NUT, HEX.	5/8	SA-194 2H	IT.L1
38	4	BOLT, HEX.	5/8x2 3/4 LG.	SA-193 B7	IT.L1
37	1	GASKET	SEE SPEC SHEET		IT.M1
36	1	GASKET	SEE SPEC SHEET		IT.L1
35	1	GASKET	SEE SPEC SHEET		IT.M2
34	1	GASKET	SEE SPEC SHEET		IT.E
33	1	LADDER, CAGED	DS239515	C.S GALV.	
32				C.S GALV.	
31				C.S GALV.	
30	4	WASHER, LOCK	1/4	SA-193 B7	
29	8	PLATFORM	DS239511	SA-193 B7	
28	4	NUT		SA-194 2H	
27	4	MACH.SCREW P/HD	1/4 IN.-20x1 1/2	304 S.S.	
26	1	MOUNTING BRACKET	DS239540	304L S.S.	
25	156	WASHER, FLAT	3/4	SA-193 B7	[illegible]
24	78	NUT, HEX.	3/4	SA-194 2H	[illegible]
23	8	BOLT, HEX.	3/4x3 1/4 LG.	SA-193 B7	(8) IT. 6
22	70	BOLT, HEX.	3/4x3 LG.	SA-193 B7	[illegible]
21	3	GASKET	SEE SPEC SHEET		
20	1	SCREEN INFLUENT	1F-1585	304 S.S.	
19	1	LEVEL SWITCH	DS239527		
18					
17	32	WASHER, FLAT	3/4	SA-1 B7	
16	1	GASKET	SEE SPEC SHEET		
15	2	GASKET	SEE SPEC SHEET	93	
14	1	DRAIN SCREEN	1F-449	304L S.S.	
13	16	NUT	3/4	SA-194 2H	
12	16	BOLT, HEX.	3/4x3 1/2 LG	SA-193 B7	
11					
10					
9					
8	1	INSTRUMENT PANEL	DS239504		
7					
6	1	DRAIN FLANGE	DS239512	304L S.S.	
5	1	CLAMP, SPLASH HOOD	DS239505	304L S.S.	IT.16
4	1	INFLUENT CONN.	DS239510	304L S.S.	
3	4	WEIR PLATES	DS239505	304L S.S.	IT. 8-11
2	1	SPLASH HOOD	DS239511	304L S.S.	
1	1	ASSEMBLY	DS239531		

DSF 2395

PARKSON CORPORATION
DynaSand FILTER
GENERAL ARRANGEMENT

Drawn By	Checked By	Approved By	Micro Rev.	CAD
RHR	PAT	RPH	D	
Date 2-9-94	Date 2-25-94	Date 2-25-94	Date 6-24-94	Scale

Location: 64 SQ. FT. TF. FOR MONSANTO
Dwg. No. DS239501
Rev. D

D 331F1-1

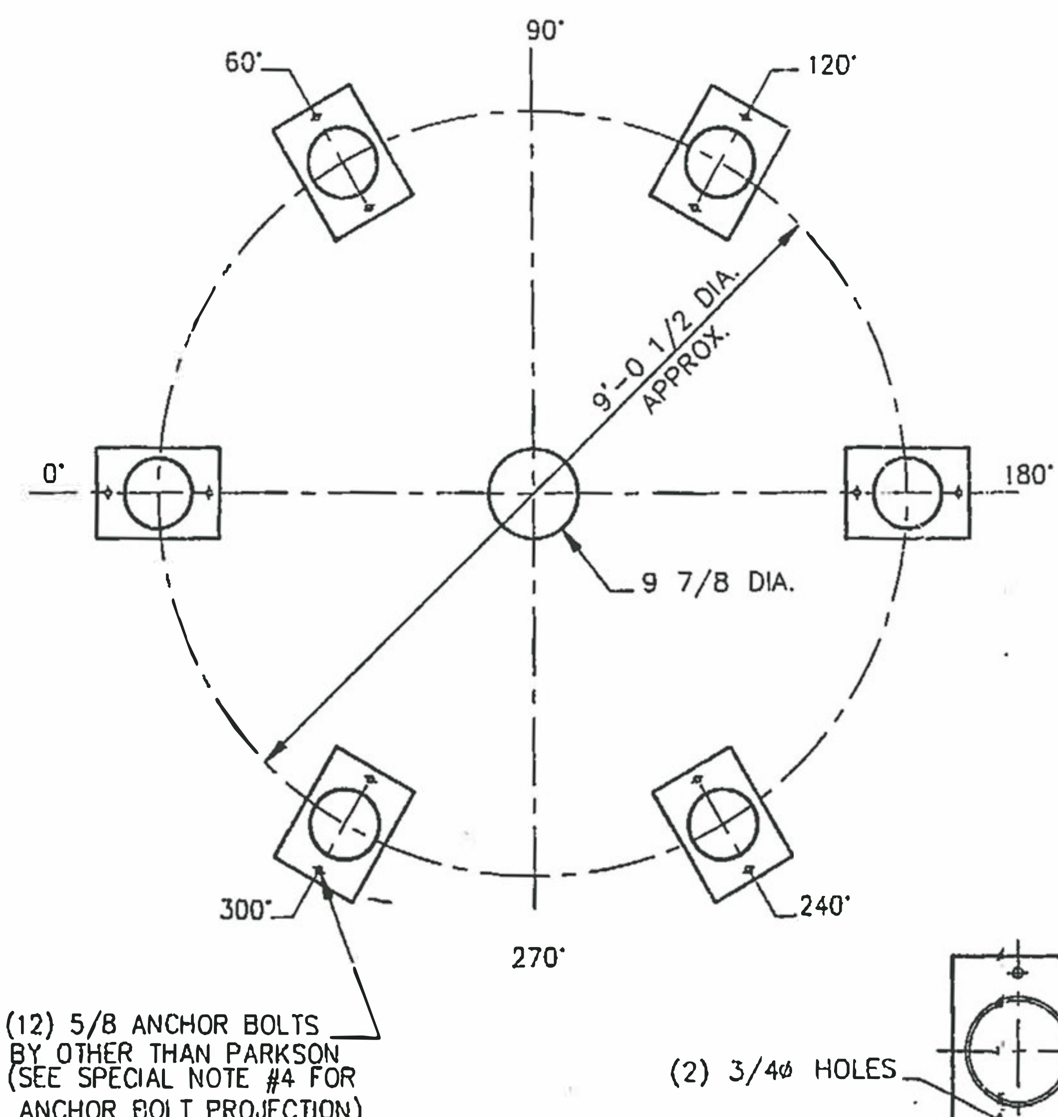
GSI Job No. 5106

GSI ENVIRONMENTAL

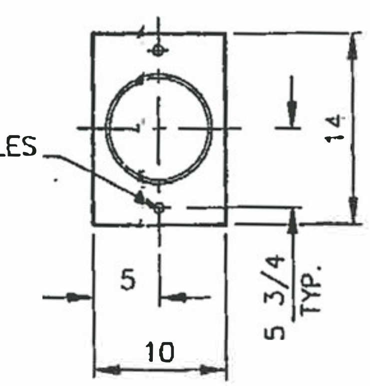
ENGINEERING REPORT FOR
SOLIDS HANDLING UNIT TANKS

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX V.11.2: DESIGN FOR FILTRATE TANK 2



FILTER BOTTOM PLAN



BASE PLATE DETAIL

LOADING CONDITIONS

1. STATIC LOAD, TANK FULL OF SAND AND WATER (WORST CONDITION). LOAD UNDER EACH PAD IS APPROX. 20.0 KIPS LOAD UNDER CONE PAD IS APPROX. 30.0 KIPS
2. WIND LOAD, TANK EMPTY (WORST CONDITION). 125 MPH WIND MIGHT CAUSE AN OVERTURNING MOMENT OF APPROX. 117.37 FT KIPS GENERATING A POSSIBLE TENSION LOAD OF 3.5 KIPS ON EACH ANCHOR BOLT.

SPECIAL NOTES

1. THE SUPPORTING CONCRETE PAD MUST BE LEVEL.
2. SEE INSTALLATION INSTRUCTIONS BEFORE SETTING GROUT.
3. APPLY 1 IN. MIN. GROUT UNDER EACH BASE PLATE AND UNDER THE CONE AT CENTER.
4. CUSTOMER ANCHOR BOLT PROJECTION TO INCLUDE GROUT, BASE PLATE 1 IN. THICK, PLUS WASHER AND NUT.

DSF 2395

MONSANTO COMPANY
LOCATION CHOCOLATE BAYOU ORDER NO 4273-1-0028 AREA 01
EQUIPMENT NO. 331F1
DESCRIPTION SAND FILTER
REVIEWED BY [illegible] DATE 5-11-94
☐ MAKE CORRECTIONS NOTED ☐ LEAVE AS SHOWN ☒ FINAL

APR 6 '94

"CERTIFIED DWG."

Item	Qty.	Description	Reference	Mat'l	Remarks

Revision: A — CHANGED NOTE ON ANCHOR BOLT LOCATION — 4-6-94 — RMR / PASW

PARKSON CORPORATION
Dyna Sand FILTER
LOADING DIAGRAM

Drawn By	Checked By	Approved By	Micro Rev.	
RMR	[illegible]	PAT	A	
Date 2-15-94	Date 4-6-94	Date 4/6/94	Date	Scale N.T.S.

64 TF — Dwg. No. DS239507 — Rev. A

Monsanto Corporate Engineering Department	C.E.A. NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	REV
	4273	46	B	331		VM15	

B 331F1-4

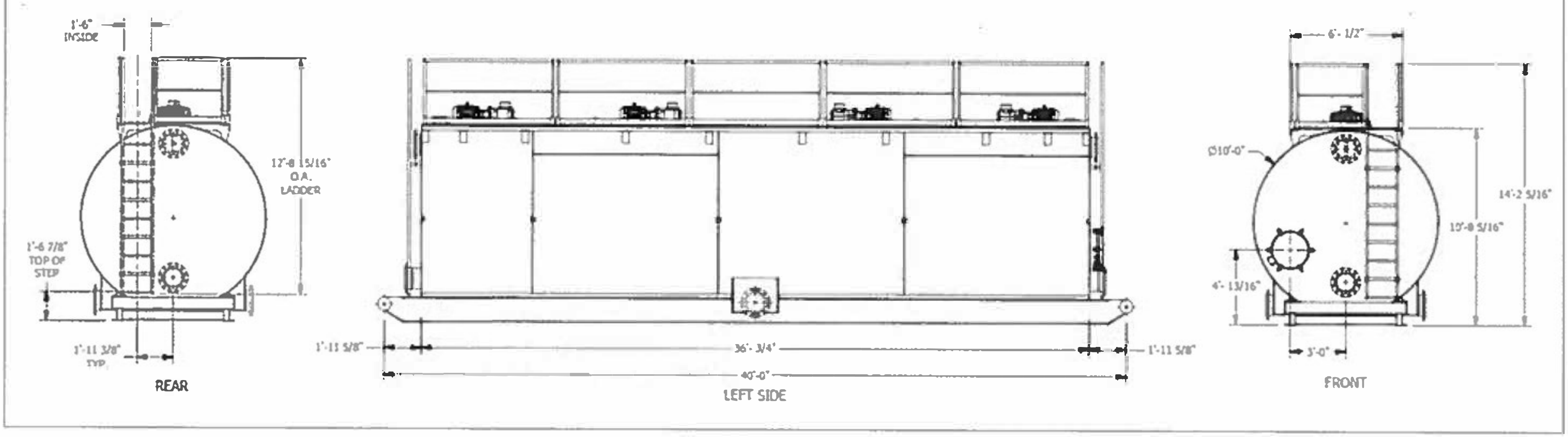
furnished without expressed written consent of PARKSON CORPORATION.

GSI Job No. 5106

ENGINEERING REPORT FOR
SOLIDS HANDLING UNIT TANKS

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX V.11.3: DRAWINGS FOR MIX TANKS 3, 4, 5, AND 6


1'-6" INSIDE
12'-8 15/16" O.A. LADDER
1'-6 7/8" TOP OF STEP
1'-11 3/8" TYP.
REAR
1'-11 5/8"
36'-3/4"
1'-11 5/8"
40'-0"
LEFT SIDE
6'-1/2"
Ø10'-0"
14'-2 5/16"
10'-8 5/16"
4'-13/16"
3'-0"
FRONT

Regards,

Dan Baker - Sales Manager
436 Hwy 93 N
Scott, LA 70583
(800) 468-2657 phone
(859) 509-0030 cell
(337) 266-7800 fax
www.deltank.com
www.delmanufacturing.com

ENGINEERING REPORT FOR
SOLIDS HANDLING UNIT TANKS

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas Inc., Alvin, Texas

APPENDIX V.11.4: CERTIFICATION OF CONSTRUCTION OF THE SOLIDS HANDLING UNIT TANKS

Certification of Construction

Certification of Construction of the Solids Handling Unit Tanks

Hazardous Waste Permit No. 50189

Ascend Performance Materials Texas Inc.
ALVIN, TEXAS

8 July 2021

GSI Environmental Inc.
2211 Norfolk, Suite 1000, Houston, Texas 77098-4044 tel. (713) 522-6300

CERTIFICATION OF CONSTRUCTION FOR
SOLIDS HANDLING UNIT TANKS (PERMIT UNIT NOS. 17, 19, 20, 21, AND 22)

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas, Inc., Alvin, Texas

TABLE OF CONTENTS

CERTIFICATION OF CONSTRUCTION FOR SOLIDS HANDLING UNIT TANKS (PERMIT UNIT NOS. 17, 19, 20, 21 AND 22)

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas, Inc., Alvin, Texas

I, James M. McDade, a registered professional engineer in the State of Texas, certify that construction has been completed for five tanks (Permit Unit Nos. 17, 19, 20, 21, and 22) within the Solids Handling Unit on the Ascend Performance Materials Texas, Inc. (Ascend) facility in Alvin, Texas. The tanks are authorized by TCEQ under Hazardous Waste Permit No. 50189 and 30 TAC 335.2(a). In accordance with Provision II.A.6.a of Hazardous Waste Permit No. 50189 and 40 CFR 264.192(a), I further certify that, based on the information provide in this report issued 8 July 2021, that the tank systems have sufficient structural integrity and are acceptable for storing and/or treating hazardous waste. The construction and installation of the tanks has been performed in accordance and compliance with good engineering practices and the design and construction specifications of Hazardous Waste Permit No. 50189.

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

8 July 2021

James M. McDade, P.E.
State of Texas Registration No. 115868
GSI Environmental Inc.
Registered Engineering Firm No. F-01198

1.0 BASIS FOR CERTIFICATION

GSI Environmental Inc. (GSI) has conducted a review of available information and conducted three site visits during construction of the Solids Handling Unit to confirm that the tanks within the unit have been constructed in compliance with applicable provisions of 40 CFR 264 Subpart J for tanks and Hazardous Waste Permit No. 50189. Based on site visits and a review of documentation for the construction and installation of the Solids Handling Units, the tank system has been found to have sufficient structural integrity and is acceptable for storing and processing hazardous waste.

Evaluation of the tank system installation has been based upon the following sources:

- Tank design and construction specifications included in the Engineering Report submitted as part of a Class 2 Permit Modification Application for the facility's Hazardous Waste Permit No. 50189, dated 19 September 2019, and approved by the Texas Commission on Environmental Quality (TCEQ) on 4 December 2019 (see Appendix 1);
- Additional updated tank design documents (see Appendix 1);
- Three inspection visits documenting the construction process of the Solids Handling Unit (see Appendix 2);
- Interviews with Ascend personnel; and
- Review of geomembrane integrity and QA/QC documentation and tanks and piping tightness testing reports (see Appendix 3).

Additional detail regarding the construction of the tanks and Solids Handling Unit is provided in this Certification Report which has been organized to generally follow the regulations as set forth in 40 CFR 264 Subpart J.

2.0 OVERVIEW OF SOLIDS HANDLING UNIT

2.1 Solids Handling Unit Construction

The Solids Handling Unit is located in the south-central portion of the Ascend Chocolate Bayou Plant (see Figure 1) in Alvin, Texas, and includes a system of permitted hazardous waste management tanks and permit exempt tanks, containers, and appurtenant equipment to be employed for dewatering and/or treating hazardous waste solids generated by manufacturing and waste processes at the facility. The permitted tanks and all associated equipment (i.e., permit exempt tanks, containers, and appurtenant equipment) are contained within a concrete secondary containment (i.e., Solids Handling Unit) that is underlain by a geomembrane. As authorized by Hazardous Waste Permit No. 50189, the Solids Handling Unit tanks have been installed in accordance with the plans and specifications provided in the Engineering Report of the Class 2 Permit Modification issued to TCEQ on 18 September 2019. The Class 2 Permit Modification was approved by TCEQ on 4 December 2019 and included a total of six permitted tanks (Permit Unit Nos. 17-22) within Solids Handling Unit.

Ascend has constructed and installed five of the six permitted tanks, with the Solids Handling Unit Decant Tank T-2 (Permit Unit No. 18) having not yet been constructed or installed. The waste processes were modified so that the wastes could be managed without the need for Decant Tank T-2 at this time. The updated process flow diagram (PFD) is included in Appendix 1 of this Certification Report.

Ascend has constructed and installed five of the six permitted tanks, with the Solids Handling Unit Decant Tank T-2 (Permit Unit No. 18) having not yet been constructed or installed. The updated process flow diagram (PFD) is included in Appendix 1 of this Certification Report. The waste processes were modified so that the wastes could be managed without the need for Decant Tank T-2 at this time. Despite the modification of not constructing Decant Tank T-2, the Solids Handling Unit has been designed, constructed, and installed to comply with and as authorized by Hazardous Waste Permit No. 50189 and 30 TAC 335.2(a), including the five tanks that have been constructed and installed.

2.2 Design of the Solids Handling Unit

In accordance with 40 CFR 264.192, the foundation, structural support, seams, and connections of the Solids Handling Unit tanks have been designed and materials were selected in order to: i) possess sufficient structural strength, ii) be compatible with the hazardous and non-hazardous materials managed, and iii) prevent corrosion so that Solids Handling Unit tanks will be protected from collapse, rupture, or failure. Tanks have been designed in accordance with API 650 (see Appendix 1) and constructed in compliance with and as authorized by the terms of the Hazardous Waste Permit No. 50189 and 30 TAC 335.2(a).

TCEQ Permit Unit	Tank Name	NOR No.	Tank Description	Capacity (gallons)
17	Filtrate Tank T-1	121	Vertical cylindrical tank approximately 9 ft diameter and 16.5 ft tall, with a 4.33 ft skirt	15,000
19	Mix Tank T-3	123	Horizontal cylindrical tank 46 ft long and 8.5 ft wide	20,000
20	Mix Tank T-4	124	Horizontal cylindrical tank 46 ft long and 8.5 ft wide	20,000
21	Mix Tank T-5	125	Horizontal cylindrical tank 46 ft long and 8.5 ft wide	20,000
22	Mix Tank T-6	126	Horizontal cylindrical tank 46 ft long and 8.5 ft wide	20,000

As the tanks final dimensions were slightly modified from the original design dimensions included in the Class 2 Permit Modification Application and Decant Tank T-2 was not constructed, the secondary containment capacity calculations were updated to ensure that the Solids Handling Unit has sufficient containment volume available as designed (see Table 1).

2.3 Hazardous Wastes Managed in Solids Handling Unit

As authorized by Hazardous Waste Permit No. 50189, the Solids Handling Unit will be utilized to manage two waste streams: i) solids collected in Tanks 331T5-1 and 331T5-2 from Department 331; and ii) solids from permitted IWPF Tanks 332T1-1 and 332T1-2 (Permit Unit Nos. 08 and 09, respectively). U.S. Environmental Protection Agency (EPA) waste codes associated with the wastes described above and waste stream numbers are listed on Table IV.B (Wastes Managed in Permitted Units) and Table V.C (Tanks and Tank Systems), respectively, of Hazardous Waste Permit No 50189. The Solids Handling Unit will manage both characteristically hazardous waste (i.e., corrosive, reactive, and toxic) and listed hazardous wastes, which are listed owing to toxicity and/or ignitability and reactivity as described in the Engineering Report in the Class 2 Permit Modification Application.

3.0 TANK INSTALLATIONS (40 CFR 264.192(b)-(f))

3.1 Prevention of Structural Damage (40 CFR 264.192(b))

As specified under 40 CFR 264.192(b), proper handling procedures were implemented so as to prevent structural damage to the tank systems during installation; therefore, no structural damage or other inadequate construction/installation conditions need to be remedied prior to use of the tank system. During construction, the tank was subjected to visual inspection to ensure the absence of structural deficiencies. GSI personnel conducted three visits at different stages during construction of the Solids Handling Unit on 5 October 2020, 16 December 2020, and 5 May 2021 to verify that the construction of the unit and tanks were consistent with the specification designs.

3.2 Backfill (40 CFR 264.192(c))

The tanks in the Solids Handling Unit are on supports and located within a reinforced concrete secondary containment area, which is underlain with a geomembrane (see Appendix 2); therefore, no backfill was used to support the tank and the provisions of 40 CFR 264.192(c) are not applicable.

3.3 Tank Tightness Testing (40 CFR 264.192(d))

As required under 40 CFR 264.192(d), tanks are to be tested for tightness and all leaks repaired prior to placing the tank system in service. For this purpose, Filtrate Tank T-1 (Permit Unit No. 17) and Mixing Tanks T-3 through T-6 (Permit Unit Nos. 19 through 22, respectively) were constructed at an off-site facility and the tanks were tightness tested between 18 May 2020 and 1 September 2020, prior to installation within the Solids Handling Unit. Filtrate Tank T-1 (Permit Unit No. 17) was filled to the maximum level and held for one hour without any leaks observed, as recorded in the Hydro Test Report by Augusta Fiberglass (see Appendix 3). Mixing Tanks 3, 4, 5, and 6 (Permit Unit Nos. 19-22) were filled with water and inspected for signs of leaks. No leaks were observed from welds and plugged/flanged openings during the test as recorded by DEL Corporation (see Appendix 3). Therefore, tightness tests demonstrated that no leaks are present and the permitted Solids Handling Unit tanks are suitable for containing the hazardous wastes to be managed.

3.4 Ancillary Equipment (40 CFR 264.192(e))

Ancillary equipment (i.e., aboveground piping, welded flanges, and pumps) were installed in accordance with the requirements of 40 CFR 264.192(e) as described in the Engineering Report included in Class 2 Permit Modification Application and as observed by GSI on 5 May 2021. Ancillary equipment has been provided support and protection to guard against physical damage and excessive stress resulting from settlement, vibration, expansion, and contraction. Moreover, ancillary equipment has been satisfactorily pressure tested after installation between 8 February 2021 and 9 June 2021 (see Appendix 3).

3.5 Corrosion Protection (40 CFR 264.192(f))

No corrosion protection is required for the tanks in the Solids Handling Unit as referenced in 40 CFR 264.192(a)(3), since no portion of the metal tanks is in contact with soil or water. The tanks are elevated on supports at a minimum of 6 inches above the concrete floor of the secondary containment (i.e., Solids Handling Unit), and the floor of the Solids Handling Unit is sloped so that precipitation, wash water, or any potential leaks flow to a sump through a system of concrete drains for collection and transfer within 24 hours, as required by 40 CFR 264.193(c)(4). The sump is located in the northern portion of the secondary containment of the Solids Handling Unit and serves as part of the secondary containment system for the Solids Handling Unit, thus meeting requirements of 40 CFR 264.190(b). Water is routed from the sump to Filtrate Tank T-1 (Permit Unit No. 17) in the northwest portion of the Solids Handling Unit.

4.0 RECORD KEEPING (40 CFR 264.192(g))

In summary, information reviewed and site observations made by GSI for tanks and ancillary equipment within the Solids Handling Unit indicate that the tank system has been properly designed and installed for the management of hazardous waste. This written assessment and certification will be maintained on file at the facility as required under 40 CFR 264.192(g).

GSI Job No. 5644

CERTIFICATION OF CONSTRUCTION FOR
SOLIDS HANDLING UNIT TANKS (PERMIT UNITS 17, 19, 20, 21, AND 22)

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas, Inc., Alvin, Texas

TABLE

TABLE 1
CALCULATION OF SECONDARY CONTAINMENT VOLUME: SOLIDS HANDLING UNIT TANKS
Ascend Performance Materials Texas, Inc., Alvin, Texas
Hazardous Waste Permit No. 50189

Item	Length (ft)	Width or Diameter (ft)	Area (sq ft)	Height/ Depth (ft)	Volume (cu ft)	Conversion from cu ft to Gallons	Volume (gallons)	Notes
Containment Area and Volume								
Secondary containment	102.2	94.8	9,689	2.53	24,485	7.48	183,148	Dimensions taken from elevations data from design drawings. Dike wall is 10" thick.
Trench	152.7	1.5	229	1.68	384	7.48	2,872	Dimensions taken from elevations data from design drawings
Sump	6.3	4.3	27	6.00	162	7.48	1,212	Dimensions taken from elevations data from design drawings
						Total Containment Volume	***187,232***	
Displacement Area and Volume								
Tank T-1 Filtrate Tank Concrete Base	—	5.8	164.3	1.3	212	7.48	1,586	The concrete base is an octagon and the height taken from elevation data from drawings.
Fitrate Transfer Pump	5.8	2.3	26.3	1.3	35	7.48	262	Pump assumed to be the same size its concrete base for conservative calculations.
Filtrate Transfer Pump Concrete Base	5.8	2.3	26.3	1.2	32	7.48	239	
Sump Pump	5.3	2.0	19.3	1.3	25	7.48	187	Pump assumed to be the same size its concrete base for conservative calculations.
Sump Pump Concrete Base	5.3	2.0	19.3	1.2	23	7.48	172	
Decant Pump	5.3	2.0	19.3	1.3	25	7.48	187	Pump assumed to be the same size its concrete base for conservative calculations.
Decant Pump Concrete Base	5.3	2.0	19.3	1.2	23	7.48	172	
Mix Tank T-3	46.1	8.5	391.5	2.5	989	7.48	7,398	Calculations done assuming conservatively that tank is rectangular and not cylindrical.
Mix Tank T-4	46.1	8.5	391.5	2.5	989	7.48	7,398	Calculations done assuming conservatively that tank is rectangular and not cylindrical.
Mix Tank T-5	46.1	8.5	391.5	2.5	989	7.48	7,398	Calculations done assuming conservatively that tank is rectangular and not cylindrical.
Mix Tank T-6	46.1	8.5	391.5	2.5	989	7.48	7,398	Calculations done assuming conservatively that tank is rectangular and not cylindrical.
Activated Carbon Drum	—	1.9	2.9	2.5	7	7.48	52	55 gallon drums, with assumed dimensions 23" diameter and 33.5" height
Activated Carbon Drum	—	1.9	2.9	2.5	7	7.48	52	55 gallon drums, with assumed dimensions 23" diameter and 33.5" height
Tank T-100 Coagulant Tank	—	8.0	50.3	1.4	72	7.48	539	
Tank T-100 Coagulant Tank Base	—	4.7	105.2	1.1	116	7.48	868	The concrete base is an octagon and the height taken from elevation data from drawings.
Coagulant Pumps	1.00	0.5	1.2	1.0	2	7.48	15	Calculations include 2 pumps with assumed dimensions of 1'Lx0.5'Wx1'H
Coagulant Pumps Concrete Base	8.0	8.0	64.0	1.0	64	7.48	479	
Acetic Acid Tote	4.0	4.0	16.0	2.5	40	7.48	299	
Acetic Acid Pump	2.0	2.0	4.0	1.5	6	7.48	45	Pump assumed to be the same size its concrete base for conservative calculations.
Acetic Acid Pump Concrete Base	2.0	2.0	4.0	1.0	4	7.48	30	
Tank T-102 DE Mix Tank	6.0	3.5	21.0	2.5	53	7.48	396	
DE Mix Transfer Pump	2.0	2.0	4.0	1.5	6	7.48	45	Pump assumed to be the same size its concrete base for conservative calculations.
DE Mix Transfer Pump Concrete Base	2.0	2.0	4.0	1.0	4	7.48	30	
Tank T-130 Air Tank	—	2.5	4.9	2.5	12	7.48	90	Air Tank is placed on the hollow skid. Conservative height used for calculations.
Tank T-105 Precoat Tank	—	12.0	113.1	1.4	161	7.48	1,204	
Tank T-105 Precoat Tank Concrete Base	—	5.8	164.3	1.1	181	7.48	1,354	The concrete base is an octagon and the height taken from elevation data from drawings.
Precoat Tank Pumps	8.0	4.0	77.3	2.5	195	7.48	1,459	Calculations include 2 rental pumps with assumed conservative dimensions of 8'Lx4'Wx4'H.
Filter Press Pumps	8.0	13.0	104.0	2.5	263	7.48	1,967	Pumps assumed to be the same size as thei hollow metal skid. Conservative height used.
Access Platform Stair Concrete Pads	3.5	3.5	11.9	0.5	18	7.48	135	Calculations include 3 stair concrete pads assumed to have same dimesions.
De Mix Access Platform Stair Concrete Pad	3.5	3.5	12.5	0.5	7	7.48	52	
Unit Access Stair Concrete Pads	3.5	3.5	11.9	0.5	12	7.48	90	Calculations include 2 stair concrete pads assumed to have same dimesions.
						Total Displacement Volume	***41,321***	

GSI ENVIRONMENTAL

TABLE 1
CALCULATION OF SECONDARY CONTAINMENT VOLUME: SOLIDS HANDLING UNIT TANKS
Ascend Performance Materials Texas, Inc., Alvin, Texas
Hazardous Waste Permit No. 50189

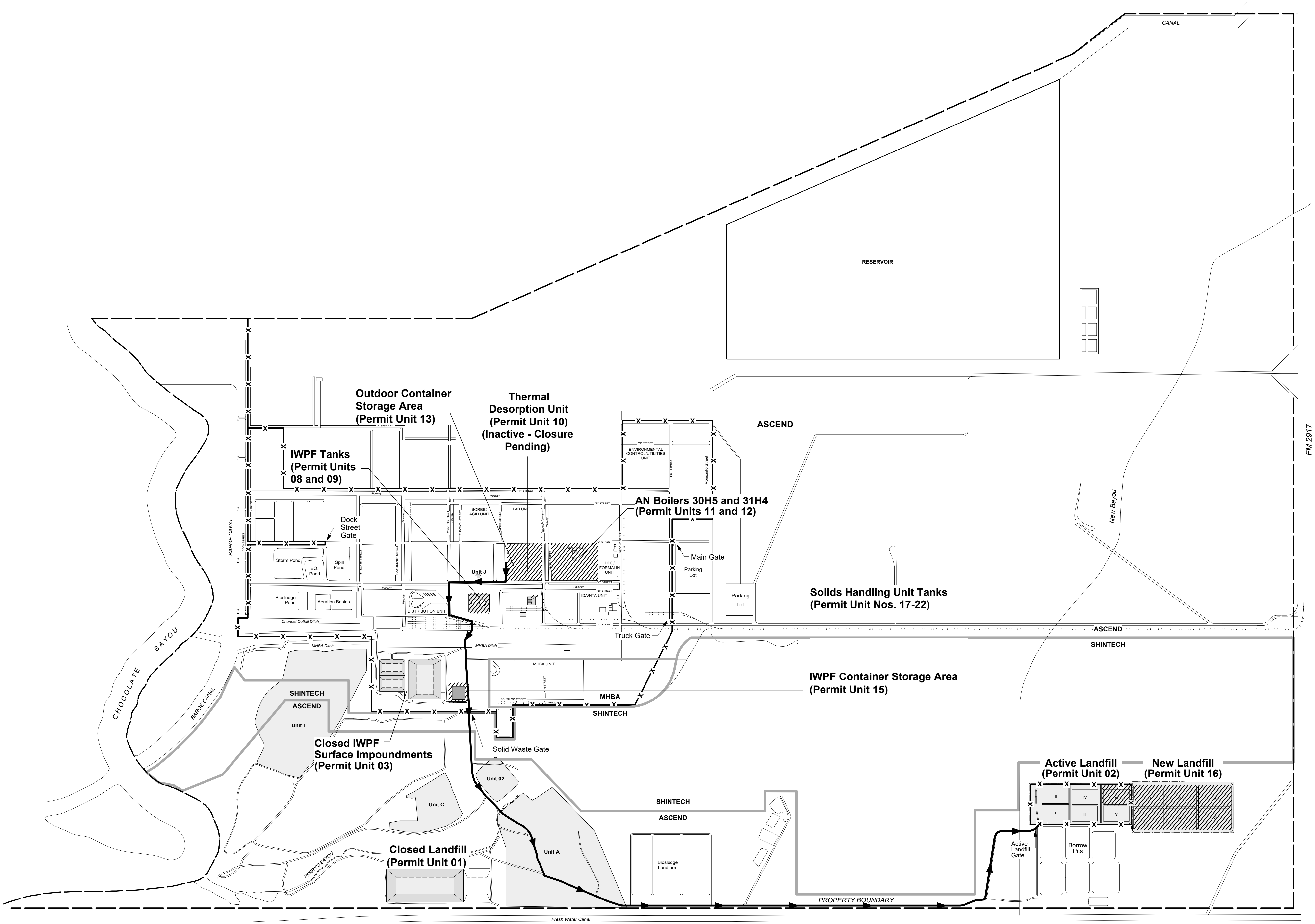
Item	Length (ft)	Width or Diameter (ft)	Area (sq ft)	Height/ Depth (ft)	Volume (cu ft)	Conversion from cu ft to Gallons	Volume (gallons)	Notes
Volume Available for Containment								
Containment Volume							187,232	Equal to total volume of containment area.
Less Displacement Volume							41,321	Equal to total volume of displacement equipment.
Less Rainfall Event	--	--	9,945	1.00	9,945	7.48	74,389	12.0 in, corresponding to a 25-year, 24-hour rain event (NOAA, 2021)
Total Available Volume for Containment							***71,522***	
Required Volume for Secondary Containment Area								
Largest Tank Volume							20,000	Mix Tanks 3, 4, 5, and 6
Total Required Volume							***20,000***	
Volume Over/(Under)								
Available Volume							71,522	Equal to total available volume for containment
Total Required Volume							20,000	Equal to total required volume
Volume Over/(Under)							***51,522***	Conclusion: Sufficient containment volume available

Notes:
1. NOAA, 2021. NOAA Atlas 14 Point Precipitation Frequency Estimates: TX, Hydrometeorological Design Studies Center, Precipitation Frequency Data Server, NOAA's National Weather Service, https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=tx.
2. DE = Diotomaceous earth.

CERTIFICATION OF CONSTRUCTION FOR SOLIDS HANDLING UNIT TANKS (PERMIT UNITS 17, 19, 20, 21, AND 22)

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas, Inc., Alvin, Texas

FIGURE



LEGEND

- Load/unloading areas
- Road to Active Landfill
- Fence line

Notes:

1) Primary roads are 20 ft wide, paved with asphalt or concrete, and designed for a 14,000-lb bearing capacity.
2) Secondary roads are paved with crushed limestone and designed for an 8,000-lb bearing capacity.
3) A 20-mph speed limit applies to all plant roads.
4) Base maps compiled from Solutia drawing No. 340GA2 issued 4-June-1992, and aerial photographs obtained from Aerial Viewpoint, Inc., Negative No. 87B-1922, flight date April-1987, and Negative No. 2, flight date 26-January-1993.

GSI ENVIRONMENTAL
Texas Registration Number: F-1198

LOCATION OF HAZARDOUS WASTE MANAGEMENT UNITS

RCRA Permit Renewal Application
RCRA Permit No. HW-50189
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No:	5644	Drawn By:	DLB/CDM
Issued:	8-Jul-2021	Chk'd By:	KCN
Revised:	8-Jul-2021	Appv'd By:	JMM
Scale:	As Shown		FIGURE 1

GSI Job No. 5644

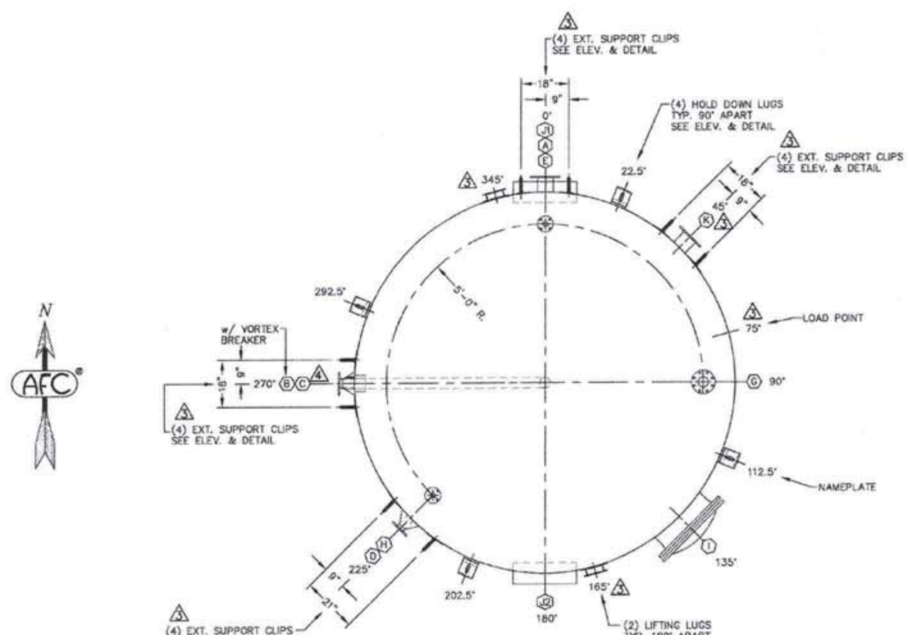
CERTIFICATION OF CONSTRUCTION FOR SOLIDS HANDLING UNIT TANKS (PERMIT UNITS 17, 19, 20, 21, AND 22)

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas, Inc., Alvin, Texas

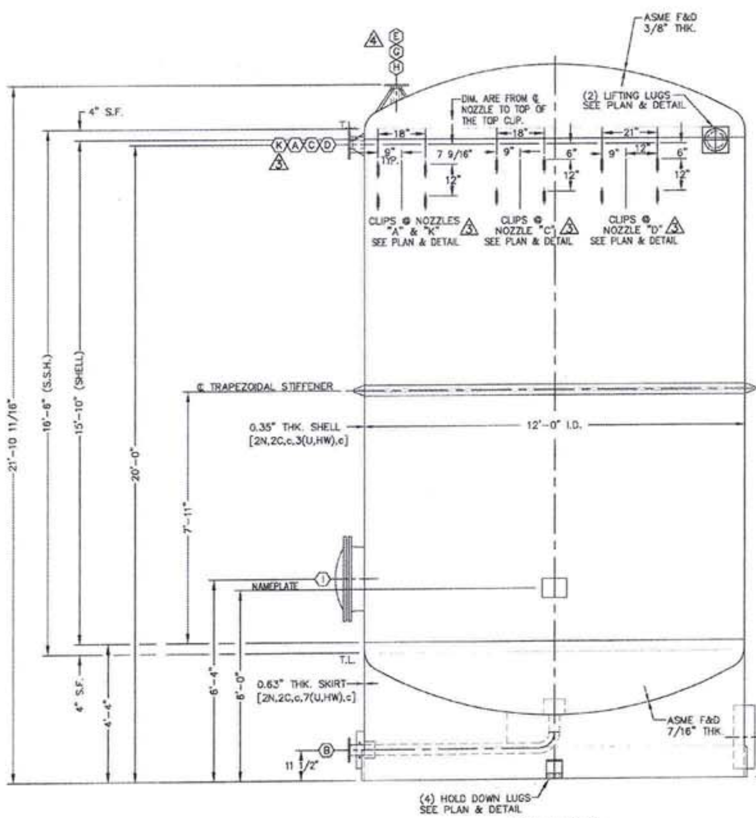
APPENDICES

APPENDIX 1
TANK DESIGN DRAWINGS

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas, Inc., Alvin, Texas

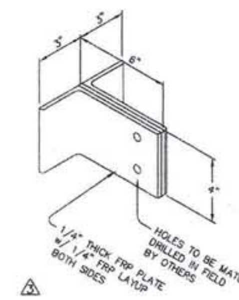


PLAN

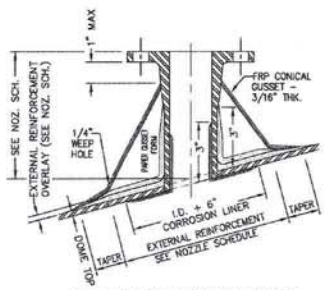


ELEVATION

SEE PLAN FOR TRUE ORIENTATION

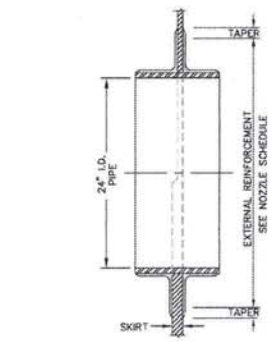


EXT. SUPPORT CLIP DETAIL

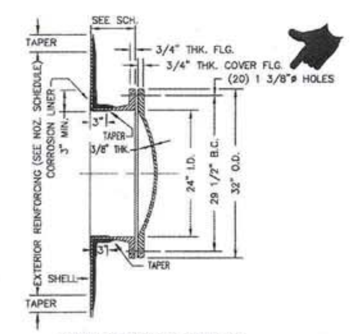


TYP. DOME NOZZLE DETAIL

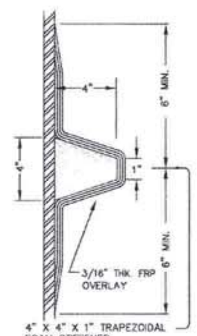
NOZZLES 4" & UNDER TO HAVE GUSSETS AS SHOWN.



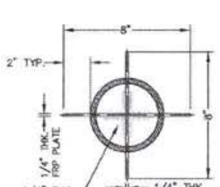
ACCESS OPENINGS "J1" & "J2" DETAIL



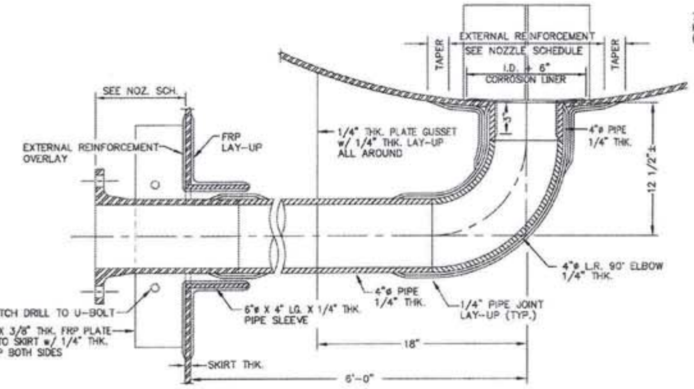
SIDE MANWAY DETAIL
w/ DOME COVER



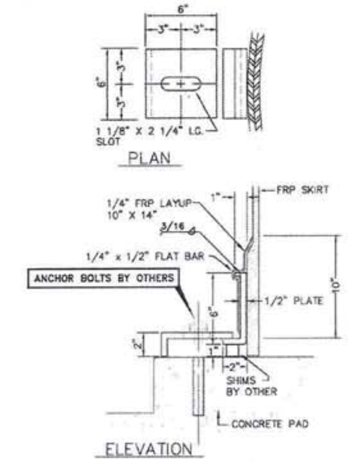
STIFFENER DETAIL



PLAN

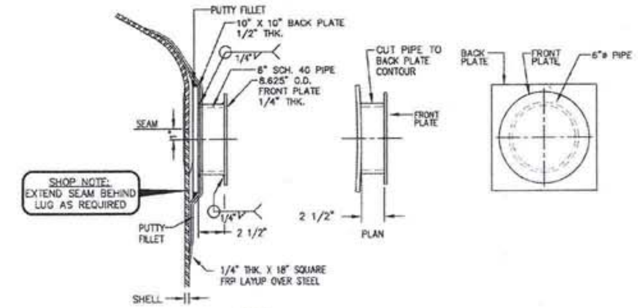


NOZZLE "B" DETAIL



HOLD DOWN LUG w/ DOG CLIP

NOTE : AFTER VESSEL IS FILLED, LUGS MUST BE SHIMMED FLUSH BY OTHERS. ANCHOR BOLTS BY OTHERS, BOTTOM NUT TO BE HAND TIGHTENED +1/4 TURN, THEN TOP NUT TO LOCK.



NOTES:
1. SPREADER BAR SHOULD BE USED FOR LIFTING.
2. LUGS NOT DESIGNED FOR LATERAL LOAD.

LIFTING LUG DETAIL
5K

CUSTOMER NOTE:
IT IS THE CUSTOMER'S RESPONSIBILITY TO PROPERLY SIZE THE VENT/OVERFLOW TO ENSURE THAT THE TANK DOES NOT EXCEED DESIGN PRESSURE. (SEE NOTE 16)

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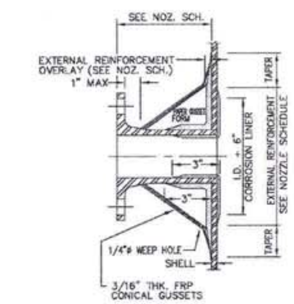
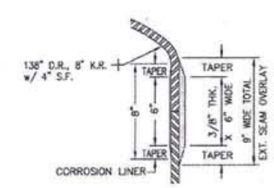


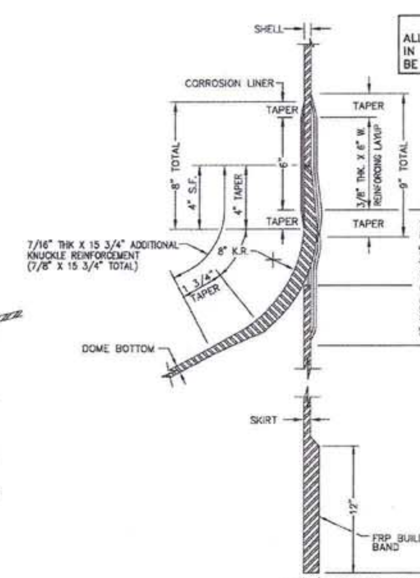
TYP. SIDEWALL NOZZLE DETAIL

NOZZLES 4" & UNDER TO HAVE GUSSETS AS SHOWN.



HEAD-SHELL SEAM DETAIL

SHOP NOTE:
ALL CHOPPED STRAND GLASS IN CORROSION LINER MUST BE ECR GLASS!



SKIRT/DOME BOTTOM DETAIL

SKIRT TO BE GROUTED, AS REQUIRED TO PROVIDE FULL SUPPORT.

CUSTOMER NOTE: REGARDING ALL FLANGED NOZZLES THAT ARE FLUSH w/ TANK I.D.
THE INTERNAL DIA. WILL BE REDUCED FROM MOLD SIZE, DUE TO THE LAYUP NECESSARY FOR PROPER INSTALLATION. PLEASE CONSIDER THIS WHEN DETERMINING NOZZLE SIZES REQUIRED FOR CONNECTIONS THAT HAVE INT. PROBES, ETC.

NOZZLE SCHEDULE

MARK	QTY.	SIZE (PIPE I.D.)	PROJ.	SERVICE	REMARKS :	FLG. THK.	PIPE THK.	EXT. REINF. THK.	EXT. REINF. FULL THK.	DIA. OVERALL w/ TAPER
A	1	6"	6"	FILTRATE WATER INLET		11/16"	1/4"	3/8"	12"	16 1/2"
B	1	4"	6"	LIQUID OUTLET	w/ ELBOW, PIPE, PIPE SLEEVE & VORTEX BREAKER	11/16"	1/4"	5/16"	10"	13 3/4"
C	1	3"	6"	SUMP WATER INLET		9/16"	1/4"	1/4"	9"	12"
D	1	3"	6"	DECANT WATER INLET		9/16"	1/4"	5/16"	9"	12 3/4"
E	1	2"	SEE ELEV.	LEVEL INDICATOR		9/16"	1/4"	1/4"	8"	11"
G	1	4"	SEE ELEV.	VACUUM BREAKER		11/16"	1/4"	1/4"	10"	13"
H	1	2"	SEE ELEV.	VENT HEADER OUTLET		9/16"	1/4"	1/4"	8"	11"
I	1	24"	6"	SIDE MANWAY	w/ SIDE MANWAY, BOLTING & GASKET	3/4"	3/8"	3/8"	48"	52 1/2"
J1	1	24"	~	ACCESS OPENING	PIPE SLEEVE 8" LG.	N/A	3/8"	1/4"	48"	51"
J2	1	24"	~	ACCESS OPENING	PIPE SLEEVE 8" LG.	N/A	3/8"	1/4"	48"	51"
K	1	6"	6"	OVERFLOW		11/16"	1/4"	1/4"	12"	15"

MATERIAL SHOWN FOR ONE (1) TANK
ONE (1) TANK REQ'D

BILL OF MATERIAL & PARTS

ITEM	REQ'D	MAT'L	THK.	DESCRIPTION
1	2	C.S. GALV.		LIFTING LUG (TLL-5K-GALV)
2	4	C.S. GALV.		HOLD DOWN LUG w/ CLIP (HDA)
3	20	316 S.S.		1 1/4"ø X 4" LG. BOLT w/NUT & (2) FLAT WASHERS (SIDE MANWAY)
4	1	316 S.S.		U-BOLT FOR A 4"ø PIPE w/ (2) NUTS & (2) FLAT WASHERS (NOZZLE "B")
5	1	GORE UPG	1/8"	24"ø, 150# DRILL, F.F. GASKET (SIDE MANWAY)
6	40 L.F.	POLYISO		4" X 4" X 1" TRAPEZOIDAL STIFFENER CORE

GENERAL NOTES:

FABRICATION SPECIFICATION :
1. ☒ HAND LAY-UP PER NBS PS 15-69 AND
☒ CORROSION RESISTANT EQUIPMENT PER ASME RTP-1-2017 DESIGN ONLY, NO STAMP/CERTIFICATION, PART 3 & 4 ONLY, LEVEL 2, NON-CRITICAL SERVICE.
2. RESIN : DERAKANE 411 OR EQUAL
CURE SYSTEM : MEKP
SHOP NOTE:
POST CURE AT 180° F @ 4 HOURS
3. SURFACING VEIL : (2) PLIES NEXUS
CORROSION LINER : 100 MILS
4. FLANGED NOZZLES TO HAVE DRILL PATTERN & THICKNESS PER :
☒ ANSI STD. B-16.5 FOR 150# DRILLING
☒ THK. RATING PER NOZZLE SCHEDULE.
☒ MANWAYS PER NOZZLE SCHEDULE & DETAILS.
5. BOLT HOLES TO STRADDLE PRINCIPAL (0-180°) CENTERLINES.
6. ALL BOLTING HARDWARE (BY AFC OR OTHERS) PER ASME RTP-1 2017 STD. FIG. 4-10. ALL FLANGE BACKFACING WILL BE 1/8" LARGER THAN WASHER SIZE.
7. FLANGED NOZZLES 4" & UNDER TO HAVE GUSSETS AS SHOWN ON DETAILS.
8. COLOR : LT. GRAY w/ U.V. INHIBITORS
9. NAMEPLATE : REQUIRED
10. HYDROTEST : REQUIRED
11. ACOUSTIC EMISSION TESTING : REQUIRED
12. INSPECTION : REQUIRED
13. SKIRT BOTTOM MUST BE FULLY SUPPORTED ON A LEVEL NON-DEFLECTING PAD. PAD MUST BE FLAT TO 1/8"± OVER A 10'-0" SPAN.
14. GASKET TO BE FULL FACED WITH A DUROMETER OF 40-70. MATING FLANGES ARE TO BE FLAT FACED.
15. ALL VESSEL NOZZLES SHOULD BE JOINED TO PIPING THROUGH A FLEXIBLE CONNECTION OR FLEXIBLE PIPING SYSTEM.
16. IF AIR LOADING IS USED, AFC STRONGLY RECOMMENDS THE TANK VENT BE (3) TIMES THE CROSS SECTIONAL AREA OF THE INLET. THIS MAY BE ACHIEVED BY OPENING TOP MANWAY, IF APPLICABLE.
17. SEE AFC'S HANDLING AND INSTALLATION INSTRUCTIONS FOR PROPER HANDLING, UNLOADING & INSTALLING THIS VESSEL.
18. ALL CUT AND EXPOSED EDGES SHALL BE RESIN COATED.
19. MARK AND SAVE ALL CUTOUTS FOR INSPECTION.
20. PRIOR TO SHIPMENT, VESSEL INSIDES MUST BE CLEANED & ALL OPENINGS CAPPED.
21. DETAILS NOT TO SCALE UNLESS OTHERWISE STATED.

WASTEWATER TANK
DWG.: B-331T11-001

AFC®
AUGUSTA FIBERGLASS®
88 LAKE CYNTHIA ROAD
BLACKVILLE, SC 29817
803-284-2246
engineering@augustafiberglass.com

CUSTOMER:	SPARKLING CLEAR INDUSTRIES
FOR:	
EQUIP. NO.:	331T11
CUSTOMER P.O. NO.:	25182
AFC JOB NO.:	88664
RESIN:	DERAKANE 411 OR EQUAL
DESIGN PRESS.:	+16" W.C. / -8" W.C.
DESIGN TEMP.:	120° F
SPECIFIC GRAVITY:	1.0
CONTENTS:	WASTE WATER
CAPACITY:	8,000 GAL. (OPER.) 15,000 GAL. (FLOODED)
ESTM. WEIGHT:	6,000 LBS. (EMPTY)
DATE BUILT:	2020

NAMEPLATE DETAIL (BLACK LETTERING): FRP ENCAPSULATED

SPARKLING CLEAR INDUSTRIES
WHSE REC / ASCEND PERFORMANCE
FM 2917/ CHOCOLATE BAYOU
ALVIN, TX 77512

(1) 12'-0" I.D. X 16'-6" S.S.H. (DB/DT)
ON FRP SKIRT ~ 15,000 GALLON
WASTEWATER STORAGE TANK

EQUIP. NO. : 331T11
SPEC. NO. :
PROJECT NO. :

DRAWN BY J. RAPP	P.O. # 25182	
DFTG. CK. BY :	APPROVAL	
DATE MARCH 16, 2020	DRAWING NO. AB-8162	
AFC JOB # 88664	SHT. 1 OF 1	REV. 4
SCALE: .375"=1'-0"	36" X 24"	

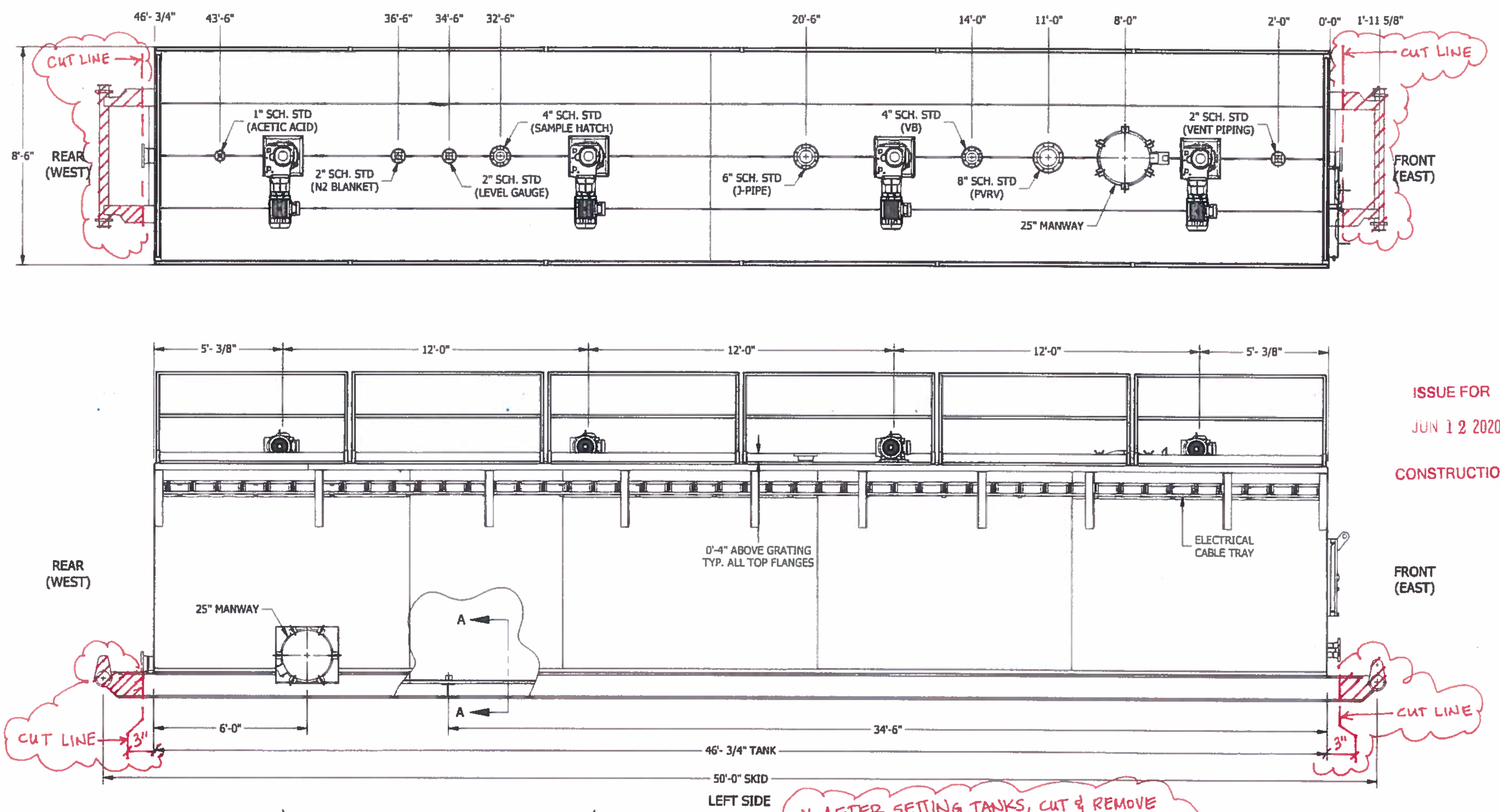
R14 FILE # 88664A20.DWG

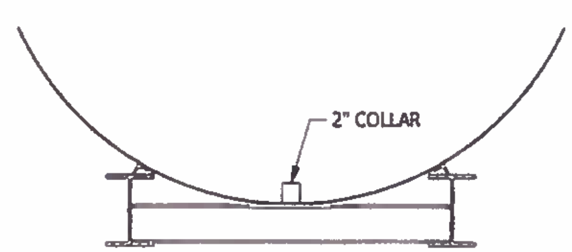
REV	CUST	SHOP	QA	PURCH
0	EMAIL	1		1
1	EMAIL	1		1
2	EMAIL	4	1	1
3	EMAIL	4	1	1
4	EMAIL	4	1	
5				

NO.	REVISION	DESCRIPTION	BY	CK	APV	DATE
0	ISSUED FOR APPROVAL		JR		PS	03/20/20
1	REISSUED FOR APPROVAL	ORIENTATIONS, ELEVATIONS	JR		PS	03/30/20
2	ISSUED FOR FABRICATION	ELEVATION OF DOME TOP NOZZLES	JR		PS	04/06/20
3	REVISED "AS NOTED"	ADD (16) PIPE SUPPORTS & (1) 6"ø FN "K", ROTATE LL'S	JR		PS	04/24/20
4	REVISED "AS NOTED"	DELETE NOZZLE "F"	JR			04/27/20
5						

CUSTOMER: PLEASE CHECK STATUS OF DRAWING
☐ ISSUE FOR FABRICATION.
☐ ISSUE FOR FABRICATION WITH NOTED EXCEPTIONS.
☐ ISSUE FOR COMPONENT FABRICATION. (HEAD, BTM & SHELL)
☐ REVISE & RESUBMIT FOR APPROVAL.
☐ OTHER: ______
AUTHORIZED BY: NAME/DATE: ______

CERTIFIED
FABRICATION DRAWING





SECTION A-A

* AFTER SETTING TANKS, CUT & REMOVE SKID BARS FROM BOTH ENDS OF TANKS. GRIND OFF BURRS & SMOOTH EDGES.

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PROPRIETARY
The information contained herein is the property of DEL Corporation and is given on the distinct understanding that it shall not be disclosed, loaned, copied, nor otherwise used by any third parties without express written consent of DEL Corporation.

UNLESS OTHERWISE SPECIFIED TOLERANCES

.X	+/- .1
.XX	+/- .03
.XXX	+/- .005
FRACTIONAL	+/- 1/16"
ANGULAR	+/- 1/2°
FINISH	+/- 125µ in

Alan 12/23/2019
Ascend Materials
200029

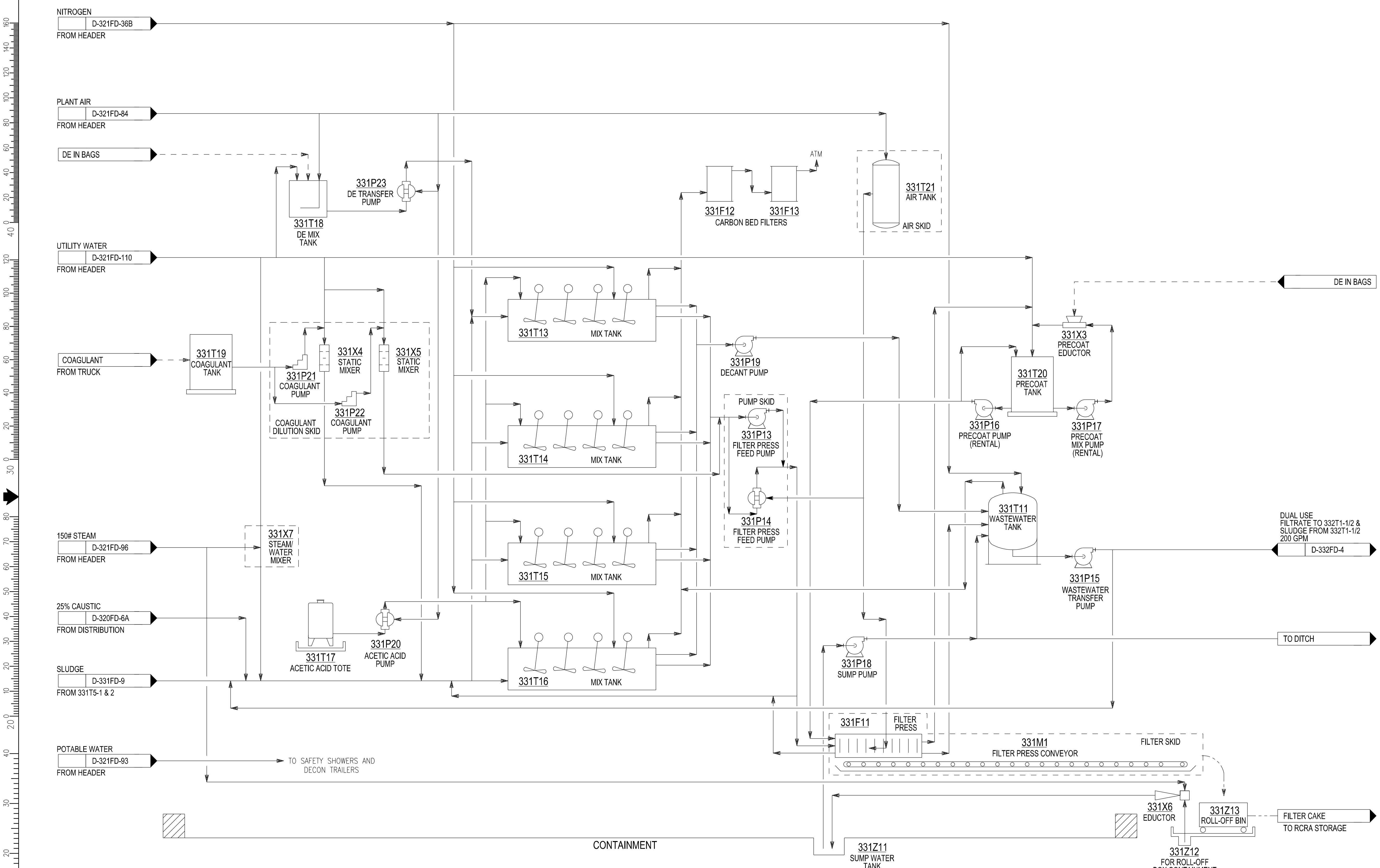
MIX TANK SKIDS MODIFICATIONS

DEL CORPORATION

B-331T13-003 B 1 0

3/31/2020 03:25:18 PM Alan

Last saved on March 31, 2020 at 01:16:00 PM By Alan



331M1	331F11	331Z13	331X3	331P21	331P13	331P14	331P15	331P16	331P17	331P18	331P19	331P23	331P22
FILTER PRESS CONVEYOR	FILTER PRESS	ROLL OFF BIN 25 CU. YD. (RENTAL)	PRECOAT EDUCTOR	COAGULANT PUMP 90 GPH 10 PSIG	FILTER PRESS FEED PUMP 100-600 GPM 10-40 PSIG	FILTER PRESS FEED PUMP 20-100 GPM 40-100 PSIG	WASTEWATER TRANSFER PUMP 100 GPM 20 PSIG	PRECOAT PUMP 1500 GPM 15 PSIG	PRECOAT MIX PUMP 250 GPM 20 PSIG	SUMP PUMP 200 GPM 25 PSIG	DECANT PUMP 200 GPM 20 PSIG	DE TRANSFER PUMP	COAGULANT PUMP 90 GPH 10 PSIG

331Z11	331Z12	331X4	331X5	331T21	331T18	331T19	331T20	331T13/14/15/16	331T11	331T17	331P20	331F12	331F13	331X6	331X7
SUMP WATER TANK	SUMP WATER TANK	STATIC MIXER	STATIC MIXER	AIR TANK	DE MIX TANK	COAGULANT TANK	PRECOAT TANK	MIX TANKS	WASTEWATER TANK	ACETIC ACID TOTE	ACETIC ACID PUMP	CARBON BED FILTER	CARBON BED FILTER	EDUCTOR	STEAM/WATER MIXER

REV	CEA	BY	DESCRIPTION	
0	TX21230 EWR 3297	J. SULLIVAN 4533 4/20		CNS VVL
		PHONE DATE		CHKD APPD

ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
P.O. BOX 711
FM 2917
ALVIN, TEXAS 77512

ASCEND PERFORMANCE MATERIALS

COMPANY ASCEND | PLANT CHOCOLATE BAYOU

ECU DEPT. 331 PFD
SLUDGE TREATMENT

			APPROVED	DATE	APPROVED	DATE
DRAWN BY:	J. SULLIVAN					
PHONE/DATE	4533	4/20	LANIER	4/20		
CHKD/DATE	CNS	4/20	MULLER	4/20		
SCALE						

C.E.A.NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	REV
TX21230 EWR3297	1046	D	331	FD	35	0

PLANT DRAWING NO.
D-331FD-35

CAD FILENAME: DATE REV 8/98

"WORK SAFELY"

331fd00035.dgn 6/14/2021 9:34:06 AM

GSI Job No. 5644

APPENDIX 2
PHOTOGRAPHIC DOCUMENTATION OF THE INSPECTIONS CONDUCTED AT THE ASCEND CHOCOLATE BAYOU PLANT

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas, Inc., Alvin, Texas

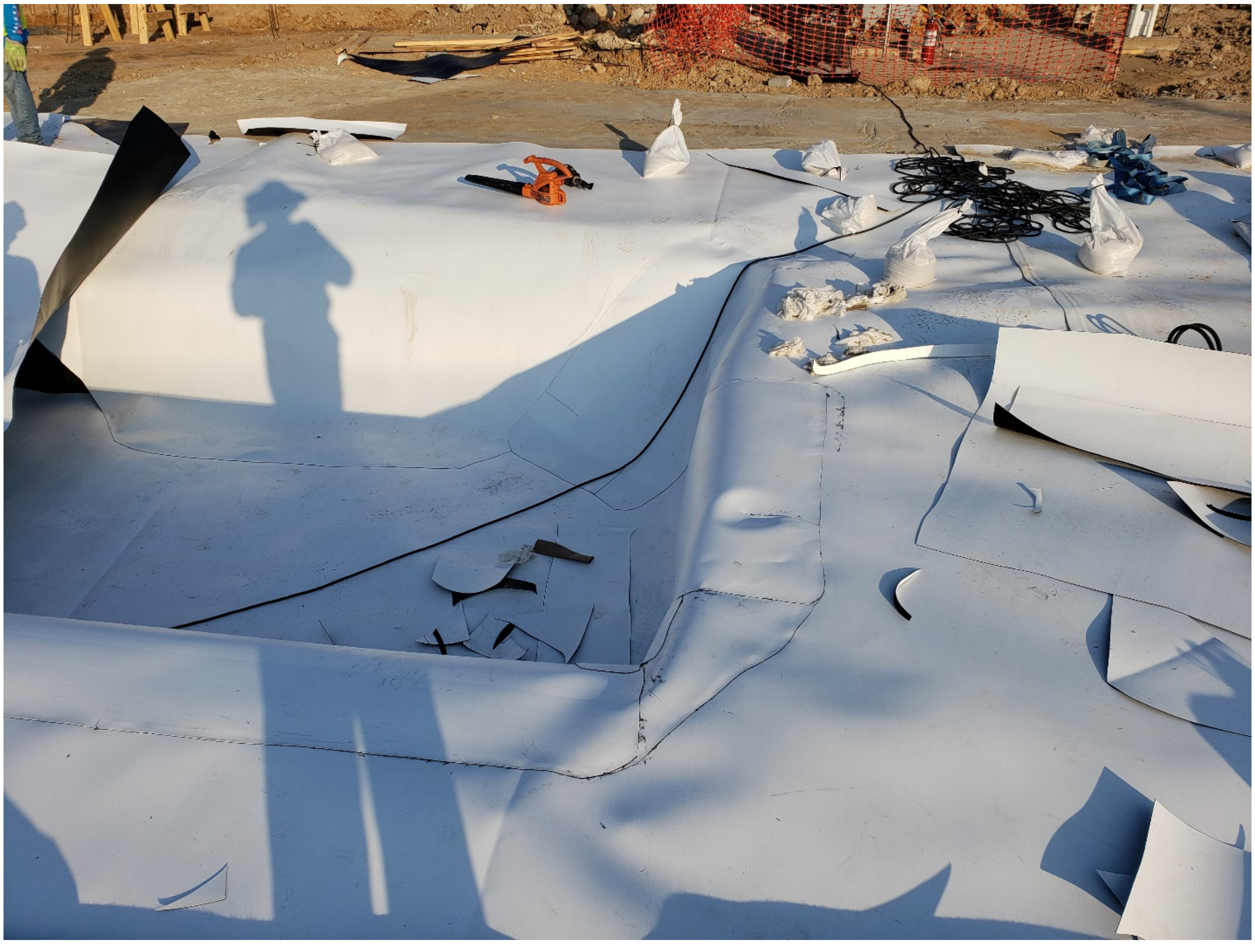
APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT GEOMEMBRANE: INSPECTION CONDUCTED ON 5 OCTOBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Geomembrane installation. Photograph Taken Facing South.

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT GEOMEMBRANE: INSPECTION CONDUCTED ON 5 OCTOBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189



Northern main sum. Photograph taken facing northwest.

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT GEOMEMBRANE: INSPECTION CONDUCTED ON 5 OCTOBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Eastern side of the geomembrane installation. Photograph taken facing southeast.

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PHOTOGRAPHS OF SOLIDS HANDLING UNIT GEOMEMBRANE: INSPECTION CONDUCTED ON 5 OCTOBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Eastern side of the geomembrane installation. Photograph taken facing southeast.

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT GEOMEMBRANE: INSPECTION CONDUCTED ON 5 OCTOBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Southeastern side of the geomembrane installation. Photograph taken facing northeast.

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT GEOMEMBRANE: INSPECTION CONDUCTED ON 5 OCTOBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Geomembrane concrete anchoring support. Photograph taken facing southeast.

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT GEOMEMBRANE: INSPECTION CONDUCTED ON 5 OCTOBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Northeastern side of the upper soil cover over geomembrane. Photograph taken facing southwest.

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT GEOMEMBRANE: INSPECTION CONDUCTED ON 5 OCTOBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Geomembrane installation. Photograph Taken Facing South.

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT SECONDARY CONTAINMENT: INSPECTION CONDUCTED ON 16 DECEMBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Southeastern portion of the secondary containment area. Facing southeast

Western portion of the secondary containment area and location of main sump. Facing southwest

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT SECONDARY CONTAINMENT: INSPECTION CONDUCTED ON 16 DECEMBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of roll-off loading/unloading area. Facing southwest

Location of roll-off loading/unloading area. Facing northeast

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT SECONDARY CONTAINMENT: INSPECTION CONDUCTED ON 16 DECEMBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of mix tanks and tank concrete pads in the southwestern portion of the secondary containment area. Facing south

Location of tank concrete pads in the western portion of the secondary containment area. Facing northeast

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT SECONDARY CONTAINMENT: INSPECTION CONDUCTED ON 16 DECEMBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of the mix tanks in the southwestern portion of the secondary containment area. Facing southeast

Location of the temporary stairway to access the southeastern portion of the secondary containment area. Facing northeast

GSI ENVIRONMENTAL

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT SECONDARY CONTAINMENT: INSPECTION CONDUCTED ON 16 DECEMBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of the collection sump and tank concrete pad in the eastern portion of the secondary containment area. Facing northwest

Eastern portion of the secondary containment area. Facing southeast

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT SECONDARY CONTAINMENT: INSPECTION CONDUCTED ON 16 DECEMBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of the mix tanks in the southwestern portion of the secondary containment area. Facing southwest

Southeastern portion of the secondary containment area. Facing southwest

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT SECONDARY CONTAINMENT: INSPECTION CONDUCTED ON 16 DECEMBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Dike wall of the southeast portion of the secondary containment area. Facing southwest

Dike wall of the southeast portion of the secondary containment area. Facing northeast

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT SECONDARY CONTAINMENT: INSPECTION CONDUCTED ON 16 DECEMBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Dike wall of the northeastern portion of the secondary containment area. Facing northwest

Dike wall of the southwestern portion of the secondary containment area Facing northwest

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT SECONDARY CONTAINMENT: INSPECTION CONDUCTED ON 16 DECEMBER 2020

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Dike wall of the northwestern portion of the secondary containment area. Facing northeast

Eastern view of the secondary containment area. Facing west

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of wastewater tank and filter press in the northern portion of the secondary containment area. Facing northwest

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of air tank, skid, ancillary equipment and mix tanks in the southwestern portion of the secondary containment area. Facing southwest

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of precoat tank, concrete base, air tank and mix tanks in the southeast portion of the secondary containment area. Facing south

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of filter press in the norther portion of the secondary containment area. Facing north

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of wastewater tank and associated pumps in the northwestern portion of the secondary containment area. Facing northeast

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of mix tanks, concrete base and ancillary equipment in the western portion of the secondary containment area. Facing south

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of the polymer tank, concrete base and mix tank in the northern portion of the secondary containment area. Facing east

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of superficial cracks in the northern portion of the secondary containment area. Facing north

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of mix tank, concrete base and ancillary equipment in the southwestern portion of the secondary containment area. Facing northwest

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of precoat tank, mix tanks and ancillary equipment in the southeastern portion of the secondary containment area. Facing northwest

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of the mix tanks in the southwestern portion of the secondary containment area. Facing southwest

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of carbon filter columns and mix tank in the southwestern portion of the secondary containment area. Facing southwest

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location de-mix tank in southwest portion of the secondary containment area. Facing southwest

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location de-mix tank and transfer pump in southwest portion of the secondary containment area. Facing southwest

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location of mix tanks in the southwest portion of the secondary containment area. Facing northwest

APPENDIX 2
PHOTOGRAPHS OF SOLIDS HANDLING UNIT TANK SYSTEM AND ANCILLARY EQUIPMENT: INSPECTION CONDUCTED ON 5 MAY 2021

Ascend Performance Materials Texas, Inc., Alvin, Texas
RCRA Hazardous Waste Permit No. 50189

Location de-mix tank, transfer pump and carbon filter columns in southwest portion of the secondary containment area. Facing northeast

APPENDIX 3
HYDRO TESTING REPORTS

Hazardous Waste Permit No. 50189
Ascend Performance Materials Texas, Inc., Alvin, Texas

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
	SERVICE TEST RECORD	Revision: 14 Page: 1 of 1 Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Potable Water Code/Specification: B31.3/

System Description: 321-DW-106-LA3, 331-PW-7-LA3, 331-PW-8-LA3

Test Boundaries: 321-DW-106-LA3-01, 331-PW-7-LA3-01,02, 331-PW-8-LA3-01

P&ID & Drawing #'s: D-321FD-80 / D-331-FD-36

Non-Destructive Testing Complete

Dharmendran Jayaraman 5/11/2021

Turner QC Date

System Design Pressure: 150 PSIG Minimum Test Pressure: 178 PSIG

Actual Test Pressure: 178 PSIG Metal Temp: 89 °F

Test Medium: Utiliti Water Medium Temp: ______ °F

Ambient Temp: 84 °F

Date of Gauge Calibration: ______ Gauge #: ______ Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: ______ PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 2:45 PM Time Test Ended: 3:55 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 5/11/2021

Turner QC Date

John MacPhee 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
	PRESSURE TEST RECORD	Revision: 14 Page: 1 of 1 Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: ______ WO#: TX21230

System: 321-K-84-B1SD.3 Code/Specification: B31.3/

System Description: 321-K-84-B1SD.3

Test Boundaries: Weld 101 - W 118

P&ID & Drawing #'s: D-331FD-36 , D-320FD-6A

Non-Destructive Testing Complete

Dharmendran Jayaraman 3/23/2021

Turner QC Date

System Design Pressure: 275 PSIG Minimum Test Pressure: 412 PSIG

Actual Test Pressure: 460 PSIG Metal Temp: 80 °F

Test Medium: Utility Water Medium Temp: ______ °F

Ambient Temp: 82 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-2 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 3:11 PM Time Test Ended: 3:39 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

______ ______

Turner Foreman Date

Dharmendran Jayaraman 3/23/2021

Turner QC Date

John MacPhe 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
	PRESSURE TEST RECORD	Revision: 14 Page: 1 of 1 Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Steam Code/Specification: B31.3/

System Description: 321-LS-186-C1CS-5

Test Boundaries: 321-LS-186-C1CS-5-01,02

P&ID & Drawing #'s: D-321FD-96/D331FD-36

Non-Destructive Testing Complete

Dharmendran Jayaraman 2/11/2021

Turner QC Date

System Design Pressure: 285 PSIG Minimum Test Pressure: 427 PSIG

Actual Test Pressure: 443 PSIG Metal Temp: 48 °F

Test Medium: Utiliti Water Medium Temp: ______ °F

Ambient Temp: 48 °F

Date of Gauge Calibration: 6/26/2020 Gauge #: 166852 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1500 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 10:12 AM Time Test Ended: 10:55 AM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 2/11/2021

Turner QC Date

John MacPhee 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
	PRESSURE TEST RECORD	Revision: 14 Page: 1 of 1 Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ____ Rev. # ____

Client: Ascend Job No.: TX21230 WO#: ____

System: Nitrogen Code/Specification: B31.3/

System Description: 321-N-166-F2BA1X

Test Boundaries: 321-N-166-F2BA1X-01,02

P&ID & Drawing #'s: DF-321FD-36B

Non-Destructive Testing Complete:

Dharmendran Jayaraman 2/8/2021

Turner QC Date

System Design Pressure: 285 PSIG Minimum Test Pressure: 427 PSIG

Actual Test Pressure: 440 PSIG Metal Temp: 54 °F

Test Medium: Utiliti Water Medium Temp: ____ °F

Ambient Temp: 55 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-2 Date of Gauge Calibration: ____ Gauge #: ____

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ____ PSIG

Time Test Started: 3:35 PM Time Test Ended: 4:09 PM

Remarks: ____

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 2/8/2021

Turner QC Date

John MacPh— 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
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Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Utility Air / Plant Air Code/Specification: B31.3/

System Description: 321-UA-66-LA1 / 331-PA-10-LA1 Through 331-PA-15-LA1

Test Boundaries: 321-UA-66-LA1-01, 331-PA-10-01-05, 331-PA-11-LA1-01,02, 331-PA-12-LA1-01-04, 331-PA-13-LA1-13-01,02, 331-PA-14-LA1-01, 331-PA-15-LA1-01-03.

P&ID & Drawing #'s: D-331FD-39, D-321FD-84, D-331FD-39, D-331FD-40

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/21/2021

Turner QC Date

System Design Pressure: 150 PSIG Minimum Test Pressure: 93 PSIG

Actual Test Pressure: 93 PSIG Metal Temp: 89 °F

Test Medium: Air Medium Temp: ______ °F

Ambient Temp: 84 °F

Date of Gauge Calibration: ______ Gauge #: ______ Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 200 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 9:20 AM Time Test Ended: 10:37 AM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 5/21/2021

Turner QC Date

[signature] 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
	PRESSURE TEST RECORD	Revision: 14 Page: 1 of 1 Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: ______ WO#: TX21230

System: 321-UW-94-LA1 Code/Specification: B31.3/

System Description: 321-UW-94-LA1

Test Boundaries: W409 - W422 ON Sheet 01 & 02

P&ID & Drawing #'s: D-331FD-110 , D-331GA-9

Non-Destructive Testing Complete:

Dharmendran Jayaraman 3/26/2021

Turner QC Date

System Design Pressure: 150 PSIG Minimum Test Pressure: 225 PSIG

Actual Test Pressure: 250 PSIG Metal Temp: 72 °F

Test Medium: Utility Water Medium Temp: ______ °F

Ambient Temp: 73 °F

Date of Gauge Calibration: 6/26/2020 Gauge #: 166845 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 600 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 3:59 PM Time Test Ended: 3:16 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 3/26/2021

Turner QC Date

[signature] 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
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		Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: ______ WO#: TX21230

System: Waste Water Code/Specification: B31.3/

System Description: 321-WW-79-C1CS-5

Test Boundaries: 321-WW-79-C1CS-5-01,02,03

P&ID & Drawing #'s: D-331FD-37 , D-332FD-4

Non-Destructive Testing Complete:

Dharmendran Jayaraman 3/25/2021

Turner QC Date

System Design Pressure: 285 PSIG Minimum Test Pressure: 427 PSIG

Actual Test Pressure: 443 PSIG Metal Temp: 71 °F

Test Medium: Utility Water Medium Temp: ______ °F

Ambient Temp: 71 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-2 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 10:14 AM Time Test Ended: 10:35 AM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 3/25/2021

Turner QC Date

John MacPhe 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
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Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Untreated Slurry Code/Specification: B31.3/

System Description: 321-WW-80-B1SD.3

Test Boundaries: 321-WW-80-B1SD.3-01,02,03

P&ID & Drawing #'s: D-331FD-9, D-331FD-36

Non-Destructive Testing Complete:

Dharmendran Jayaraman 3/29/2021

Turner QC Date

System Design Pressure: 275 PSIG Minimum Test Pressure: 412 PSIG

Actual Test Pressure: 438 PSIG Metal Temp: 65 °F

Test Medium: Utiliti Water Medium Temp: ______ °F

Ambient Temp: 66 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-2 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 3:43 PM Time Test Ended: 3:58 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

______ ______

Turner Foreman Date

Dharmendran Jayaraman 3/29/2021

Turner QC Date

John MacPhee 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
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Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: 331-F-11-1-C1CS-5 Code/Specification: B31.3/

System Description: 331-F-11-1-C1CS-01

Test Boundaries: W#104

P&ID & Drawing #'s: D-331FD-36/39

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/3/2021

Turner QC Date

System Design Pressure: 285 PSIG Minimum Test Pressure: 427 PSIG

Actual Test Pressure: 447 PSIG Metal Temp: 98 °F

Test Medium: Utility Water Medium Temp: ______ °F

Ambient Temp: 83 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 4:35 PM Time Test Ended: 4:58 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

______ ______

Turner Foreman Date

Dharmendran Jayaraman 5/3/2021

Turner QC Date

John Mac Pelham 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION **PRESSURE TEST RECORD**	Exhibit No. 13C Revision: 14 Page: 1 of 1 Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: 331-F-11-2 / 331-F-11-3 Code/Specification: B31.3/

System Description: 331-F-11-2-C1CS-5 / 331-F-11-3C1CS-5

Test Boundaries: W# 132 on 331-F-11-2-C1CS-5-01, W# 105 - 117 on 331-F-11-2-C1CS-5-02,
W# 132,133 on 331-F-11-3-C1CS-5-01, W# 121- 131 on 331-F-11-3-C1CS-5-02

P&ID & Drawing #'s: D-331FD-39

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/14/2021
Turner QC Date

System Design Pressure: 285 PSIG Minimum Test Pressure: 427 PSIG

Actual Test Pressure: 462 PSIG Metal Temp: 88 °F

Test Medium: Utility Water Medium Temp: ______ °F

Ambient Temp: 79 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 1:05 PM Time Test Ended: 1:40 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

______ ______
Turner Foreman Date

Dharmendran Jayaraman 5/14/2021
Turner QC Date

John MacPhee 6/3/21
Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
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Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Nitrogen / Tank vapor Code/Specification: B31.3/

System Description: 331-F-12-1 / 331-F-12-2

Test Boundaries: 331-F-12-1-B1SD.3-01, 331-F-12-1-B1SD.3-02, 331-F-12-2-B1SD.3-01

P&ID & Drawing #'s: D-331FD-36, D-331FD-36/37

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/6/2021

Turner QC Date

System Design Pressure: 275 PSIG Minimum Test Pressure: 412 PSIG

Actual Test Pressure: 440 PSIG Metal Temp: 91 °F

Test Medium: Utility Water Medium Temp: ______ °F

Ambient Temp: 81 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 4:50 PM Time Test Ended: 5:15 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

______ ______

Turner Foreman Date

Dharmendran Jayaraman 5/6/2021

Turner QC Date

John MacPh 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
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Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Nitrogen Code/Specification: B31.3/

System Description: 331-N-46, 331-N-47, 331-N-48, 331-N-49, 331-N-50, 331-N-51

1 W# 111 on 331-N-46-01, W# 106,107 on 331-N-47-01, W# 108 on N-48-01, W# 109 on N-48-02,
W# 101,102,112-115, on N-49-01, W# 103-105 on N-49-02, W# 116 on N-50-01, W# 117 on N-50-02,
W# 110 on N-51-01.

P&ID & Drawing #'s: D-331FD-36/37, D-331FD-36

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/14/2021
Turner QC Date

System Design Pressure: 285 PSIG Minimum Test Pressure: 427 PSIG

Actual Test Pressure: 445 PSIG Metal Temp: 83 °F

Test Medium: Utility Water Medium Temp: ______ °F

Ambient Temp: 78 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 1:15 PM Time Test Ended: 1:40 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

______ ______
Turner Foreman Date

Dharmendran Jayaraman 5/14/2021
Turner QC Date

John MacPhee 6/3/21
Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
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Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Precoat Slurry Code/Specification: B31.3/

System Description: 331-T-20-3 / 331-P-16-1

Test Boundaries: 331-T-20-3-B1SD.3-01 , 331-P-16-1-B1SD.3-01,02

P&ID & Drawing #'s: D-331FD-38 , D-331FD-38/39

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/26/2021

Turner QC Date

System Design Pressure: 275 PSIG Minimum Test Pressure: 412 PSIG

Actual Test Pressure: 458 PSIG Metal Temp: 89 °F

Test Medium: Utiliti Water Medium Temp: ______ °F

Ambient Temp: 84 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 2:20 PM Time Test Ended: 2:52 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 5/26/2021

Turner QC Date

John Mac Pher 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
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Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX 21230 WO#: ______

System: Decant Water Code/Specification: B31.3/

System Description: 33-P-19-1-C1CS-5

Test Boundaries: 331-P-19-1-C1CS-5-01, 331-P-19-1-C1CS-5-02, 331-P-19-1-C1CS-5-03.

P&ID & Drawing #'s: D-331FD-37/36, D-331FD-36, D-331FD-40.

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/20/2021

Turner QC Date

System Design Pressure: 285 PSIG Minimum Test Pressure: 427 PSIG

Actual Test Pressure: 455 PSIG Metal Temp: 84 °F

Test Medium: Utiliti Water Medium Temp: ______ °F

Ambient Temp: 78 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 2:05 PM Time Test Ended: 2:35 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 5/20/2021

Turner QC Date

John MacPhee 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION **PRESSURE TEST RECORD**	Exhibit No. 13C Revision: 14 Page: 1 of 1 Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ____ Rev. # ____

Client: Ascend Job No.: TX21230 WO#: ____

System: Decant Water Code/Specification: B31.3/

System Description: 331-P-19-2-C1CS

Test Boundaries: W# 101,102 on 331-P-19-2-C1CS-01,02

P&ID & Drawing #'s: D-331FD-37

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/17/2021

Turner QC Date

System Design Pressure: 285 PSIG Minimum Test Pressure: 427 PSIG

Actual Test Pressure: 435 PSIG Metal Temp: 87 °F

Test Medium: Utility Water Medium Temp: ____ °F

Ambient Temp: 84 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ____ Gauge #: ____

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ____ PSIG

Time Test Started: 10:20 AM Time Test Ended: 10:40 AM

Remarks: ____

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 5/17/2021

Turner QC Date

John McPh[illegible] 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
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Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: 331-P-20-1-B1SD.3 Code/Specification: B31.3/

System Description: 331-P-20-1-B1SD.3-01/02/03

Test Boundaries: W#103,SW1,SW2,SW3 on Sheet -01 - 101C1,102,104 through 108,SW4,SW5 on sheet -02
SW6 through SW8 on sheet -03

P&ID & Drawing #'s: D331FD-40

Non-Destructive Testing Complete:

Dharmendran Jayaraman 4/28/2021
Turner QC Date

System Design Pressure: 275 PSIG Minimum Test Pressure: 412 PSIG

Actual Test Pressure: 415 PSIG Metal Temp: 83 °F

Test Medium: Utility Water Medium Temp: ______ °F

Ambient Temp: 81 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 3:40 PM Time Test Ended: 3:10 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 4/28/2021
Turner QC Date

John Mee Pl 6/3/21
Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
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Pre-Pressure Checklist Complete? Procedure # ________ Rev. # ________

Client: Ascend Job No.: TX 21230 WO#: ________

System: 331-P-21-1 Code/Specification: B31.3/

System Description: 331-P-21-1-B1SD.3-01

Test Boundaries: W# 101

P&ID & Drawing #'s: D-331FD-40.

Non-Destructive Testing Complete:

Dharmendran Jayaraman — 5/24/2021

Turner QC — Date

System Design Pressure: 275 PSIG Minimum Test Pressure: 412 PSIG

Actual Test Pressure: 450 PSIG Metal Temp: 88 °F

Test Medium: Utiliti Water Medium Temp: ________ °F

Ambient Temp: 80 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ________ Gauge #: ________

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ________ PSIG

Time Test Started: 3:45 PM Time Test Ended: 4:14 PM

Remarks: ________

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman — Date

Dharmendran Jayaraman — 5/24/2021

Turner QC — Date

John Mer Ph — 6/3/21

Client/AI — Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
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Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Cougalant Slurry Code/Specification: B31.3/

System Description: 331-P-22-1-B1SD.3

Test Boundaries: 331-P-22-1-B1SD.3-01,02

P&ID & Drawing #'s: D-331FD-40

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/3/2021
Turner QC Date

System Design Pressure: 275 PSIG Minimum Test Pressure: 412 PSIG

Actual Test Pressure: 449 PSIG Metal Temp: 88 °F

Test Medium: Utiliti Water Medium Temp: ______ °F

Ambient Temp: 85 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-2 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 4:25 PM Time Test Ended: 4:54 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 5/3/2021
Turner QC Date

John Mac Phe 6/3/21
Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
	PRESSURE TEST RECORD	Revision: 14
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Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX 21230 WO#: ______

System: 331-P-23-1 / 331-WW-1 / 331-T-18-1 Code/Specification: B31.3/

System Description: 331-P-23-1-B1SD.3 / 331-WW-1-B1SD.3 / 331-T-18-1-B1SD.3

Test Boundaries: 331-P-23-1-B1SD.3-01 / 331-WW-1-B1SD.3-02,03 / 331-T-18-1-B1SD.3-01

P&ID & Drawing #'s: D-331FD-40 / D-331FD-36 / D-331FD-36/40

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/25/2021
Turner QC Date

System Design Pressure: 275 PSIG Minimum Test Pressure: 412 PSIG

Actual Test Pressure: 442 PSIG Metal Temp: 84 °F

Test Medium: Utiliti Water Medium Temp: ______ °F

Ambient Temp: 82 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 1:46 PM Time Test Ended: 2:16 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

______ ______
Turner Foreman Date

Dharmendran Jayaraman 5/25/2021
Turner QC Date

John Mac Phe 6/1/21
Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
	PRESSURE TEST RECORD	Revision: 14 Page: 1 of 1 Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Steam Header/Steam Code/Specification: B31.3/

System Description: 331-SL-9-C1CS-5, 331-SL-10-C1CS-5

Test Boundaries: 331-SL-9-C1CS-5-01,02 / 331-SL-10-C1CS-5-01,02,03

P&ID & Drawing #'s: D-331FD-36, D-331FD-36/39, D-331FD-39

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/12/2021
Turner QC Date

System Design Pressure: 285 PSIG Minimum Test Pressure: 427 PSIG

Actual Test Pressure: 442 PSIG Metal Temp: 76 °F

Test Medium: Utiliti Water Medium Temp: ______ °F

Ambient Temp: 72 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 1:30 PM Time Test Ended: 1:55 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

______ ______
Turner Foreman Date

Dharmendran Jayaraman 5/12/2021
Turner QC Date

John MacPhee 6/3/21
Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
	PRESSURE TEST RECORD	Revision: 14 Page: 1 of 1 Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX 21230 WO#: ______

System: Filtrate Water Code/Specification: B31.3/

System Description: 331-T-11-1-C1CS-5

Test Boundaries: 331-T-11-1-C1CS-5-01, 331-T-11-1-C1CS-5-02

P&ID & Drawing #'s: D-331FD-37/39

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/20/2021

Turner QC Date

System Design Pressure: 285 PSIG Minimum Test Pressure: 427 PSIG

Actual Test Pressure: 461 PSIG Metal Temp: 77 °F

Test Medium: Utiliti Water Medium Temp: ______ °F

Ambient Temp: 75 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-2 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 9:35 AM Time Test Ended: 10:15 AM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 5/20/2021

Turner QC Date

6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
	PRESSURE TEST RECORD	Revision: 14 Page: 1 of 1 Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Cuagulant Code/Specification: B31.3/

System Description: 331-T-19-1-B1SD.3

Test Boundaries: 331-T-19-1-B1SD.3-01

P&ID & Drawing #'s: DF-331FD-40

Non-Destructive Testing Complete:

Dharmendran Jayaraman 4/29/2021

Turner QC Date

System Design Pressure: 275 PSIG Minimum Test Pressure: 412 PSIG

Actual Test Pressure: 420 PSIG Metal Temp: 81 °F

Test Medium: Utiliti Water Medium Temp: ______ °F

Ambient Temp: 80 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 1:45 PM Time Test Ended: 2:08 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 4/29/2021

Turner QC Date

6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
	PRESSURE TEST RECORD	Revision: 14 Page: 1 of 1 Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Precout Slurry Code/Specification: B31.3/

System Description: 331-T-20-1-B1SD.3

Test Boundaries: 331-T20-1-B1SD.3-02, 03

P&ID & Drawing #'s: DF-331FD-40

Non-Destructive Testing Complete

Dharmendran Jayaraman 5/7/2021

Turner QC Date

System Design Pressure: 275 PSIG Minimum Test Pressure: 412 PSIG

Actual Test Pressure: 440 PSIG Metal Temp: 91 °F

Test Medium: Utiliti Water Medium Temp: ______ °F

Ambient Temp: 83 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 2:22 PM Time Test Ended: 3:02 PM

Remarks ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

______ ______

Turner Foreman Date

Dharmendran Jayaraman 5/7/2021

Turner QC Date

John MacPh 6/3/21

Client/AI Date

TURNER INDUSTRIES

SPECIFICATION	Exhibit No. 13C
SERVICE TEST RECORD	Revision: 14
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	Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Utility Water Code/Specification: B31.3/

System Description: 331-UTW-10 / 331-UTW-11 / 331-UTW-12 / 331UTW-13 / 331-UTW-14 / 331-UTW-15/16

Test Boundaries: 331-UTW-10-01, 331-UTW-11-01-03, 331-UTW-12-01,02, 331UTW-13-01, 331-UTW-14-01-03, 331-UTW-15-01,02, 331-UTW-16-01.

P&ID & Drawing #'s: D-331FD-36, D-331FD-38, D-331FD-40

Non-Destructive Testing Complete:

Dharmendran Jayaraman 6/9/2021

Turner QC Date

System Design Pressure: 200 PSIG Minimum Test Pressure: 200 PSIG

Actual Test Pressure: 200 PSIG Metal Temp: 92 °F

Test Medium: Utility Water Medium Temp: ______ °F

Ambient Temp: 86 °F

Date of Gauge Calibration: ______ Gauge #: ______ Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 600 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 1:45 PM Time Test Ended: 2:15 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 6/9/2021

Turner QC Date

[signature] 6/9/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
	PRESSURE TEST RECORD	Revision: 14
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		Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX 21230 WO#: ______

System: Untreated Slurry Code/Specification: B31.3/

System Description: 331-WW-1-B1SD.3

Test Boundaries: 331-WW-1-B1SD.3-01

P&ID & Drawing #'s: D-331FD-36.

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/24/2021
Turner QC Date

System Design Pressure: 275 PSIG Minimum Test Pressure: 412 PSIG

Actual Test Pressure: 432 PSIG Metal Temp: 88 °F

Test Medium: Utiliti Water Medium Temp: ______ °F

Ambient Temp: 80 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 3:45 PM Time Test Ended: 4:14 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 5/24/2021
Turner QC Date

John Mac Phee 6/3/21
Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
	PRESSURE TEST RECORD	Revision: 14 Page: 1 of 1 Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ________ Rev. # ________

Client: Ascend Job No.: TX21230 WO#: ________

System: Untreated Slurry Code/Specification: B31.3/

System Description: 331-WW-2-C1CS-5

Test Boundaries: 331-WW-2-C1CS-5-01, 02, 03, 04

P&ID & Drawing #'s: D-331FD-36 , D-331FD-36/37

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/21/2021
Turner QC Date

System Design Pressure: 285 PSIG Minimum Test Pressure: 427 PSIG

Actual Test Pressure: 445 PSIG Metal Temp: 83 °F

Test Medium: Utiliti Water Medium Temp: ________ °F

Ambient Temp: 78 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ________ Gauge #: ________

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ________ PSIG

Time Test Started: 1:48 PM Time Test Ended: 2:16 PM

Remarks ________

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

________ ________
Turner Foreman Date

Dharmendran Jayaraman 5/21/2021
Turner QC Date

[signature] 6/3/21
Client/AI Date

TURNER INDUSTRIES

SPECIFICATION	Exhibit No. 13C
PRESSURE TEST RECORD	Revision: 14
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	Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Treated Slurry Code/Specification: B31.3/

System Description: 331-WW-3-B1SD.3-

Test Boundaries: 331-WW-3-B1SD.3-01,02

P&ID & Drawing #'s: D-331FD-36/39, D-331FD-36

Non-Destructive Testing Complete

Dharmendran Jayaraman 5/2/2021

Turner QC Date

System Design Pressure: 275 PSIG Minimum Test Pressure: 412 PSIG

Actual Test Pressure: 442 PSIG Metal Temp: 58 °F

Test Medium: Utiliti Water Medium Temp: ______ °F

Ambient Temp: 58 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-2 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 1:00 PM Time Test Ended: 1:38 PM

Remarks ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 5/2/2021

Turner QC Date

John Mec Pr 6/3/21

Client/AI Date

TURNER INDUSTRIES	SPECIFICATION	Exhibit No. 13C
	PRESSURE TEST RECORD	Revision: 14
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		Revision Date: 4/8/2020

Pre-Pressure Checklist Complete? Procedure # ______ Rev. # ______

Client: Ascend Job No.: TX21230 WO#: ______

System: Waste Water Code/Specification: B31.3/

System Description: 331-WW-4-C1CS-

Test Boundaries: W# 101,102,103,104 on 331-WW-4-C1CS-01,02

P&ID & Drawing #'s: D-331FD-37

Non-Destructive Testing Complete:

Dharmendran Jayaraman 5/17/2021

Turner QC Date

System Design Pressure: 285 PSIG Minimum Test Pressure: 427 PSIG

Actual Test Pressure: 435 PSIG Metal Temp: 89 °F

Test Medium: Utility Water Medium Temp: ______ °F

Ambient Temp: 84 °F

Date of Gauge Calibration: 3/6/2021 Gauge #: 03621-3 Date of Gauge Calibration: ______ Gauge #: ______

Pressure Gauge Range: 1000 PSIG Pressure Gauge Range: ______ PSIG

Time Test Started: 1:45 PM Time Test Ended: 2:15 PM

Remarks: ______

Post Pressure Checklist Complete?

Pressure Test Satisfactorily Completed:

Turner Foreman Date

Dharmendran Jayaraman 5/17/2021

Turner QC Date

Client/AI [signature] 6/3/21 Date

DEL CORPORATION
www.deltank.com

QMSP 8.1-100

Vessel Water Test

Revision 1

Document Summary:	Provide and establish a procedure for the water testing of vessels as a verification step in the product realization process.
Document Approval:	Approval in the QMS Document Management Module
Document Control:	Document must be stamped "Controlled" in red ink and signed by responsible authority or display watermark to ensure proper revision level. Otherwise the document must be treated as an "uncontrolled" document and user must ensure current revision.

Customer:	Ascend
Date:	5-18-2020
Project Number:	200029
Serial Number:	200029-100-001

1.0 Applicable Documents & Standards

DEL CORPORATION
Quality Management System Manual
QM 7.5.1-001
Revision 1

ISO 9001:2015
Quality Management System - Requirements
5th Edition

2.0 Responsibility, Authority, and Accountability

- **Vice President of Operations**
- **Mechanical Operations Foreman**
- **Mechanics**
- **Fabrication Inspector**
- **Quality Manager**

3.0 Test Procedure

		Confirm	N/A
1.	Plug / blind flange all vessel openings (as required)	☒	☐
2.	Fill vessel with water. Ensure all plugged / flanged openings and all welded areas are covered	☒	☐
3.	Visually inspect all welds for signs of leaks	☒	☐
4.	Verify all welds are free from leaks	☒	☐
5.	Drain tank	☒	☐
6.	Test Complete	☒	☐

4.0 Confirmation

Keith Kulbeth — 5-18-2020

DEL Corporation Representative — **Date:**

Customer Representative (if applicable) — **Date:**

Third Party Representative (if applicable) — **Date:**

QMSP 8.1-100

Vessel Water Test

Revision 1

Document Summary:	Provide and establish a procedure for the water testing of vessels as a verification step in the product realization process.
Document Approval:	Approval in the QMS Document Management Module
Document Control:	Document must be stamped "Controlled" in red ink and signed by responsible authority or display watermark to ensure proper revision level. Otherwise the document must be treated as an "uncontrolled" document and user must ensure current revision.

Customer:	Ascend
Date:	5-21-2020
Project Number:	200029
Serial Number:	200029-100-002

1.0 Applicable Documents & Standards

DEL CORPORATION
Quality Management System Manual
QM 7.5.1-001
Revision 1

ISO 9001:2015
Quality Management System - Requirements
5th Edition

2.0 Responsibility, Authority, and Accountability

- **Vice President of Operations**
- **Mechanical Operations Foreman**
- **Mechanics**
- **Fabrication Inspector**
- **Quality Manager**

3.0 Test Procedure

		Confirm	N/A
1.	Plug / blind flange all vessel openings (as required)	☒	☐
2.	Fill vessel with water. Ensure all plugged / flanged openings and all welded areas are covered	☒	☐
3.	Visually inspect all welds for signs of leaks	☒	☐
4.	Verify all welds are free from leaks	☒	☐
5.	Drain tank	☒	☐
6.	Test Complete	☒	☐

4.0 CONFIRMATION

Keith Kulbeth — 5-21-2020

DEL Corporation Representative — **Date:**

Customer Representative (if applicable) — **Date:**

Third Party Representative (if applicable) — **Date:**

QMSP 8.1-100

Vessel Water Test

Revision 1

Document Summary:	Provide and establish a procedure for the water testing of vessels as a verification step in the product realization process.
Document Approval:	Approval in the QMS Document Management Module
Document Control:	Document must be stamped "Controlled" in red ink and signed by responsible authority or display watermark to ensure proper revision level. Otherwise the document must be treated as an "uncontrolled" document and user must ensure current revision.

Customer:	Ascend
Date:	5-29-2020
Project Number:	200029
Serial Number:	200029-100-003

1.0 Applicable Documents & Standards

Del Corporation
Quality Management System Manual
QM 7.5.1-001
Revision 1

ISO 9001:2015
Quality Management System - Requirements
5th Edition

2.0 Responsibility, Authority, and Accountability

- **Vice President of Operations**
- **Mechanical Operations Foreman**
- **Mechanics**
- **Fabrication Inspector**
- **Quality Manager**

3.0 Test Procedure

		Confirm	N/A
1.	Plug / blind flange all vessel openings (as required)	☒	☐
2.	Fill vessel with water. Ensure all plugged / flanged openings and all welded areas are covered	☒	☐
3.	Visually inspect all welds for signs of leaks	☒	☐
4.	Verify all welds are free from leaks	☒	☐
5.	Drain tank	☒	☐
6.	Test Complete	☒	☐

4.0 Confirmation

Keith Kulbeth
DEL Corporation Representative

5-29-2020
Date:

Customer Representative (if applicable)

Date:

Third Party Representative (if applicable)

Date:

QMSP 8.1-100

Vessel Water Test

Revision 1

Document Summary:	Provide and establish a procedure for the water testing of vessels as a verification step in the product realization process.
Document Approval:	Approval in the QMS Document Management Module
Document Control:	Document must be stamped "Controlled" in red ink and signed by responsible authority or display watermark to ensure proper revision level. Otherwise the document must be treated as an "uncontrolled" document and user must ensure current revision.

Customer:	Ascend
Date:	6-3-2020
Project Number:	200029
Serial Number:	200029-100-004

1.0 Applicable Documents & Standards

DEL CORPORATION
Quality Management System Manual
QM 7.5.1-001
Revision 1

ISO 9001:2015
Quality Management System - Requirements
5th Edition

2.0 Responsibility, Authority, and Accountability

- **Vice President of Operations**
- **Mechanical Operations Foreman**
- **Mechanics**
- **Fabrication Inspector**
- **Quality Manager**

3.0 Test Procedure

		Confirm	N/A
1.	Plug / blind flange all vessel openings (as required)	☒	☐
2.	Fill vessel with water. Ensure all plugged / flanged openings and all welded areas are covered	☒	☐
3.	Visually inspect all welds for signs of leaks	☒	☐
4.	Verify all welds are free from leaks	☒	☐
5.	Drain tank	☒	☐
6.	Test Complete	☒	☐

4.0 CONFIRMATION

Keith Kulbeth | 6-3-2020

DEL Corporation Representative | **Date:**

Customer Representative (if applicable) | **Date:**

Third Party Representative (if applicable) | **Date:**

Augusta Fiberglass

Manufacturing Facility & Staging Area

5500 Allen Rd Ocean Springs MS 39565 (228) 872 0539

Hydro Test Report

Customer: Sparkling Clear Industries

For: N/A

Equip# 331T11

PO# 25182

AFC Job# 88664

A Hydro test was performed 9-1-20. The 15,000 Gallon WasteWater Storage tank was filled to the maximum water level and held for 1 hour. The test was successful with zero leaks and witnessed by Miles Witt Quality Control Manager

Feel free to contact me, if you have any questions or concerns

Sincerely,

Miles Witt

QC Manager

Augusta Fiberglass

228-872-0539

Augusta Fiberglass

AFC-3 QUALITY CONTROL MANAGER DATA REPORT

CUSTOMER : **Sparkling Clear Industries**

(FOR) **N/A**

AFC. JOB # **88664**

EQUIP. # **331T11**

DESCRIPTION: **15,000 Gallon Wastewater Storage Tank**

P.O. NO: **25182**

DRAWING NO: **AB-8162** DATE: **6/23/20**

Laminate Composition:

SHELL	[2N,2C,c,3(U,HW),c]
TOP-HEAD	[2N,2M,3(M,R)3M]
BOTTOM	[2N,2M,4(M,R)3M]
OTHER	[2N,2C,c,7(U,HW),c] Skirt

SECONDARY BONDS:

	INSIDE	OUTSIDE
TOP	[2N,2M]	[2N,2M,3(M,R)3M]
BOTTOM	[2N,2M]	[2N,2M,3(M,R)3M]
NOZZLES	[2N,2M]	[2N,2M,3(M,R)3M]
APPURTENANCE		

V= Veil: C= 1 ½ oz chop, N=Nexus, M=1 ½ oz. mat or chop R=24oz. woven roving, FW=wind cycle e= exotherm ply mat

LAMINANTE QUALITY

	Cracks	Crazing	Blisters	Wrinkles	Pits	Porosity
Shell	OK	OK	OK	OK	OK	OK
Top Head	OK	OK	OK	OK	OK	OK
Bottom	OK	OK	OK	OK	OK	OK
Seams	OK	OK	OK	OK	OK	OK
Other						

	Chips	Dry Spots	Air	Exposed Glass	Burns	Scratches	Foreign Matter
Shell	OK	OK	OK	OK	OK	OK	OK
Top Head	OK	OK	OK	OK	OK	OK	OK
Bottom	OK	OK	OK	OK	OK	OK	OK
Seams	OK	OK	OK	OK	OK	OK	OK
Other							

Augusta Fiberglass

AFC QUALITY CONTROL MANAGER DATA REPORT

CUSTOMER: **Sparkling Clear Industries** **DATE: 6/23/20**

BUYOUT INSPECTION

ITEM	BY	DATE	COMMENTS
SEE PACKING LIST WITH SHIPMENT	AW		
LIFTING LUGS	AW		
HOLD DOWNS LUGS	AW		

MOLD INPECTION

ITEM	BY	DATE	COMMENTS
Top	AW	6/18/20	
Bottom	AW	6/18/20	
Shell	AW	6/10/20	

Augusta Fiberglass

AFC QUALITY CONTROL MANAGER DATA REPORT

CUSTOMER: **Sparkling Clear Industries** **DATE: 6/23/20**

DIMENSIONAL CHECK	DESIGN	ACTUAL	BY	DATE
DIAMETER	12'-0"	12'-0"	AW	6/12/20
SHELL HEIGHT	15'-10"	15'-10"	AW	6/12/20
SHELL THICKNESS	.35	.35	AW	6/12/20
TOP THICKNESS	3/8"	3/8"	AW	6/22/20
BOTTOM THICKNESS	7/16"	7/16"	AW	6/22/20
SHELL SKIN THICKNESS				
TOP SKIN				
OTHER				

NOZZLES

NAME	A	B	C	D	E	F	G	H
SIZE	6"	4"	3"	3"	2"	8"	4"	2"
FLANGE THICKNESS	OK	OK	OK	OK	OK	OK	OK	OK
STUB THICKNESS	OK	OK	OK	OK	OK	OK	OK	OK
FLATNESS	OK	OK	OK	OK	OK	OK	OK	OK
BACKFACE	OK	OK	OK	OK	OK	OK	OK	OK
GUSSETS	OK	OK	OK	OK	OK	OK	OK	OK
DRILLING	OK	OK	OK	OK	OK	OK	OK	OK
LOCATION	OK	OK	OK	OK	OK	OK	OK	OK
PROJECTION	OK	OK	OK	OK	OK	OK	OK	OK
MISCELLANEOUS						Installed Per Rev 3		
BY	AW	AW	AW	AW	AW	AW	AW	AW
DATE	6/29/20	6/29/20	6/29/20	6/29/20	6/29/20	6/29/20	6/29/20	6/29/20

NAME	I	J1	J2	K				
SIZE	24"	24"	24"	6"				
FLANGE THICKNESS	OK	OK	OK	OK				
STUB THICKNESS	OK	OK	OK	OK				
FLATNESS	OK	OK	OK	OK				
BACKFACE	OK	OK	OK	OK				
GUSSETS	OK	OK	OK	OK				
DRILLING	OK	OK	OK	OK				
LOCATION	OK	OK	OK	OK				
PROJECTION	OK	OK	OK	OK				
MISCELLANEOUS								
BY	AW	AW	AW	AW				
DATE	6/29/20	6/29/20	6/29/20	6/29/20				

Augusta Fiberglass

AFC QUALITY CONTROL MANAGER DATA REPORT

CUSTOMER: Sparkling Clear Industries **DATE: 6/23/20**

APPURTENANCES

		COMMENTS	BY	DATE
X	HOLD DOWN LUGS		AW	6/25/20
X	LIFTING LUGS		AW	6/25/20
X	LEGS/SUPPORTS	Skirt	AW	6/25/20
	LADDERS			
	BRACKETS/CLIPS/SUPPORT BANDS			
	INTERNAL CLIPS			
	BAFFLES			
X	NOZZLES		AW	7/2/20
	OTHER			

ACETONE SENSITIVITY

LOCATION TESTED	SENSITIVE YES	SENSITIVE NO	REMARKS	BY	DATE
Top		X		AW	7/9/20
Shell		X		AW	7/9/20
Bottom		X		AW	7/9/20

Augusta Fiberglass

AFC QUALITY CONTROL MANAGER DATA REPORT

CUSTOMER: **Sparkling Clear Industries** **DATE: 6/23/20**

BARCOL HARDNESS

	LOCATION			
	Top	Shell	Bottom	Inside Seam
READING 1	36	37	36	38
READING 2	36	34	36	35
READING 3	36	35	35	36
READING 4	37	35	35	36
READING 5	35	36	35	36
TOTAL OF FIVE	180	177	177	181
AVERAGE	36	35.4	35.4	36.2
	Manway			
READING 1	36			
READING 2	35			
READING 3	35			
READING 4	36			
READING 5	38			
TOTAL OF FIVE	180			
AVERAGE	36			

RECORDED BY: AW

ESSES

O HELICALS

SION BARRIER

NUMBER OF COVERS

1

2

3

4

5

6

7

8

9

10

11

12

13

IERS,

CHIEVABLE
ESE THICKNESSES.
M HEIGHTS.

GN THICKNESSES.

ERS FROM THE
CNESS IS EQUAL TO
WING.

E A "V" FOR
"C" GLASS OR

TW,C,A (328 MILS)

Barcol Hardness

Hetron 992	35	
Hetron 980	35	
Hetron 998	40	
Hetron 922	30	
Hetron 197	40	
Derakane 411	35	
Derakane 470	40	
Derakane 510A	40	
Derakane 510N	40	
Dion 9102	35	
Dion 9300	40	
Dion 6631	40	
Dion 6694	38	
Corezyn 8300	35	
510 B	35	
441	35	
7241-ISO		45
Vipel K022	40	45
400		

510C 35

Shell Molds

Dia	Length	Dia	Leng
2"	11'	5'	42'
3"	15'	6'	24'
4"	20'	7'	20'
6"	40'	8'	30'
8"	40'	8' 6"	28'
10"	42'	9'	28' 3
12"	40'	10'	23' 8
14"	40'	10'	36'
16"	40'	11'	24'
18"	40'	11' 9"	31'
20"	40'	12'	29' 1
24"	38'	12'	40'
24"	32'	13'	36'
30"	41'	13' 6"	32'
36"	39' 6"	14'	36'
42"	42'	15'	23'
48"	22'	16'	24'
48"	42'		
54"	20'		

HAND LAY-UP CONSTRUCT

THK.	DECIMAL EQUIVILANT	LAMINA
		CORROSION LINER / STRUC
		[V,2M,2M]
3/16"	.1875	[V,2M,MRM,M]

B&D PLASTICS LLC
CUSTOM DUAL-LAMINATE FABRICATION

5500 Allen Road
Ocean Springs, MS 39565
Ph: (228) 875-5865 * 1-800-844-5005
Fax: (228) 875-5834

RESIN MIXING DATA REPORT

B&D Job Number: Stock

Date: 6/9/20

Traceability Identifier: 0002449719

Resin: 411 Signia

RTP-1 Snap Test: [ ]

Drum Number: Bulk Stock

4

Gel Time: 22 Temp: 80 Catalyst: mekp %: 2

To be used for:

[ ] Spray-Up [ ] Hand Lay-Up

[ ] Shell Production [ ] Parrifinated Top Coat

[ ] Assembly [ ] Winding

Formula:

Component	Traceability Identifier	Amount
411 Signia	0002449719	3,164#
cobalt	19/102HF	6#

B&D PLASTICS LLC
CUSTOM DUAL-LAMINATE FABRICATION

5500 Allen Road
Ocean Springs, MS 39565
Ph: (228) 875-5865 * 1-800-844-5005
Fax: (228) 875-5834

RESIN MIXING DATA REPORT

B&D Job Number: Stock Date: 5/22/20

Traceability Identifier: ORoBoo853 Resin: Gry Gelcoat

RTP-1 Snap Test: [ ] Drum Number: 9+10

Gel Time: 4 Temp: 80 Catalyst: mekp %:

To be used for:

[ ] Spray-Up [ ] Hand Lay-Up

[ ] Shell Production [ ] Parrifinated Top Coat

[ ] Assembly [ ] Winding

Formula:

Component	Traceability Identifier	Amount
Gry Gelcoat	ORoBoo853	1,100 #
Cobalt	19/102 HC	1 #
DMA	4902249/901	1 #
UV9	OR5K01039	14 #
Wax Solutions	200408	70 #

Hazardous Waste Permit Renewal Application
Ascend Performance Materials Texas Inc., Alvin, Texas

Hazardous Waste Permit No. 50189

Part B, Section V: Appendix V.D.1 – Engineering Report for Closed IWPF Surface Impoundment

Note: There were no changes to the Engineering Report for IWPF Surface Impoundment, originally issued 31 December 2009 in the previous hazardous waste permit renewal application. Therefore, the 31 December 2009 Engineering Report and supporting documentation are submitted as is.

ATTACHMENT V.5
ENGINEERING REPORT FOR
CLOSED IWPF SURFACE IMPOUNDMENTS (PERMIT UNIT 03)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

TABLE OF CONTENTS

Section **Page No.**

GSI Job No. G-3379

GSI ENVIRONMENTAL

CERTIFICATION OF ENGINEERING REPORT FOR CLOSED IWPF SURFACE IMPOUNDMENTS (PERMIT UNIT 03)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

I, Elaine A. Higgins, a registered professional engineer in the State of Texas, certify that the Engineering Report in the RCRA Permit Renewal Application issued 31 December 2009 for the Closed IWPF Surface Impoundments (Permit Unit 03) on the Ascend Chocolate Bayou Plant in Alvin, Texas, has been prepared in accordance with the requirements of 40 CFR 264.220 - .231 and 30 TAC 335.168 - .169.

STATE OF TEXAS
ELAINE A. HIGGINS
85482
LICENSED PROFESSIONAL ENGINEER

Elaine A. Higgins 31 Dec 09

Elaine A. Higgins, P.E.
State of Texas
Registration No. 85482

1.0 DESCRIPTION OF THE CLOSED IWPF SURFACE IMPOUNDMENTS

The Injection Well Pretreatment Facility (IWPF) Surface Impoundments, Permit Unit 03, were utilized from 1964 to 1997 for solids settlement, equalization, and cooling of collected wastewater and stormwater prior to deepwell injection. Hazardous waste flow to the surface impoundments was terminated in 1994, and the ponds were closed in-place in a phased manner over the period 1994 to 1997 in accordance with the provisions of an approved closure plan and Delay of Closure Application. This section provides a brief description of the closed IWPF unit. The Closure Certification report for the closed IWPF surface impoundments is provided in Appendix V.5.1. Post-closure care requirements for the unit are provided in Section VII of this document.

The closed IWPF unit (Permit Unit 03) is located in the central portion of the Ascend Chocolate Bayou facility (see Attachment C.1). Wastewater and stormwater were collected in the impoundments for solids settlement, equalization, pH adjustment, oil/water separation, and cooling, and were then filtered by means of a continuous backwash sand filter prior to deepwell injection.

Hazardous waste flow to the impoundments was terminated in 1994, with subsequent in-place closure of four of the original six impoundments in accordance with the approved closure plan. The two remaining impoundments were temporarily converted to non-hazardous service in accordance with an approved Delay of Closure Application before final closure in 1997.

2.0 HAZARDOUS WASTES MANAGED

2.1 Types of Wastes Managed

The closed IWPF surface impoundments were used for management and storage of organic and inorganic liquids such as process wastewater, stormwater, and landfill leachate prior to disposal by deepwell injection. Waste streams which had previously been managed in the IWPF surface impoundments are currently managed in the IWPF Tanks (Permit Units 08 and 09; see Attachment V.4). Wastes managed in the IWPF surface impoundments are listed on Table V.D.1.

2.2 Ignitable and/or Reactive Wastes

Within the IWPF surface impoundments, wastewater treatment involved oil/water separation, pH adjustment, and/or solids separation to meet the operating requirements of the injection wells. Liquids managed in the IWPF surface impoundments did not meet the definition of ignitable or reactive wastes as defined in 40 CFR 261.21 or .23, respectively.

2.3 Incompatible Wastes

Determination of waste compatibility was based upon the procedure presented in Section IV: Waste Analysis Plan. In order to prevent potential adverse reactions or releases, unit operating procedures required that all newly generated wastes were evaluated to determine compatibility with existing wastes. If a new waste was determined to be incompatible with existing wastes managed in the unit, the waste was not managed in the IWPF surface impoundments.

3.0 SPECIFICATIONS OF CLOSED IWPF SURFACE IMPOUNDMENTS

The general layout of the closed IWPF surface impoundments is depicted on Figure XI.1. Major components of the closed IWPF surface impoundments include a natural clay liner, solidified sludge and dike materials, compacted clay cap, and protective surface cover.

3.1 Pre-Closure Construction

Prior to the start of the closure program, the IWPF unit consisted of six surface impoundments designated Ponds 1 through 6. The impoundments were of earthen construction, with compacted clay dikes and a natural clay liner ranging in thickness from 7 ft to over 30 ft beneath the unit.

3.2 Post-Closure Construction

Specifications for completion of the closed IWPF surface impoundments, and the Closure Certification report are provided in Appendix V.5.1.

3.3 Control of Run-On/Run-Off

The closure of the IWPF surface impoundments was designed, constructed, and maintained to direct rainfall away from the protective cap and prevent direct run-on during a 100-yr flood event. The predicted 100-yr flood elevation is 15 ft MSL in the vicinity of the unit. Currently, the lowest elevation of the top of the protective surface cap of the closed IWPF unit is approximately 17.5 ft MSL, or 2.5 ft higher than expected water levels during a 100-yr flood event.

(Note that elevations shown in the Closure Certification in Appendix V.5.1 are referenced to Plant Datum and may be converted as follows: Elevation Plant Datum - 85.5 ft = Elevation Mean Sea Level.)

4.0 CORRECTIVE ACTION PROGRAM

Compliance Plan CP-50189-001, issued by the TCEQ on 24 May 1995, established corrective action and groundwater monitoring programs for the IWPF unit in response to a confirmed detection of hazardous constituents exceeding background levels within shallow groundwater underlying the unit. On 22 May 1995, Ascend began implementation of a Corrective Action Program designed to address the affected groundwater underlying the IWPF unit. Additional information concerning the Corrective Action Program for the Closed IWPF surface impoundments is provided in Section XI: Compliance Plan.

ATTACHMENT V.5
ENGINEERING REPORT FOR
CLOSED IWPF SURFACE IMPOUNDMENTS (PERMIT UNIT 03)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.5.1

Appendix V.5.1 Closure Certification for IWPF Surface Impoundments

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

RECEIVED
OCT 16

October 9, 1997

Mr. José A. Boix
Senior Environmental Specialist
Solutia Inc.
P. O. Box 711
Alvin, TX 77512

RE: Certification Report and Proof of Deed Recordation for Closure of Injection Well Pretreatment Facility Surface Impoundments
Permit Unit No. 3 (Notice of Registration [NOR] Unit No. 005)
Hazardous Waste Permit No. HW-50189-001
Industrial Solid Waste Registration No. 30138
EPA I.D. No. TXD001700806

Dear Mr. Boix:

The Texas Natural Resource Conservation Commission (TNRCC) has reviewed your Closure Certification Report submittal package transmitted by letter dated July 3, 1997, addressing closure of TNRCC Permit Unit No. 3/NOR Unit No. 5, and the proof of recordation in Brazoria County deed records of the deed certification transmitted with your letter dated July 29, 1997.

Based on the information provided, the TNRCC accepts that closure of Permit Unit No. 3 was completed in accordance with 40 Code of Federal Regulations (CFR) Sections 264.110 through 264.116, 30 Texas Administrative Code (TAC) Section 335.169, the approved closure plan, and Permit No. HW-50189-001, Provisions IV.A. and C..

Please be aware that it is the continuing obligation of persons associated with a site to assure that industrial solid waste or municipal hazardous waste are managed in a manner which does not cause the discharge or imminent threat of discharge of waste into or adjacent to waters in the state, a nuisance, or the endangerment of the public health and welfare as required by 30 TAC Section 335.4. If the closure fails to comply with these requirements, the burden remains upon Solutia Inc. - Chocolate Bayou Plant, to take any necessary and authorized action to correct such conditions.

Questions regarding this matter should directed to Mr. E.J. Biskup at 512/239-6620. Please be sure to use Mail Code MC130 when responding by mail.

Sincerely,

Richard C. Carmichael

Richard C. Carmichael, Ph.D., P.E., CIH
Supervisor, Team III, Permits Section
Industrial and Hazardous Waste Division

RCC/EJB/rlb

GROUNDWATER
SERVICES, INC.

June 30, 1997
GSI Job No. G-1936

Mr. Bill Kibikas
Monsanto Company
P.O. Box 711
Alvin, Texas 77512

Re: Closure Certification for IWPF Surface Impoundments, Monsanto Chocolate Bayou Plant, Alvin, Texas. Industrial Solid Waste Registration No. 30138. Hazardous Waste Permit No. HW-50189-001.

Dear Mr. Kibikas:

At your request, Groundwater Services, Inc. (GSI), has provided oversight for field closure activities conducted for the Injection Well Pretreatment Facility (IWPF) surface impoundments, located on the Monsanto Chocolate Bayou Plant in Alvin, Texas. The IWPF surface impoundments were operated as a single unit designated as Facility Unit No. 5 in the TNRCC Notice of Registration and as Permit Unit No. 3 in the Monsanto RCRA Permit HW-50189-001. In May 1997, closure of the IWPF surface impoundments was completed in accordance with the provisions of 40 CFR 264.110-114, 30 TAC 335.169, and the Monsanto RCRA Permit No. HW-50189-001. This letter reviews the closure procedures implemented during the period of April 1994 to May 1997 and certifies compliance with applicable provisions of the approved closure plan.

1.0 IWPF UNIT SYSTEM DESCRIPTION

1.1 Facility Description

The Monsanto Chocolate Bayou Plant is located on FM 2917, approximately 11 miles south of the city of Alvin in Brazoria County, Texas (see Figure 1). Current plant operations include the manufacture of chemical feedstocks and intermediates at the following manufacturing units: Acrylonitrile (AN), Diphenyl Oxide (DPO), Formalin, Iminodiacetic Acid (IDA), Methionine Hydroxy Butanoic Acid (MHBA), Nitrilotriacetic Acid (NTA), Linear Alkyl Benzene (LAB), and Sorbic Acid.

1.2 Components of IWPF Surface Impoundments

The IWPF unit is located in the central portion of the Monsanto Chocolate Bayou Plant (see Figure 2), and was placed in service in 1964 for collection and pretreatment of process wastewater and stormwater prior to disposal by deepwell injection. Wastewater and stormwater were collected in the impoundments for solids settlement, equalization, pH adjustment and cooling, and were then filtered by means of a continuous backwash sand filter prior to deepwell injection.

Prior to the start of the closure program, the IWPF unit consisted of six surface impoundments designated Ponds 1, 2, 3, 4, 5, and 6 (see Figures 3 and 4). The impoundments were of earthen construction, with compacted clay dikes and a natural clay liner ranging in thickness from 7 ft to over 30 ft beneath the unit.

1.3 Basis for the IWPF Surface Impoundments Closure Certification

The IWPF surface impoundments were permitted as a single hazardous waste management unit under the terms of RCRA Permit No. HW-50189-001 (TWC, 1987). Monsanto's RCRA Part B Permit Application included an approved closure plan for the IWPF surface impoundments (Monsanto, 1986). In conjunction with this permit, the EPA granted Monsanto a variance to the Minimum Technological Requirements (MTR) for surface impoundment liner retrofitting, based on a no-migration demonstration submitted for the IWPF unit pursuant to Section 3005(j)(4) of Hazardous and Solid Waste Amendments (HSWA). Under the terms of the variance, Monsanto removed accumulated sludge from the IWPF surface impoundments on an annual basis and conducted a Groundwater Detection Monitoring Program in accordance with RCRA Permit provisions.

In addition, Monsanto was required to apply for renewal of the retrofitting variance every 5 years, based upon a reconfirmation of the no-migration demonstration. The first five-year renewal of this variance required submittal of a workplan for a second no-migration demonstration by September 30, 1992. In September 1992, Monsanto informed the TWC (predecessor agency the TNRCC) regarding a decision to close the IWPF unit rather than apply for re-authorization of the liner retrofitting variance. For units no longer subject to an MTR variance, EPA policy allows a 2 to 3-year period for either completion of retrofitting or commencement of closure (see 57 FR 37219). As required under 40 CFR 264.113, Monsanto submitted a Delay of Closure application for the IWPF surface impoundments on October 22, 1993, to accommodate the temporary conversion of this unit to non-hazardous service following termination of hazardous waste flow.

June 30, 1997

2.0 OVERVIEW OF THE CLOSURE PROGRAM

The closure of the IWPF surface impoundments proceeded in a phased manner over the period of April 1994 to May 1997 in accordance with the Monsanto RCRA permit (TWC, 1987), the approved closure plan (Monsanto, 1986), the Delay of Closure Application (GSI, 1993) approved by the TNRCC in June 1996, and standard engineering practice. Standards regarding sludge solidification, fill soil placement, and clay cap and topsoil installation are summarized on Table 1. A summary of material quantities remaining in place after closure of the unit is provided on Table 2. General work items involved in closure of the unit are outlined below.

2.1 Delay of Closure

- *Preliminary Waste Removal and Closure of Pond 6:* Wastewater flow was temporarily diverted in order to drain hazardous wastewater from Ponds 4, 5, and 6. After removal from Ponds 4 and 5, hazardous waste sludge was solidified and placed in Pond 6. Dikes surrounding Pond 6 were demolished and a compacted clay cap and topsoil cover were constructed over Pond 6. Time period: April - August 1994.

- *Termination of Hazardous Waste Flow:* Hazardous waste flow was terminated to the IWPF surface impoundments and routed to permitted above-ground tanks in September 1994. Non-hazardous wastewater was routed to Ponds 4 and 5. Time period: September 1994 - January 1997.

- *Closure of Ponds 1, 2, and 3:* In-place closure of IWPF Ponds 1, 2, and 3 was completed per closure plan specifications. Liquids were drained to the on-site permitted injection well; mechanical equipment was dismantled and decontaminated; waste sludge was solidified and compacted in Pond 1; dikes were demolished; and a compacted clay cap and topsoil cover were placed over Ponds 1, 2, and 3. Time period: September 1994 - March 1995.

2.2 Completion of Unit Closure

The in-place closure of Ponds 4 and 5 was completed per closure plan specifications. Ponds 4 and 5 were dewatered; non-hazardous sludge was solidified and compacted in place; dikes were demolished; and a compacted clay cap and topsoil cover were placed over Ponds 4 and 5. Time period: January - May 1997.

GROUNDWATER
SERVICES, INC.

June 30, 1997

3.0 FINAL SITE CONDITIONS

Field data obtained during closure of the IWPF surface impoundments were compared to specifications of the approved closure plan. As summarized on Table 1, the results of all geotechnical testing and elevation surveying indicated compliance with applicable specifications.

A formal closure certification for the IWPF surface impoundments unit is attached to this letter. Should you have any further questions regarding this matter, please contact me at (713) 522-6300.

Sincerely,

John A. Connor,. P.E.

JAC:eah
attachments

cc: Mr. José Boix
Mr. Forrest Morris

GROUNDWATER
SERVICES, INC.

CLOSURE CERTIFICATION

On the basis of the information reviewed in the Groundwater Services, Inc., letter of June 30, 1997, I, John A. Connor, a registered professional engineer in the State of Texas, certify that the IWPF surface impoundments on the Monsanto Chocolate Bayou Plant in Alvin, Texas, have been closed in accordance with the provisions of 40 CFR 264.110-114, 30 TAC 335.169, the approved closure plan, and the Monsanto RCRA Permit No. HW-50189-001 issued October 1987.

STATE OF TEXAS
JOHN A. CONNOR
62707
REGISTERED
PROFESSIONAL ENGINEER

John A. Connor,. P.E.
State of Texas
Registration No. 62707

Seal

SUBSCRIBED AND SWORN TO BEFORE ME on the 30th day of June 1997, to certify which witness my hand and official seal.

Brenda K. Engelhardt
Notary Public in and for
Harris County, Texas

My Commission Expires:

NOTARY PUBLIC STATE OF TEXAS
BRENDA K. ENGELHARDT
MY COMMISSION EXPIRES
November 23, 1999

GSI Job No. G-1936
June 30, 1997

GROUNDWATER
SERVICES, INC.

CLOSURE CERTIFICATION FOR IWPF SURFACE IMPOUNDMENTS

RCRA Permit No. HW-50189-001
Monsanto, Alvin, Texas

TABLES

TABLE 1
COMPARISON OF APPROVED CLOSURE PLAN SPECIFICATIONS TO QUALITY CONTROL DATA

Certification of Closure for IWPF Surface Impoundments
RCRA Permit No. HW-50189-001
Monsanto, Alvin, Texas

FINAL COVER LAYER / MATERIAL PROPERTIES	PLACEMENT AND COMPACTION SPECIFICATIONS			COMPLETED FILL LAYER		QUALITY CONTROL DOCUMENTATION REVIEWED	RESULTS MEET CLOSURE PLAN SPECS?
	Loose Lift Thickness	Lift Scarification Depth	Percent of Optimum Density	Min. Layer Thickness	Surface Slope		
Solidified Sludge Suitable for handling and compaction using conventional earthwork equipment. Sufficient compressive strength to support overlying layers.	NS	NS	NS	NS	NS	• Construction observations and geotechnical testing data from McBride-Ratcliff and Associates, Inc., for 5 - 7/94 and 10/94 - 3/95. • Construction observations and geotechnical testing data from Fugro-McClelland (Southwest), Inc., for 2 - 5/97.	YES
Fill Soil Existing dike soils or other clay soil.	6 - 9 in	NS	NS	NS	NS	• Construction observations and geotechnical testing data from McBride-Ratcliff and Associates, Inc., for 5 - 7/94 and 10/94 - 3/95. • Construction observations and geotechnical testing data from Fugro-McClelland (Southwest), Inc., for 2 - 5/97.	YES
Clay Cap Clean clay soil USCS Soil Classification: CL or CH Plasticity Index: ≥ 15% Liquid Limit: ≥ 30% Percent Passing No. 200 Sieve: ≥ 30% Compacted Permeability: $<1\times10^{-7}$ cm/sec	6 - 9 in	1 - 2 in	95	4 ft	2 - 5	• Construction observations and geotechnical testing data from McBride-Ratcliff and Associates, Inc., for 5 - 7/94 and 10/94 - 3/95. • Construction observations and geotechnical testing data from Fugro-McClelland (Southwest), Inc., for 2 - 5/97. • Elevation survey information from Galloway and Associates for 6/94 and 3/95. • Elevation survey information from Jay Garrett Engineer for 3/97 and 4/97.	YES
Topsoil Cover Fertilized and seeded with appropriate grass mixture.	NS	NS	NS	1.5 ft	NS	• Elevation survey information from Galloway and Associates for 7/94 and 4/95. • Elevation survey information from Jay Garrett Engineer for 4/97 and 5/97. • Seed certification from Pennington Seed Inc. for 7/94. • Seed certification from ESCO Distribution for 3/95. • Seed certification from RWI Companies, Inc. for 4/97.	YES

Notes:
1. Approved closure plan specifications provided in Monsanto, 1986.
2. Compaction specifications for clay cap expressed as percent of Standard Proctor (i.e., ASTM D698)optimum density and moisture content.
3. NS = No specifications provided in approved closure plan.

TABLE 2
MATERIAL QUANTITIES REMAINING IN PLACE AFTER CLOSURE OF IWPF SURFACE IMPOUNDMENTS

Certification of Closure for IWPF Surface Impoundments
RCRA Permit No. HW-50189-001
Monsanto Company, Alvin, Texas

IWPF UNIT IMPOUNDMENT	Oil/Sludge Volume (cy)	Dike Soil Volume (cy)	General Fill Volume (cy)	Flyash Volume (cy)	Portland Cement Volume (cy)	Total Placed and Compacted Volume (cy) (to nearest 100)
Pond 1: Runoff Pond	2,490	1,900	—	3,725	0	5,800
Pond 2: West Vacuum Truck Pit	300	0	—	300	0	400
Pond 3: East Vacuum Truck Pit	60	0	—	60	0	100
Pond 4: West Process Basin Pond 5: East Process Basin	300	5,100	1,728	0	0	5,100
Pond 6: Sludge Settlement Pond	3,642	800	—	814	490	4,100
Totals:	**6,792**	**7,800**	**1,728**	**4,899**	**490**	**15,500**

Notes:
1. Quantities for obtained from RUST, 1994; 1995, and Laidlaw, 1997.
2. All volumes are loose cubic yards (cy), except when noted. Compacted volumes indicate a reduction in volume of 40%.
3. Ponds 4 and 5 were closed concurrently, therefore volumes were reported for both ponds.

GSI Job No. G-1936
Issued: 6/30/97
Page 1 of 1

GROUNDWATER SERVICES, INC.

TABLE 3
REFERENCES

Closure Certification for IWPF Surface Impoundments
RCRA Permit No. HW-50189-001
Monsanto, Alvin, Texas

GSI, 1993. "Application for Class 2 RCRA Permit Modification, IWPF Unit Delay of Closure, Injection Well Pretreatment Facility (IWPF), Monsanto Company, Alvin, Texas," Groundwater Services, Inc., October 22, 1993. GSI Job No. G-1395.

GSI, 1995. "Certification of Closure of the IWPF Filtration Tank System, Monsanto Choco9late Bayou Plant, Alvin, Texas," Groundwater Services, Inc., February 8, 1995. GSI Job No. G-1628.

Laidlaw, 1997. "Pond Closure Phase II Project, Monsanto Chocolate Bayou, Alvin, Texas," Laidlaw Environmental Services, May 6, 1997.

Monsanto, 1986. "Response to Notice of Deficiency, RCRA Part B Permit Application, Monsanto Company, Alvin, Texas," Monsanto, August 5, 1986.

Rust, 1994. "IWPF Pond Closure: Phase I Activity Summary, Monsanto Chocolate Bayou, Alvin, Texas," Rust Remedial Services Inc., October 4, 1994.

Rust, 1995. "IWPF Pond Closure: Phase II Activity Summary, Monsanto Chocolate Bayou, Alvin, Texas," Rust Remedial Services Inc., March 21, 1995.

TWC, 1987. "Permit for Industrial Solid Waste Management Site Issued Under Provisions of Texas Health and Safety Code Ann. Chapter 361 (Vernon), Permit No. HW-50189-001," Texas Water Commission, Austin, Texas, September 30, 1987.

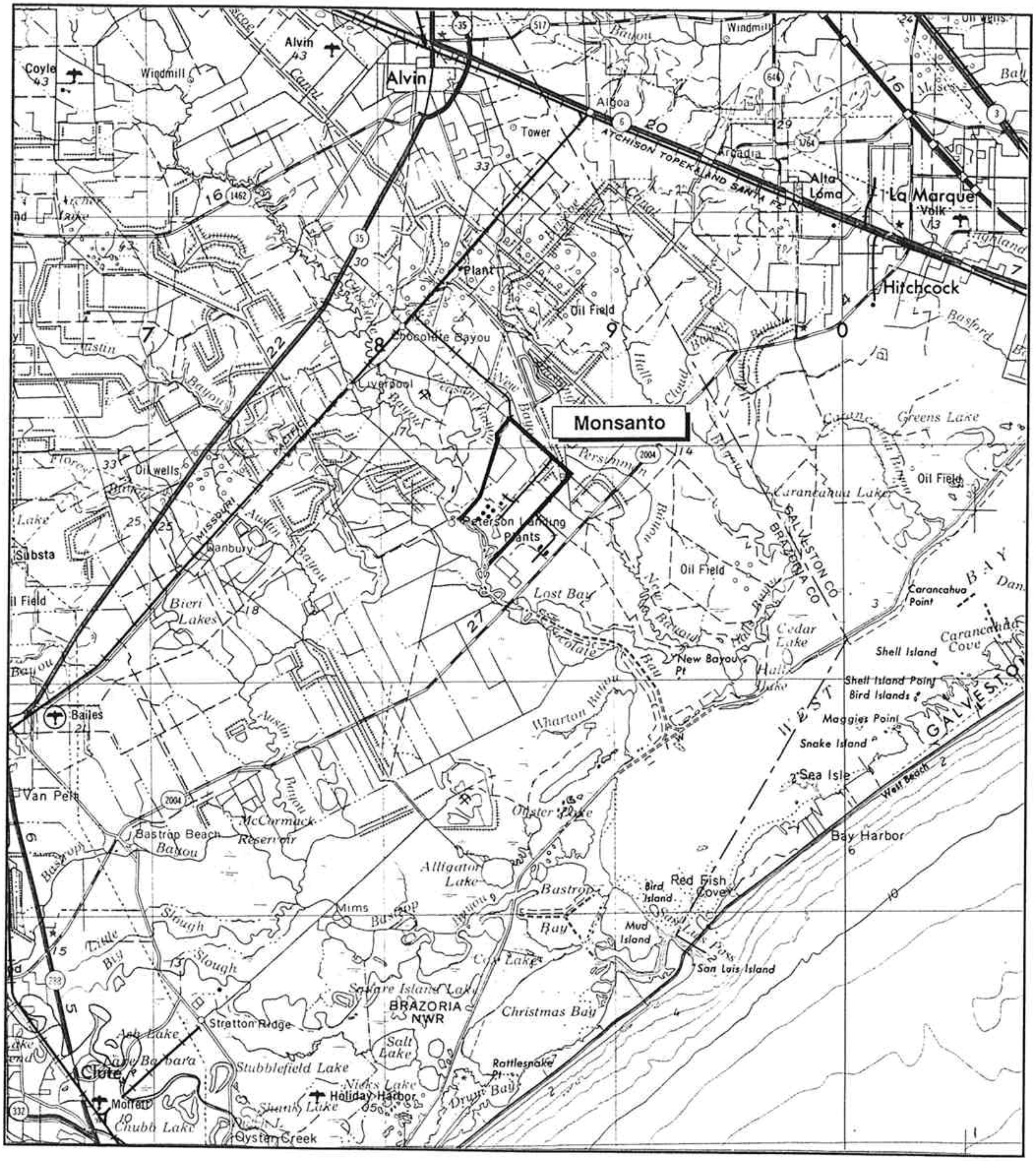
GSI Job No. G-1936
June 30, 1997

GROUNDWATER
SERVICES, INC.

CLOSURE CERTIFICATION FOR IWPF SURFACE IMPOUNDMENTS

RCRA Permit No. HW-50189-001
Monsanto, Alvin, Texas

FIGURES



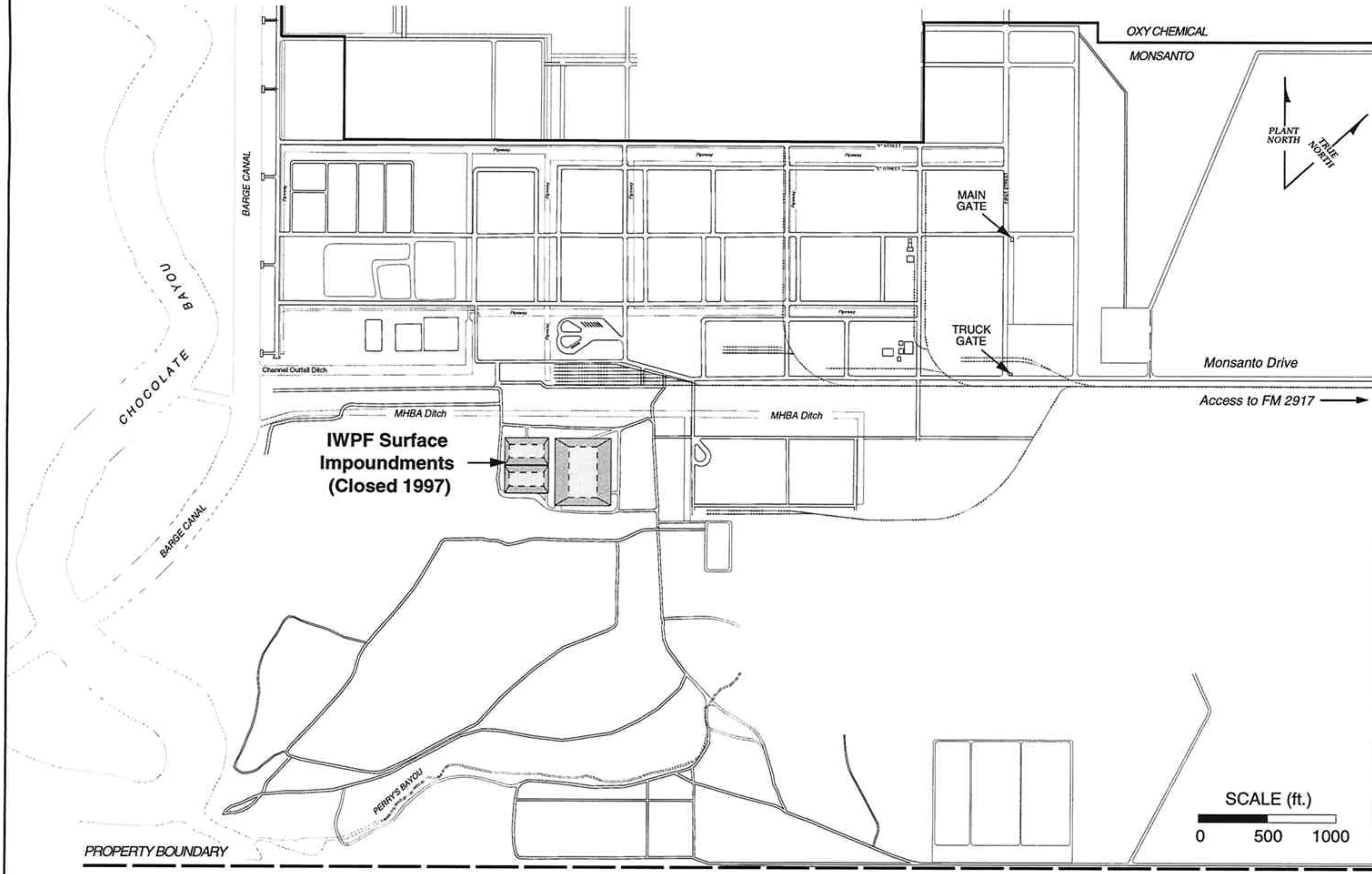
U.S. Geological Survey Map
Houston, Texas
Topographic-Bathymetric 1: 250,000
Date: 1975

SCALE (mi.)
0 2 4

Groundwater Services, Inc.
Houston, Texas

SITE LOCATION MAP
Closure Certification for IWPF Surface Impoundments
RCRA Permit No. HW-50189-001
Monsanto, Alvin, Texas

GSI Job No.:	G-1936	Scale: As Shown		FIGURE 1
Drawn by:	DLB	Approved by:	EAH	
Revised:	———	Date:	6/30/97	

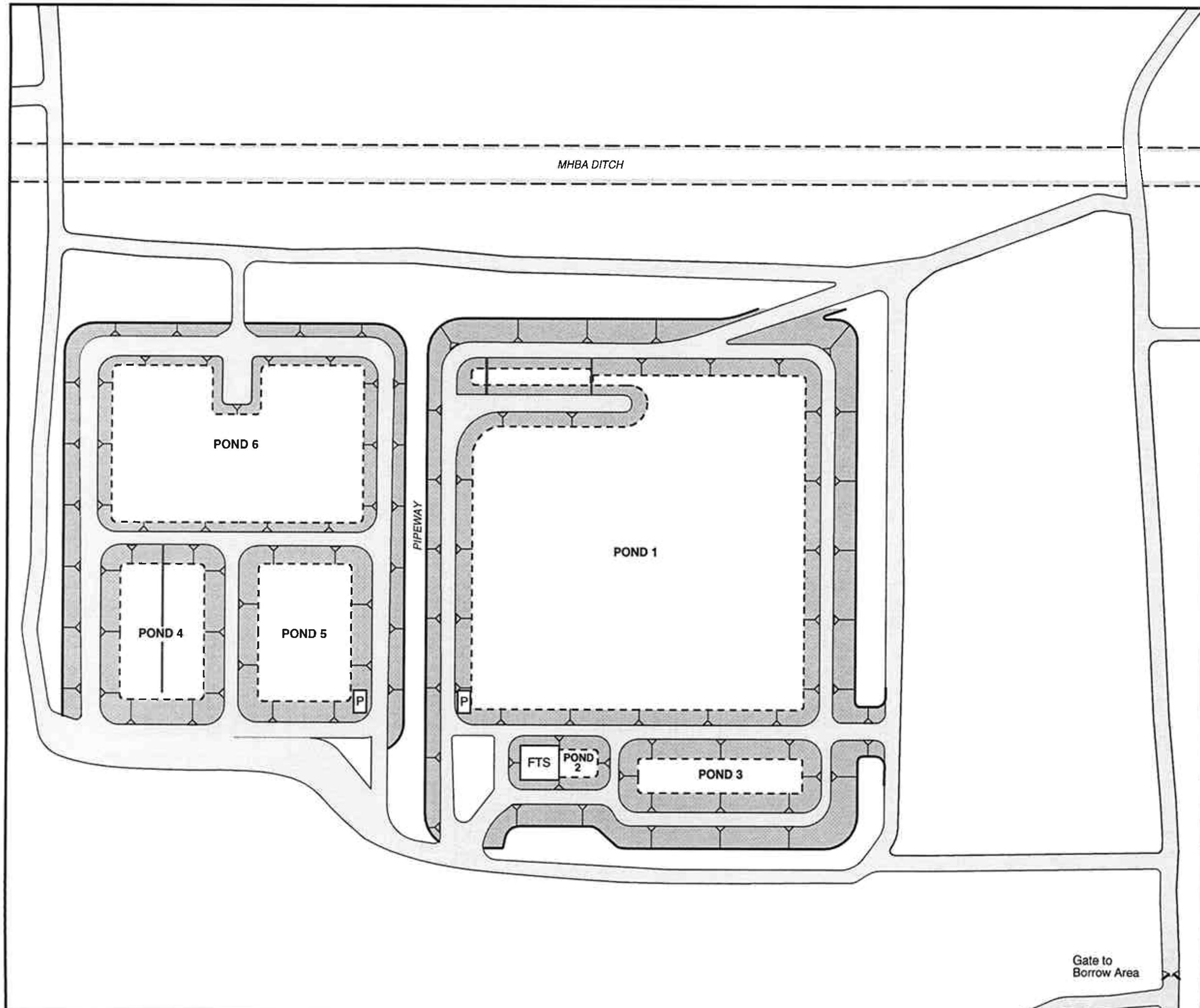


Groundwater Services, Inc.
Houston, Texas

GSI Job No.	G-1936	Drawn By:	DLB
Issued:	6/30/97	Chk'd By:	EAH
Revised:	————	Aprv'd By:	EAH
Scale:	As Shown		FIGURE 2

LOCATION OF IWPF SURFACE IMPOUNDMENTS

Closure Certification for IWPF Surface Impoundments
RCRA Permit No. HW-50189-001
Monsanto, Alvin, Texas



PLANT NORTH
TRUE NORTH

LEGEND

- - - - Inside toe of dike

Direction of downward dike slope (to right)

P Pump station

FTS IWPF-Filtration Tank System (IWPF-FTS)

Interior baffle or weir structure

SCALE (ft.)

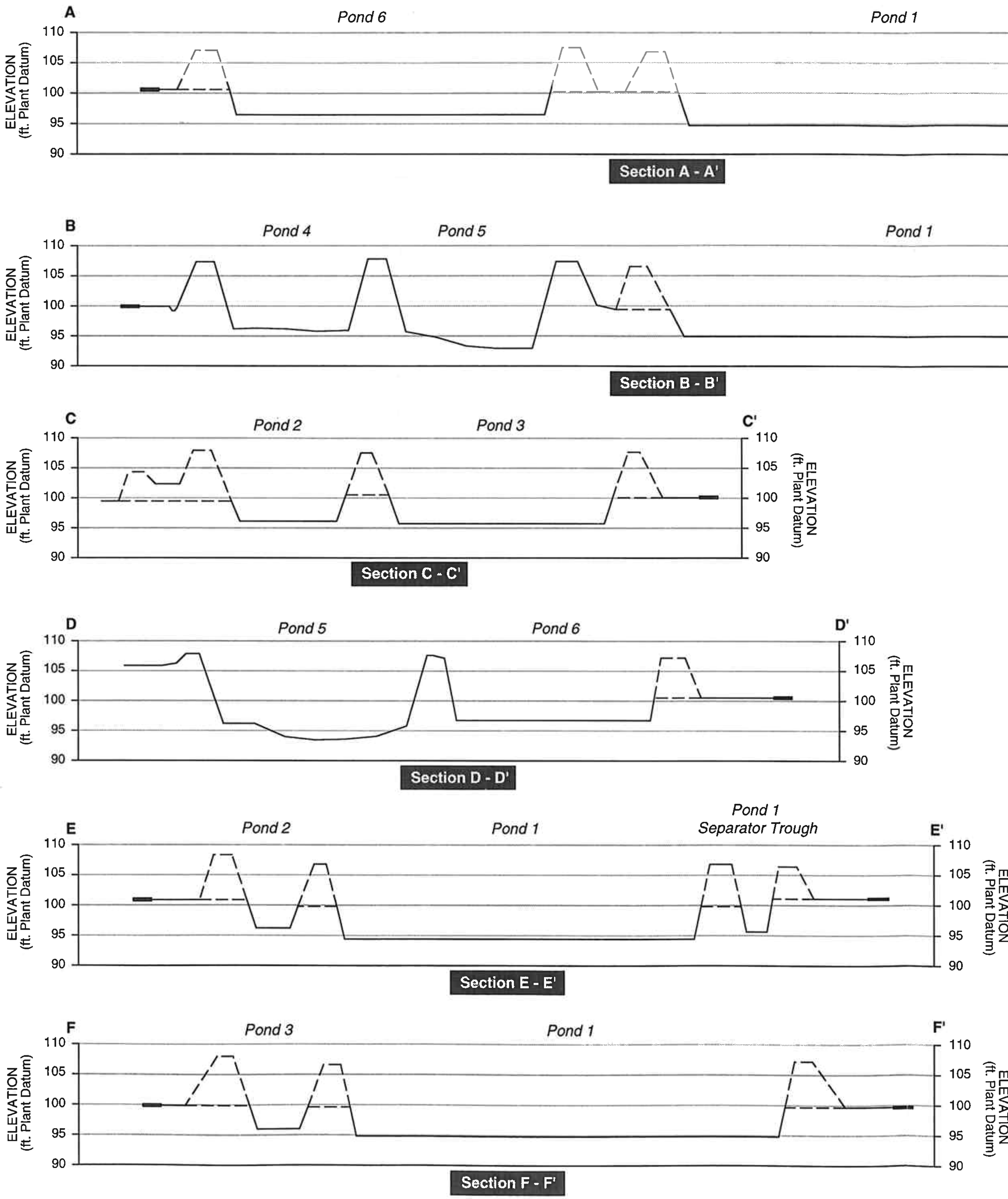
0 75 150

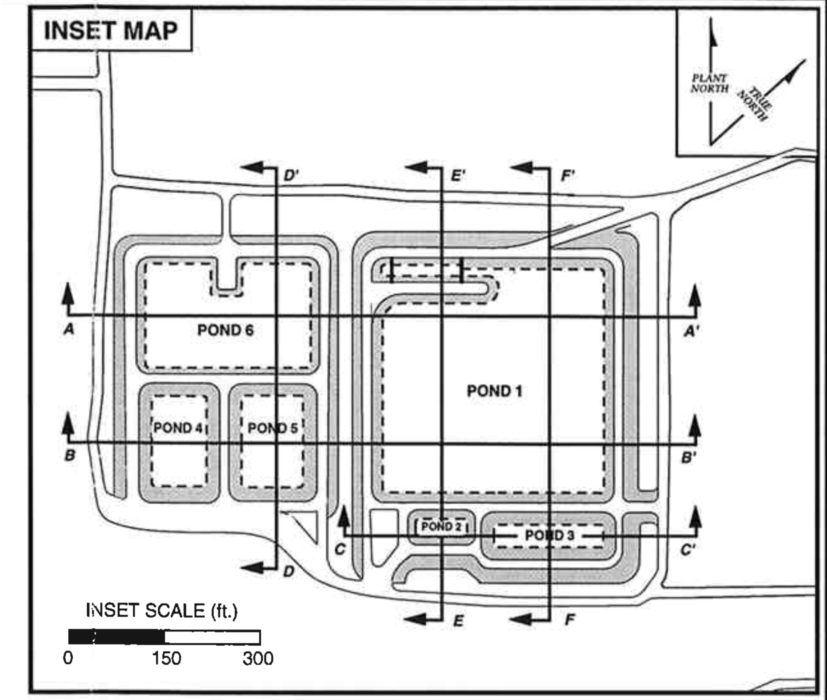
Groundwater Services, Inc.
Houston, Texas

PRE-CLOSURE SITE PLAN OF IWPF SURFACE IMPOUNDMENTS: 1994

Closure Certification for IWPF Surface Impoundments
RCRA Permit No. HW-50189-001
Monsanto, Alvin, Texas

GSI Job No: G-1936		Drawn By: DLB	
Issued: 6/30/97		Chk'd By: EAH	
Revised: ——		Appv'd By: EAH	
Scale: As Shown		FIGURE 3	





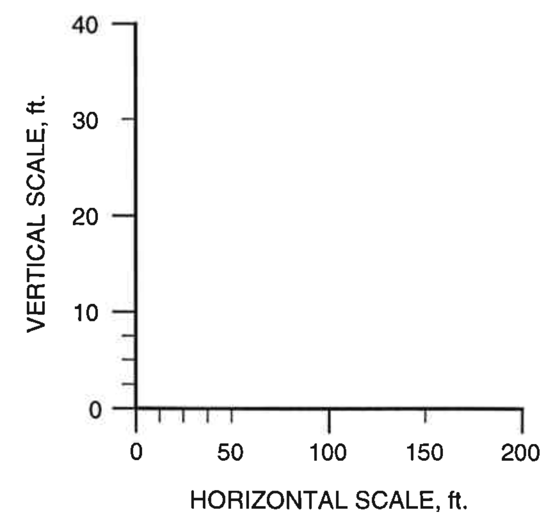
LEGEND

- - - - Dike wall material to be removed

——— Current dike or pond base surface

▬▬▬ Road surface

Note:
85.51 ft, Plant Datum = 0 ft, Mean Sea Level



VERTICAL EXAGGERATION: 5X

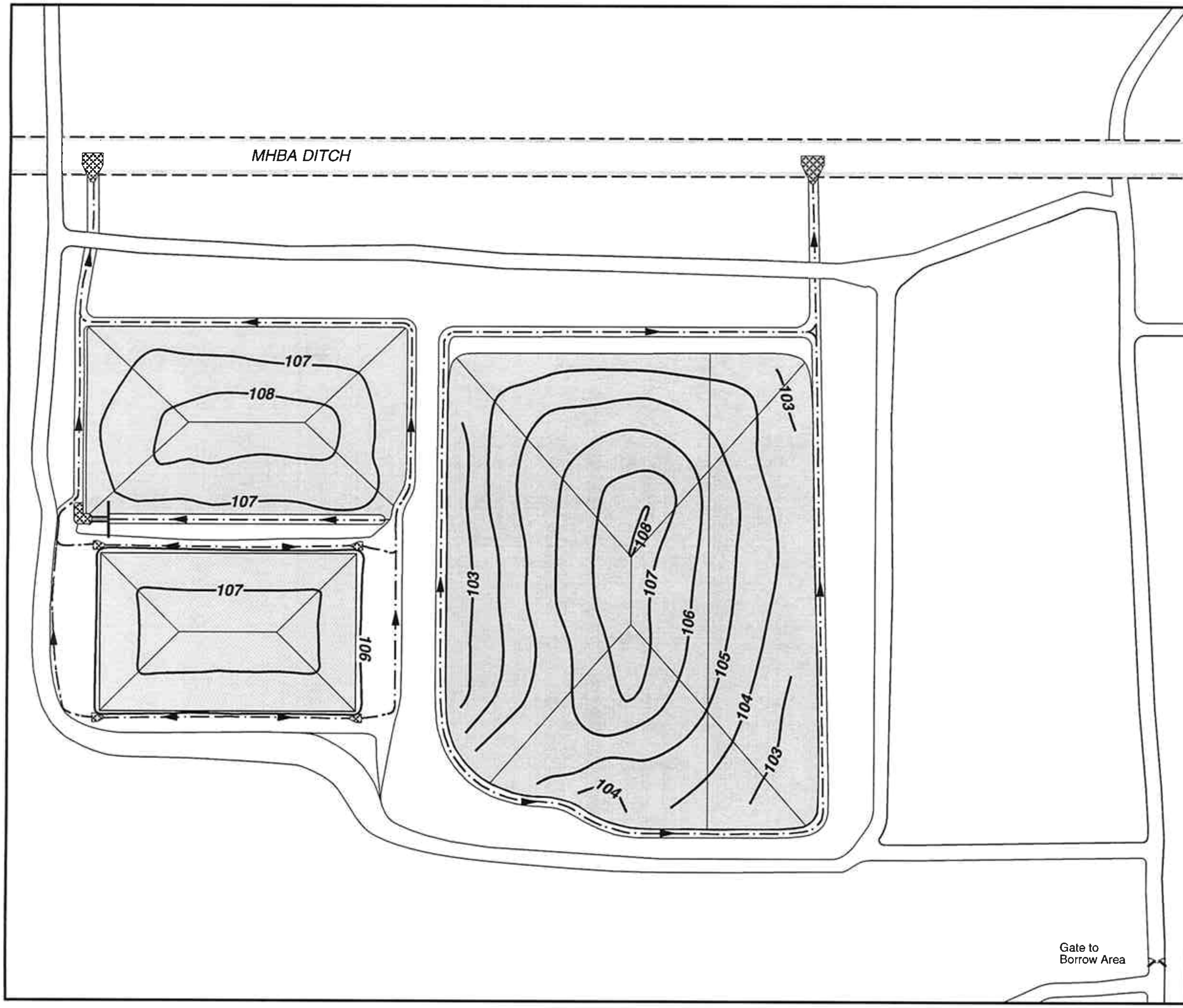
Note: 85.51 ft, Plant Datum = 0 ft, Mean Sea Level.

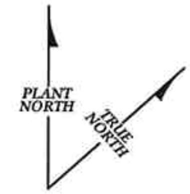
Groundwater Services, Inc.
Houston, Texas

PRE-CLOSURE CROSS-SECTIONS OF IWPF SURFACE IMPOUNDMENTS: 1994

Closure Certification for IWPF Surface Impoundments
RCRA Permit No. HW-50189-001
Monsanto Company, Alvin,Texas

GSI Job No:	G-1936	Drawn By:	DLB
Issued:	6/30/97	Chk'd By:	EAH
Revised:	———	Appv'd By:	EAH
Scale:	As Shown		FIGURE 4





LEGEND

—108— Contour line (ft plant datum) as surveyed by Galloway and Associates,Inc., on 7/25/94 and 3/20/95; and Jay Garrett Engineer on 5/5/97. Note: 85.51 ft plant datum = 0 ft mean sea level.

—·— Center line of drainage ditch

Direction of drainage flow

Riprap

Topsoil cover

SCALE (ft.)

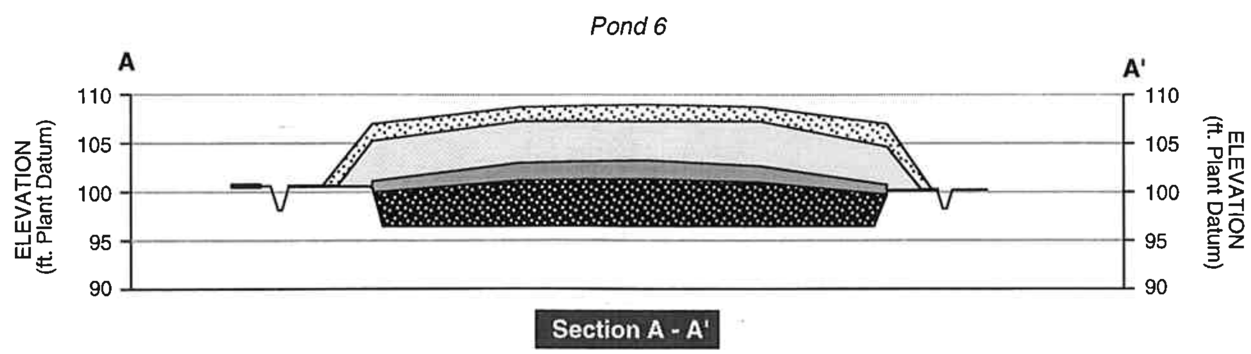
0 75 150

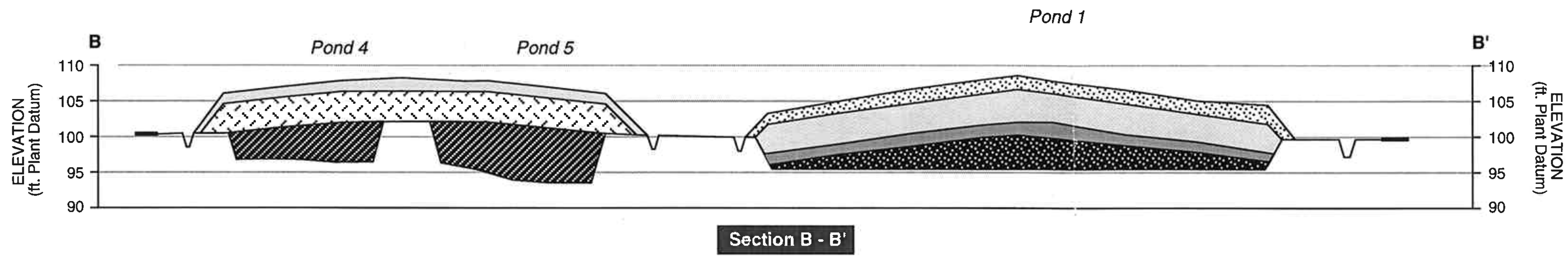
Groundwater Services, Inc.
Houston, Texas

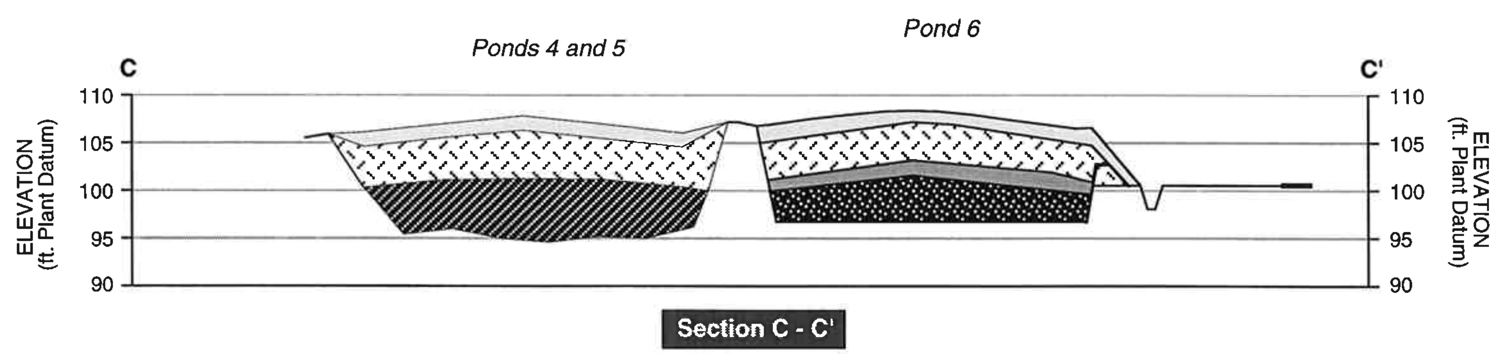
SITE PLAN OF CLOSED IWPF SURFACE IMPOUNDMENTS: 1997

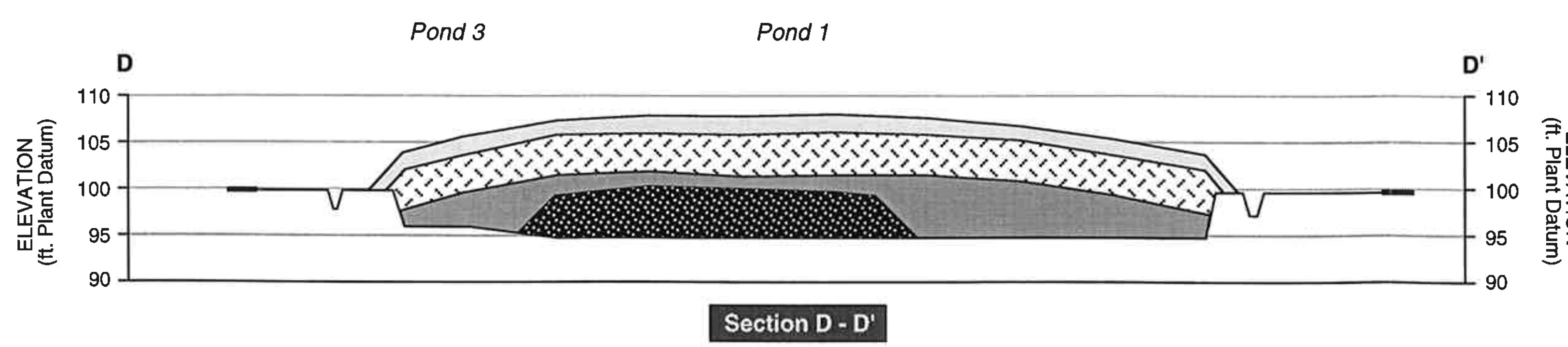
Closure Certification for IWPF Surface Impoundments
RCRA Permit No. HW-50189-001
Monsanto, Alvin, Texas

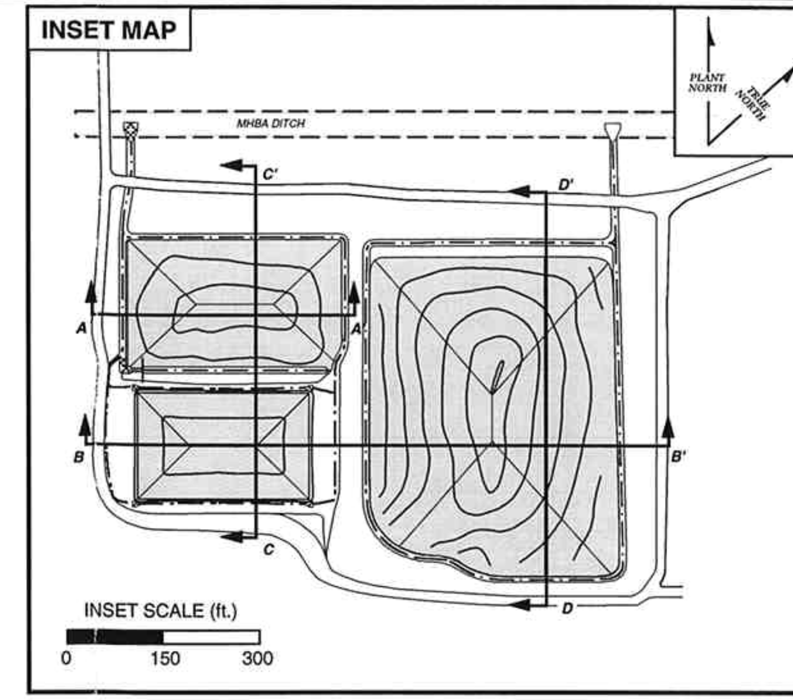
GSI Job No:	G-1936	Drawn By:	DLB
Issued:	6/24/97	Chk'd By:	EAH
Revised:	———	Appv'd By:	EAH
Scale:	As Shown		**FIGURE 5**

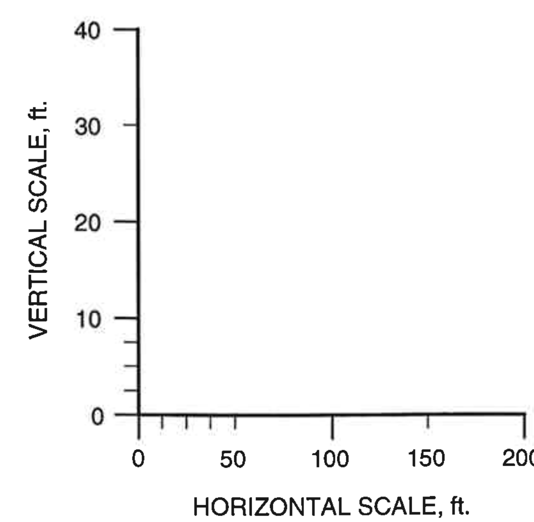












VERTICAL EXAGGERATION: 5X

Note: 85.51 ft, Plant Datum = 0 ft, Mean Sea Level.

LEGEND

- Road surface
- Drainage ditch
- Topsoil
- Compacted clay cover
- Dike wall material
- Solidified sludge material
- Combined solidified sludge and dike wall materials

Groundwater Services, Inc.
Houston, Texas

CROSS-SECTIONS FOR CLOSED IWPF UNIT: 1997

Closure Certification for IWPF Surface Impoundments
RCRA permit No. HW-40189-001
Monsanto, Alvin, Texas

GSI Job No:	G-1936	Drawn By:	EAH
Issued:	6/30/97	Chk'd By:	EAH
Revised:		Appv'd By:	EAH
Scale:	As Shown		**FIGURE 6**

Hazardous Waste Permit Renewal Application
Ascend Performance Materials Texas Inc., Alvin, Texas

Hazardous Waste Permit No. 50189

Part B, Section V: Appendix V.G.1 – Engineering Report for Closed Landfill

Note: There were no changes to the Engineering Report for the Closed Landfill, originally issued 31 December 2009 and updated on 6 February 2012 and 21 February 2013. Therefore, the 21 February 2013 Engineering Report and supporting documentation are submitted as is.

GSI Job No. 3742

ATTACHMENT V.6
ENGINEERING REPORT FOR
CLOSED LANDFILL (PERMIT UNIT 01)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas Inc., Alvin, Texas

GSI Job No. 3742

ATTACHMENT V.6
ENGINEERING REPORT FOR
CLOSED LANDFILL (PERMIT UNIT 01)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas Inc., Alvin, Texas

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GSI Job No. 3742

GSI ENVIRONMENTAL

CERTIFICATION OF
ENGINEERING REPORT FOR
CLOSED LANDFILL (PERMIT UNIT 01)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas Inc., Alvin, Texas

I, Elaine A. Higgins, a registered professional engineer in the State of Texas, certify that the Engineering Report in the RCRA Permit Renewal Application issued 31 December 2009 and revised 6 February 2012 and 21 February 2013 for the Closed Landfill (Permit Unit 01) on the Ascend Chocolate Bayou Plant in Alvin, Texas, has been prepared in accordance with the requirements of 40 CFR 264.300 - .317 and 30 TAC 335.173 - .176.

STATE OF TEXAS
ELAINE A. HIGGINS
85482
LICENSED
PROFESSIONAL ENGINEER

Elaine A. Higgins 21 March 2013

Elaine A. Higgins, P.E.
State of Texas Registration No. 85482
GSI Environmental Inc.
Texas Firm Registration Number F-1198

1.0 DESCRIPTION OF THE CLOSED LANDFILL

The Closed Landfill (Permit Unit 01) was closed in 1995 in accordance with the provisions of an approved closure plan and is currently under post-closure care. This section provides a brief description of the Closed Landfill.

The Closed Landfill (Permit Unit 01) is located in the southwest portion of the undeveloped section of the Solutia Chocolate Bayou facility (see Attachment C.1). The landfill was constructed with a compacted clay liner, leachate collection system, and a compacted clay cover. Upon closure in 1995, the landfill was capped in accordance with the terms of an approved closure plan (TNRCC, 1987) and entered in the deed records of Brazoria County, Texas. Since 1988, a Groundwater Detection Monitoring Program (GWDMP) has been implemented for the Closed Landfill as described in Section VI: Geology Report of this application.

2.0 HAZARDOUS WASTES MANAGED

2.1 Types of Wastes Managed

The Closed Landfill was used for disposal of hazardous wastes during the period of 1962 to 1995, when the unit was closed with an estimated total of 258,000 cubic yards of waste in place. During the active life of the unit, the following hazardous wastes were disposed: industrial process sludge, wastewater treatment sludge, inorganic solids, spent filter cartridges, and spent catalysts. Wastes managed in the Closed Landfill are provided on Table V.G.1.

Containers which may have been placed in the Closed Landfill include those referenced by 30 TAC 335.175(e), as follows: i) very small containers, such as ampoules; or ii) containers designed to hold free liquids for use other than storage such as a battery or capacitor. Unless very small, such as an ampoule, containers were crushed, shredded or similarly reduced in volume to the maximum extent practical prior to burial per 30 TAC 335.176.

2.2 Ignitable and/or Reactive Wastes

All wastes disposed in the Closed Landfill were treated prior to disposal to meet applicable requirements specified in the Land Disposal Restrictions referenced in 40 CFR Part 268. Thus, standard operating procedures implemented at the Closed Landfill excluded disposal of ignitable and/or reactive wastes per 40 CFR 264.312.

2.3 Incompatible Wastes

In order to prevent a potential adverse reaction or release, unit operating procedures required completion of a compatibility determination prior to disposing a waste or other material in the Closed Landfill. Material compatibility was assessed using the procedure described in Section IV: Waste Analysis Plan.

3.0 LANDFILL SPECIFICATIONS

The general layout of the Closed Landfill encompassed one cell as shown on Figure VI.18. Major components of the cell are as follows: i) a liner, ii) a leachate collection system, and iii) a protective surface cover installed at the time of closure. Table V.G.1 summarizes design and construction information for the unit.

3.1 Liner and Leachate Collection System

A leachate collection system has been installed above the single constructed clay liner of the Closed Landfill. Each of the four cells in the Closed Landfill is equipped with a sump for the collection of leachate. The liquid level in each sump is maintained at a depth of 12 inches or less. Generally, leachate is removed by a vacuum truck on a monthly basis, or more frequently in the event of heavy precipitation. Fluids removed from the leachate collection sumps are disposed in a permitted on-site injection well or off-site disposal facility.

3.2 Final Cover

Specifications for completion of the Closed Landfill are provided in Appendix V.6.1. The Closure Certification report is provided in Appendix V.6.2.

3.3 Control of Run-On/Run-Off

The landfill was designed, constructed, operated, and maintained to prevent physical transport of any hazardous waste by a 100-yr flood event. The predicted 100-yr flood elevation is 15 ft MSL in the vicinity of this unit, and the landfill perimeter dikes were completed to a nominal elevation of 26.5 ft MSL. Therefore, the dikes are a minimum of 11 ft higher than expected water levels during a 100-yr flood event.

(Note that elevations shown in the Closure Certification Appendix V.6.2 are referenced to Plant Datum and may be converted as follows: Elevation Plant Datum - 85.5 ft = Elevation Mean Sea Level.)

3.4 Monitoring and Inspection of Leachate Collection System

Ascend inspects the leachate collection and removal system on a regular basis. The liquid level in the leachate collection sump is checked and recorded as described in Section 3.1 and fluids are removed by a vacuum truck for disposal in the permitted on-site injection well or other approved off-site waste disposal facility.

4.0 ACTION LEAKAGE RATE

The Closed Landfill was not required to be constructed in accordance with Minimum Technological Requirements (MTR) per 30 TAC 335.173 - .176; and 40 CFR 264.300 - .317; therefore, calculation and monitoring of the Action Leakage Rate is not required.

GSI Job No. G-3379
Issued: 31 December 2009

GSI ENVIRONMENTAL

ATTACHMENT V.6
ENGINEERING REPORT FOR
CLOSED LANDFILL (PERMIT UNIT 01)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.6.1

Appendix V.6.1 Specifications: Class I Landfill

SPECIFICATIONS
CLASS I LANDFILL
PERMIT NO. HW-50189-001 UNIT 06
CLOSURE

Prepared for

MONSANTO CHEMICAL COMPANY
CHOCOLATE BAYOU FACILITY
BRAZORIA COUNTY, TEXAS

Prepared by

McBRIDE-RATCLIFF AND ASSOCIATES, INC.
HOUSTON, TEXAS
SEPTEMBER 1993

DIVISION 1 - GENERAL REQUIREMENTS

DIVISION 2 - SITE WORK

DIVISION 1 - GENERAL REQUIREMENTS

INDEX

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01010

SUMMARY OF WORK

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Work Covered by Contract Documents

B. Work Sequence

C. CONTRACTOR Use of Premises

D. ENGINEER Occupancy

E. Owner Furnished Products

1.02 RELATED REQUIREMENTS

A. General Specification to Bidders provided by Monsanto Chemical Co. under separate cover.

1.03 WORK COVERED BY CONTRACT DOCUMENTS

A. Work Included: CONTRACTOR shall provide all labor, equipment, materials, tools, supplies, transportation, and supervision required for closure of the Class I Landfill in accordance with construction drawings and these specifications. Work consists of the following elements:

Mobilization
Clay Cover Installation
Topsoil Installation
Vegetation
Constructing Site Access Road
Final Grading and Drainage
Demobilization

Estimated construction quantities are shown on the construction drawings.

1.04 WORK SEQUENCE

A. CONTRACTOR shall construct Work in a sequence to enable timely completion.

1.05 CONTRACTOR USE OF PREMISES

A. CONTRACTOR shall limit use of premises for Work, for storage, and for access to areas designated on the Plans.

B. CONTRACTOR shall coordinate use of premises under direction of the ENGINEER.

1.06 ENGINEER OCCUPANCY

A. Engineering personnel will occupy premises during entire construction period to conduct Construction Quality Control and Quality Assurance activities.

1.07 OWNER FURNISHED PRODUCTS

A. Owner will not furnish any materials or supplies for performance of the Work under this Contract.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

STATE OF TEXAS
ROBERT N. JENNINGS
63437
REGISTERED PROFESSIONAL ENGINEER

SECTION 01050

FIELD ENGINEERING

SECTION 01050

FIELD ENGINEERING

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Surveying Services

B. Surveys for CONTRACTOR Quality Control Program

C. Surveys for Measurement and Payment

1.02 RELATED REQUIREMENTS

A. Section 01010 - Summary of Work

B. Section 02223 - Earthwork

C. Section 02410 - Roadway

1.03 QUALITY CONTROL

A. Land Surveyor : Surveyor shall be a registered land surveyor in the State of Texas and provided by the ENGINEER.

1.04 SUBMITTALS

A. ENGINEER will provide registered land surveyor for certification of clay cover thickness.

B. Surveyor shall submit drawings to ENGINEER certifying elevations and locations of site constructed features are in conformance, or non-conformance, with Contract Documents.

1.05 PROJECT RECORD DOCUMENTS

A. CONTRACTOR shall maintain on site a complete, accurate log of control and survey work as it progresses.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 INSPECTION

A. CONTRACTOR shall verify locations of site reference and survey control points prior to starting Work. CONTRACTOR shall promptly notify the ENGINEER of any discrepancies discovered.

3.02 SURVEY REFERENCE POINTS

A. CONTRACTOR shall protect survey control points prior to starting work and preserve permanent reference points during construction. CONTRACTOR shall not relocate site reference points without prior written notice to the ENGINEER.

B. CONTRACTOR shall utilize reference points which have been established at the site. These points are located on the construction drawings.

3.03 SURVEY REQUIREMENTS

A. CONTRACTOR shall record locations of survey control points, with horizontal and vertical data.

B. CONTRACTOR shall establish lines and levels and locate and lay out by instrumentation and similar appropriate means:

1. Site features to be constructed including necessary stakes for cut, fill, placement, and grading operations and stakes for slopes.

3.04 SURVEYS FOR CONTRACTOR QUALITY CONTROL

A. CONTRACTOR shall perform surveys to determine as built elevations of all closure components as required by the specifications and shall notify the ENGINEER prior to starting the work. The CONTRACTOR shall perform surveys to determine grade elevations for backfilling and grading of roadway.

3.05 SURVEYS FOR MEASUREMENT AND PAYMENT

A. CONTRACTOR shall perform surveys to determine percent of completed lump sum Work including surveys to establish measurement reference lines and shall notify the ENGINEER prior to starting Work.

B. Surveys shall be conducted after establishing a grid system sufficiently close between grid lines to determine the measured quantity to within a two (2) percent margin of accuracy. Grid spacings shall not be greater than 50 ft for determination of volume calculations, unless otherwise approved by the ENGINEER.

C. CONTRACTOR's field superintendent shall sign Surveyor's field notes or shall keep duplicate field notes and shall calculate and certify quantities for payment purposes.

END OF SECTION

ROBERT N. JENNINGS

9·10·93

SECTION 01210

PRECONSTRUCTION CONFERENCE

SECTION 01210

PRECONSTRUCTION CONFERENCE

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Contractor participation in preconstruction conference.

1.02 RELATED REQUIREMENTS

A. Section 01010 - Summary of Work

B. Section 01300 - Submittals

C. Individual Specification Sections

1.03 PRECONSTRUCTION CONFERENCE

A. Monsanto Chemical Co. will schedule an initial preconstruction conference before the CONTRACTOR starts the Work at the site.

B. Attendance: Monsanto Chemical Co., ENGINEER, CONTRACTOR, and Sub-Contractor(s).

C. Agenda:

1. Discussion of CONTRACTOR submitted estimated progress schedule including starting dates and completion dates of the various stages of the Work.

2. Submittal of list of subcontractors and list of products by the CONTRACTOR.

3. Designation of responsible personnel by the CONTRACTOR.

4. Review of procedures and processing of field decisions, substitutions, and change orders.

5. Review of the principal features of Work and any questions regarding the Contract, work site, and conduct of the Work.

6. Discussion of health and safety considerations related to the site.

D. ENGINEER shall record minutes and distribute copies after conference to participants.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

STATE OF TEXAS
ROBERT N. JENNINGS
53437
PROFESSIONAL ENGINEER

9·10·93

DIVISION 2 - SITE WORK

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DIVISION 2 - SITE WORK

SECTION 02223

EARTHWORK

SECTION 02223
EARTHWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. General earthwork

B. Interim cover preparation

C. Earthen cover construction

D. Quality control testing associated with placement and compaction operations.

1.02 RELATED WORK

A. Section 02410 - Roadway

B. Section 02910 - Vegetative Cover

1.03 REFERENCES

A. ASTM D 422 - Particle Size Analysis of Soils.

B. ASTM D 698 - Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using a 5.5-lb (2.49-kg) Rammer and 12-in (305-mm) Drop.

C. ASTM D 1140 - Amount of Material in Soils Finer than the No. 200 Sieve.

D. ASTM D 2216 - Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.

E. ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

F. ASTM D 3017 - Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

G. ASTM D 4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

H. ASTM D 5084 - Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.

1.04 DEFINITIONS

Not Used.

1.05 TESTS

A. Tests and analysis of cohesive fill materials shall be performed in accordance with referenced standards.

1.06 SUBMITTALS

A. Results of all field and laboratory quality control testing shall be submitted to the ENGINEER.

B. Results of all field surveys shall be submitted to the ENGINEER.

C. Clay fill processing methods shall be submitted to the ENGINEER.

D. Compaction equipment data shall be submitted to the ENGINEER prior to the start of work.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. Clay Cover - Inorganic cohesive soils with a Unified Soil Classification symbol of CL or CH meeting the following requirements:

Plasticity Index (ASTM D 4318)	$\geq$ 15
Liquid Limit (ASTM D 4318)	$\geq$ 30%
Percent Finer Than No. 200 Sieve (ASTM D 1140)	$\geq$ 30%
Hydraulic Conductivity (Compacted)	$\leq 1 \times 10^{-7}$ cm/sec

B. Structural Fill - Inorganic cohesive soils with a Unified Soil Classification symbol of CL or CH and a minimum Plasticity Index of 15.

C. Topsoil - Inorganic soils free of debris.

2.02 MATERIAL QUALITY CONTROL

The following material quality evaluation tests shall be performed on each type of fill material and proposed borrow source.

A. Clay Fill
1. ASTM D 698
2. ASTM D 1140
3. ASTM D 4318
4. ASTM D 5084

B. Structural Fill
1. ASTM D 698
2. ASTM D 1140
3. ASTM D 4318

C. Topsoil
1. ASTM D 1140
2. ASTM D 4318

PART 3 EXECUTION

3.01 PREPARATION OF INTERIM COVER

Prior to placement of the clay fill for the final cover the existing interim cover shall be prepared as follows:

A. An area failing to meet these specifications shall be removed or reworked and repaired in accordance with Section 3.07. These areas will be identified by the Engineer prior to commencing construction.

B. Brush, trash, or other objectionable material shall be removed from the interim cover.

C. The surface shall be scarified to an adequate depth to provide uniformity but not less than 2 inches.

D. Just prior to the placement of the first lift of the clay fill for the final cover, the surface of the interim cover shall be moisture conditioned. This conditioning shall be adequate to assure the material is at or above its optimum moisture content as determined by ASTM D 698.

3.02 CLAY COVER PLACEMENT AND MAINTENANCE

A. Clay fill shall be placed as required by the lines, grades, and dimensions indicated in the cross sections and details of the plans.

B. Materials shall be processed such that secondary structures have been removed. Processing shall be performed to remove lenses, cracks, channels, root holes, and other structural discontinuities. Discing shall be used to initially reduce clod size and to enhance moisture conditioning. Materials shall be processed such that the maximum clod size is less than one (1) inch at the greatest dimension. A mechanical mixer shall be used to condition the clay before compacting.

C. Material shall be placed in uniform horizontal lifts which do not exceed a nominal thickness of 8 inches before compaction.

D. Material shall be compacted to a density equal to or greater than 95% of the maximum dry density determined in accordance with ASTM D 698. The corresponding moisture content shall be at or above optimum moisture content.

E. Moisture content shall be adjusted as required to maintain the range specified. Moisture content adjustment shall be accomplished by discing and aerating when too wet or by adding water and mixing by discing or blading when too dry. The addition of water to the clay fill shall utilize thorough mixing to achieve a uniform moisture content distribution within the clay fill.

F. Prior to placement of subsequent lifts, previous lifts shall be moisture conditioned and dimpled (rolled) with a footed compactor, or disced to promote bonding.

G. During work stoppages contractor shall take adequate measure to prevent moisture loss from the compacted clay liner.

H. If temporary covers are used to prevent moisture loss they may consist of synthetic materials or earth materials.

1. Synthetic Protective Covers

a. Synthetic protective covers shall be no less than 10 mils thick and shall be provided in sheets or rolls without tears, holes or surface discontinuities.

b. Synthetic protective covers shall be placed utilizing a minimum of 1 foot overlap.

c. Synthetic materials shall be anchored in a manner acceptable to the ENGINEER. Protective cover anchors shall not use wooden or metal stakes which require perforating the compacted clay liner.

2. Earth Material Protective Covers

a. Earth material protective covers shall be placed in loose thicknesses no less than twelve (12) inches.

b. Earth material protective cover moisture content shall be maintained within the ranges specified in Paragraph 3.02D of this Section.

I. Observed desiccation cracks within the compacted clay cover shall be repaired in accordance with Section 3.07.

3.03 TOPSOIL PLACEMENT

A. Topsoil shall be placed in loose lifts and compacted as required to shape to lines, grades and dimensions indicated in the cross sections and details of the plans.

B. Surface of topsoil shall be seeded as per vegetation specification.

3.04 STRUCTURAL FILL PLACEMENT

A. Area to receive structural fill shall be stripped of brush, trash and grass. Unstable or otherwise objectionable material shall be removed and replaced with structural fill material.

B. Material shall be placed in uniform horizontal lifts which do not exceed a nominal thickness of 8 inches before compaction.

C. Material shall have a moisture content no less than two (2) percent below optimum and be compacted to at least 95 percent of the maximum dry density as determined by ASTM D 698.

3.05 TOLERANCES

A. Constructed surface of compacted clay cover: From specified clay liner thickness to three inches greater.

B. Top surface of topsoil and structural fill: Plus or minus three inches.

3.06 CONSTRUCTION QUALITY CONTROL

Described herein are the minimum construction quality evaluation tests to be performed on each type of fill material.

A. Clay Fill

1. ASTM D 1140: A minimum of one test per 50,000 sq. ft of each lift.

2. ASTM D 4318: A minimum of one test per 50,000 sq. ft of each lift.

3. ASTM D 2922: 1 per 10,000 sq. ft of each lift.

4. ASTM D 3017 or ASTM D 2216: 1 per 10,000 sq. ft of each lift.

5. Hydraulic Conductivity: A minimum of two (2) undisturbed samples of compacted clay liner will be tested for laboratory hydraulic conductivity for each 50,000 sq. ft of each lift.

6. Visual observations shall also be performed. Attention shall be given to excavation and processing; the character and condition of the placement surface; water content, density, and other pertinent physical properties of the compacted soil; loose and compacted lift thicknesses and elevations; lift scarification and bonding procedures; effects of equipment on the construction surface; and desiccation cracking of clay materials due to drying.

B. Structural Fill

1. ASTM D 1140: 1 per 25,000 sq. ft of each lift.

2. ASTM D 4318: 1 per 25,000 sq. ft of each lift.

3. ASTM D 2922: 1 per 10,000 sq. ft of each lift.

4. ASTM 3017 or ASTM D 2216: 1 per 10,000 sq. ft of each lift.

5. Visual observations shall also be performed. Attention shall be given to the character and condition of the placement surface; water content, density, and other pertinent physical properties of the compacted soil; loose and compacted lift thicknesses and elevations; lift scarification and bonding procedures; effects of equipment on the construction surface; desiccation cracking of clay materials due to drying; and removal of unsuitable materials.

C. Elevations and slopes of layers shall be verified by survey. Data points shall be no further than 50 ft apart and shall include grade breaks. Survey data shall be collected as required to verify as-built elevation of all constructed clay layers.

3.07 CLAY COVER REPAIR

A. In areas where sample cores have been removed the void shall be filled with bentonite pellets or flakes, which are then hydrated. Areas which do not meet specifications, or where the material has been disturbed by drying or other factors shall be repaired as described herein. These repair methods apply to the interim cover as well as the final cover.

B. Shallow desiccation cracks (less than 2 inches in depth) shall be repaired by discing or mechanically mixing of the clay fill to produce clods that are no greater than one inch. Moisture content of the clay fill shall be adjusted to within the range specified. Clay fill shall be thoroughly mixed to achieve a uniform moisture content distribution. The material shall be recompacted in accordance with Section 3.02.

C. Deep desiccation cracks (greater than 2 inches in depth) shall be repaired by removing the clay fill from the compacted clay liner to a depth suitable to the ENGINEER. Clay fill shall be placed and compacted in accordance with Section 3.02.

D. Areas which require repair shall be repaired with the same clay material used to construct the clay cover. The area to be repaired shall be excavated to a shape that can be filled and compacted using conventional hand-operated or self-propelled compaction equipment. For self-propelled equipment repairs, sideslopes may not be steeper than 1 vertical to 6 horizontal. The surface of the area to be filled shall be scarified a minimum of 2 in. If hand-operated equipment is used, the fill shall be placed in maximum 3 in. loose lifts. For self-propelled equipment, the fill shall be placed in maximum 6 in. loose lifts. The top of each lift shall be scarified before placing the next lift. The fill shall be compacted in accordance with Section 3.02. The repaired area shall be tested in accordance with Section 3.06.

END OF SECTION

STATE OF TEXAS
ROBERT N. JENNINGS
53427
LICENSED PROFESSIONAL ENGINEER

Robert N. Jennings
9·10·93

SECTION 02410
ROADWAY

SECTION 02410

ROADWAY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Placement, Compaction and grading of crushed rock roadway surface.

1.02 RELATED WORK

A. Section 02223 - Earthwork

1.03 REFERENCES

A. ASTM D 2922 - Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth).

B. ASTM D 3017 - Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C. ASTM D 4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

D. ASTM D 422 - Particle-Size Analysis of Soils.

E. ASTM C 131 - Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

F. ASTM D 1557 - Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in. (457-mm) Drop.

G. ASTM D 2216 - Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.

1.04 SUBMITTALS

A. Results of all field surveys shall be submitted to the ENGINEER.

B. Results of all test data on delivered products shall be submitted to the ENGINEER.

PART 2 PRODUCTS

2.01 CRUSHED ROCK

A. Crushed gravel, stone or recycled sound (crushed) concrete.

B. Abrasion total loss shall be no greater than 45 after ASTM C 131.

C. Material passing No. 40 sieve shall meet the following:

1. Liquid Limit: 35 max. ASTM D 4318
2. Plasticity Index: 10 max. ASTM D 4318

D. Sieve Analysis (ASTM D 422)

Size	Percent by Weight Retained
1-3/4 in.	0
7/8 in.	10 - 35
3/8 in.	30 - 50
No. 4 Sieve	45 - 65
No. 40 Sieve	70 - 85

PART 3 EXECUTION

3.01 GENERAL

A. Check subgrade for conformity with grades and absence of weak areas. Remove and replace any soft or weak areas.

B. Place material in one lift.

C. Spread and shape material deposited upon subgrade in same day.

D. Adjust moisture as required.

E. Correct or remove areas of segregated coarse or fine material and replace with well graded material as required.

F. Compact by rolling to at least 95% of ASTM D 1557 dry density at ±2% of optimum moisture content.

3.02 MATERIAL QUALITY CONTROL

A. Described herein are the minimum material quality evaluation tests which the ENGINEER will perform on the aggregate base.

1. ASTM D 1557: minimum of 2 per source
2. ASTM D 4318: minimum of 2 per source
3. ASTM D 422: minimum of 1 per source

3.03 CONSTRUCTION QUALITY CONTROL

Described herein are the minimum construction quality evaluation tests which the ENGINEER will perform on the imported fill. CONTRACTOR shall assist ENGINEER when requested to do so.

A. ASTM D 2922: A minimum of 1 test per 5,000 sq. ft.

B. ASTM D 2216 or ASTM D 3017: A minimum of 1 test per 5,000 sq. ft. ASTM D 3017 will be the preferred method.

END OF SECTION

STATE OF TEXAS
ROBERT N. JENNINGS
53437
Robert N. Jennings
9·10·93

SECTION 02910

VEGETATIVE COVER

SECTION 02910
VEGETATIVE COVER

PART 1 GENERAL

1.01 WORK INCLUDED

The final cover area and areas where the original vegetation has been removed shall receive the following:

A. Seeding
B. Fertilizing
C. Mulching
D. Maintenance

1.02 RELATED WORK

A. Section 02223 - Earthwork

1.03 REFERENCES

A. FS 0-F-241 - Fertilizers, Mixed Commercial.

1.04 DEFINITIONS

Not used.

1.05 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.06 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.07 MAINTENANCE DATA

A. Submit maintenance data for continuing Monsanto maintenance of established vegetative cover.

B. Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer; and watering schedule.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site to support progress of Work.

B. Store and protect products from deleterious conditions.

C. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

D. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.09 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement and until grass is well established and exhibits vigorous growing conditions for 30 days.

PART 2 PRODUCTS

2.01 SEED MIXTURE

A. Seed Mixture:

1. Bermuda Grass Seed: 100 percent

B. Bermuda Grass Seed (Cynodon Dactylion) must be at least 98 percent pure live seed having not less than a 90 percent germination rate. The seed must also be of the hulled extra fancy type.

2.02 ACCESSORIES

A. Mulching Material: Hemlock species wood cellulose fiber, dust form, free of growth or germination inhibiting ingredients, must contain a distinctive dye to aid in the attainment of proper coverage during application.

B. Fertilizer: FS Q-F-241, Type 1, Grade A; recommended for grass, with fifty percent of the elements derived from organic sources; to the following proportions: Nitrogen 16 percent, phosphoric acid 20 percent, soluble potash 0 percent.

C. Water: Clean fresh and free of substances or matter which could inhibit vigorous growth of grass.

D. Mulch: Stalks or stems of oats, rye, rice, wheat or other approved straw, or hay, free from mold, Johnson grass or other noxious weeds. It is to be applied at a rate of 100 pounds per 1,000 square feet.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that prepared soil base is ready to receive the Work of this Section.

3.02 FERTILIZING

A. Apply fertilizer at a rate of 20 lbs. per 1,000 sq. feet.

B. Apply after smooth raking of topsoil.

C. Do not apply fertilizer at the same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.03 SEEDING

A. Apply Bermuda Grass Seed at a rate of 1 lbs. per 1,000 sq. ft. Rake in lightly. Do not seed area in excess of that which can be mulched on the same day.

B. Do not sow immediately following rain, when ground is too dry, or during windy periods.

C. Roll seeded area with roller not exceeding 112 lbs.

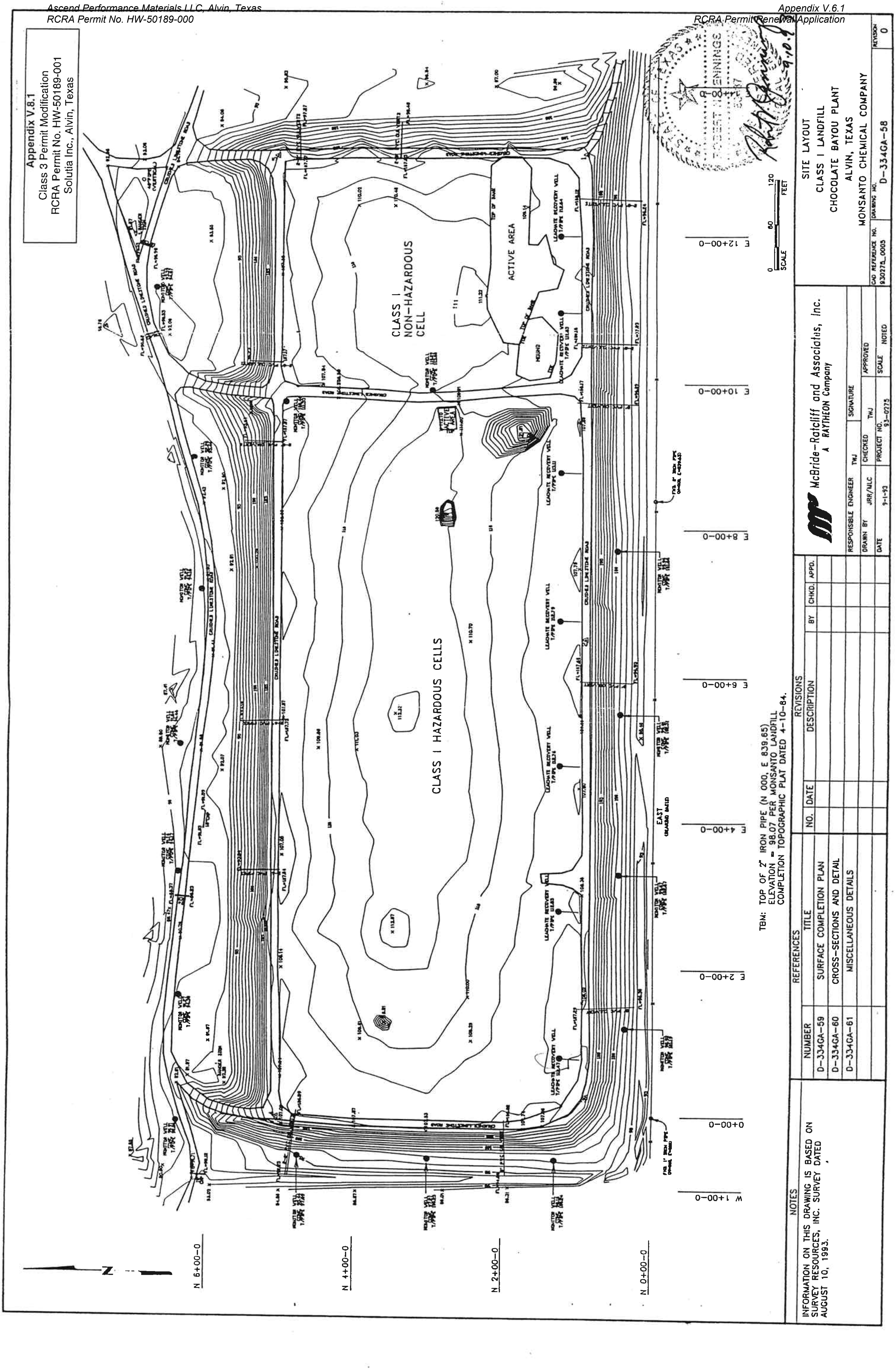
D. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches.

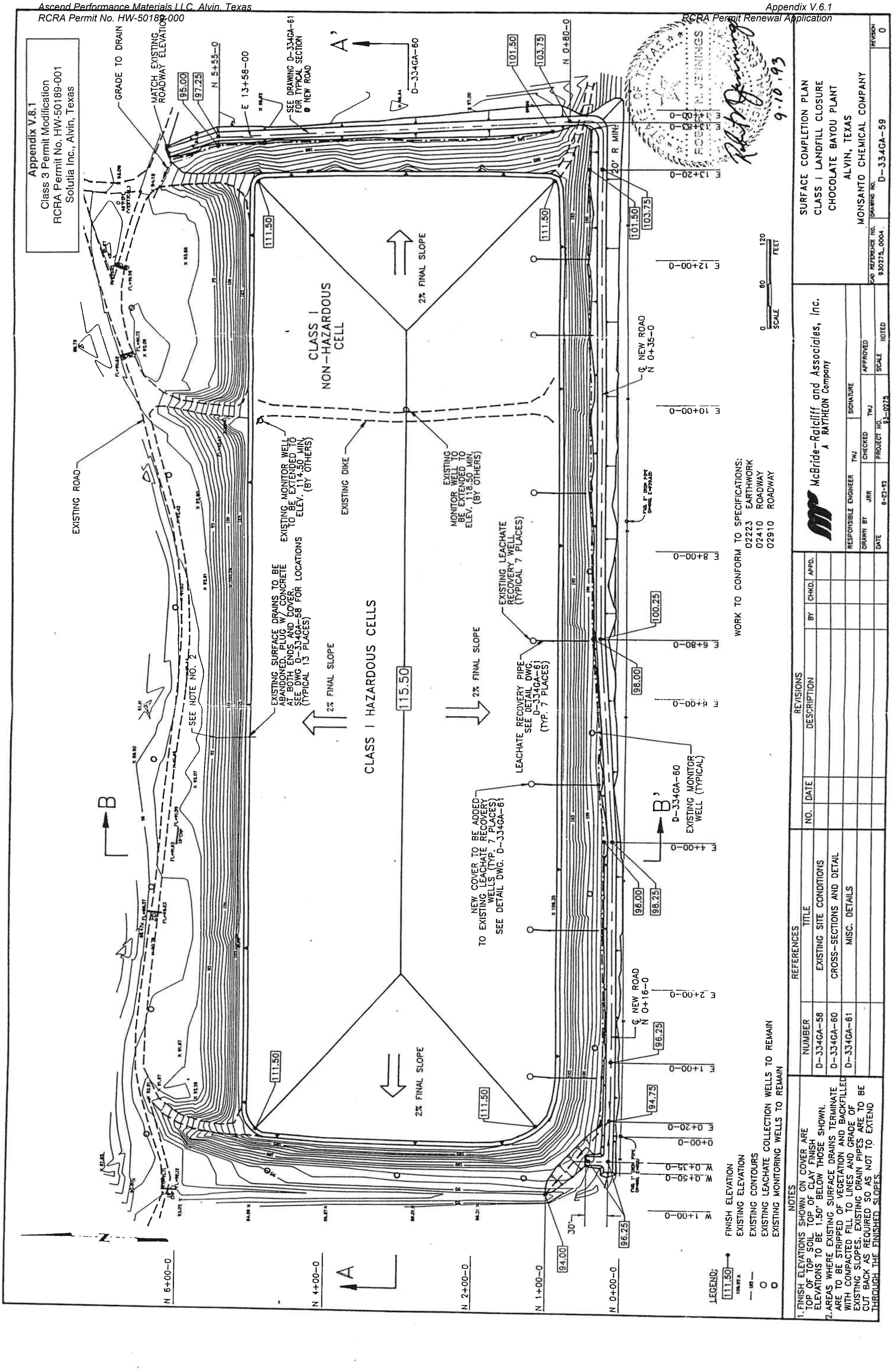
E. Apply water with a fine spay immediately after each area has been mulched. Saturate soil to 4 inches.

END OF SECTION

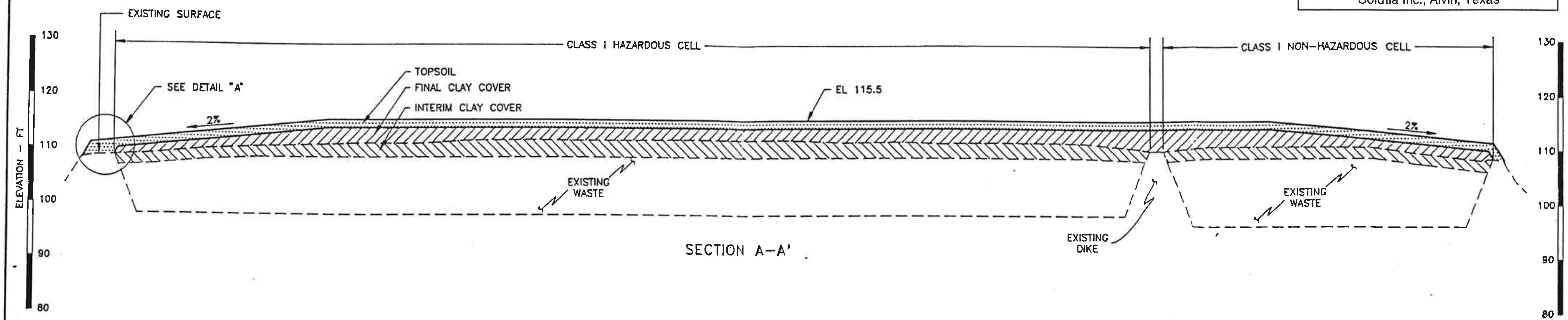
STATE OF TEXAS
ROBERT N. JENNINGS
53437

9·10·93

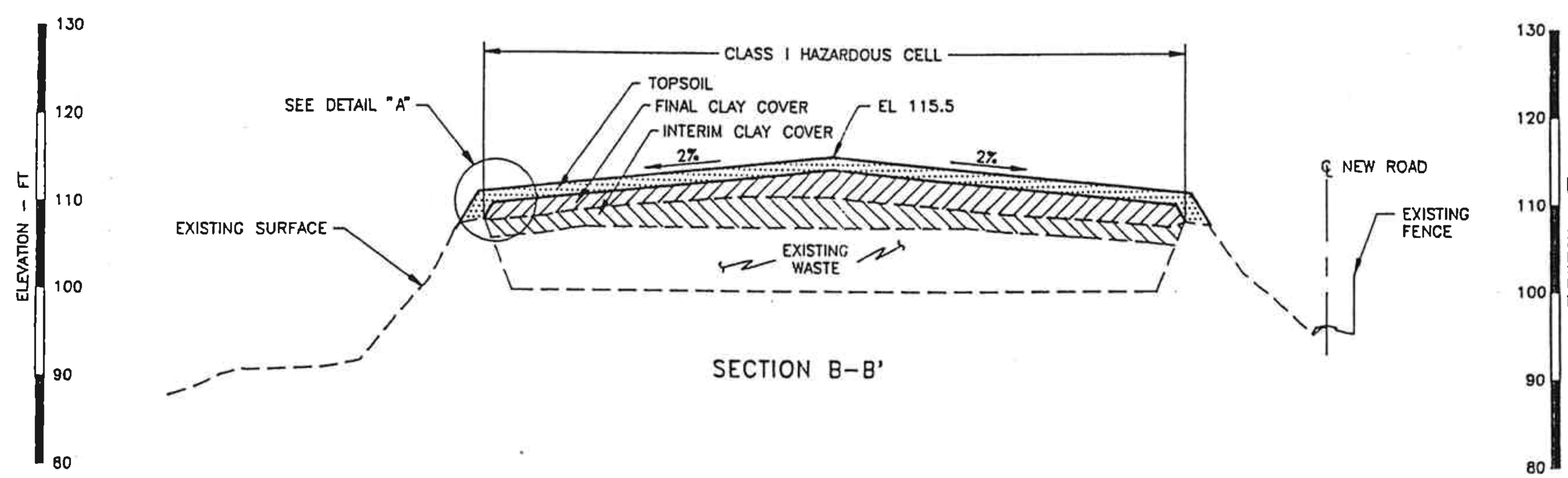

Appendix V.8.1
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas
CLASS I NON-HAZARDOUS CELL
ACTIVE AREA
CLASS I HAZARDOUS CELLS
TBM: TOP OF 2" IRON PIPE (N 000, E 839.65)
ELEVATION = 98.07 PER MONSANTO LANDFILL
COMPLETION TOPOGRAPHIC PLAT DATED 4-10-84.
E 12+00-0
E 10+00-0
E 8+00-0
E 6+00-0
E 4+00-0
E 2+00-0
0+00-0
W 1+00-0
N 6+00-0
N 4+00-0
N 2+00-0
N 0+00-0
NOTES
INFORMATION ON THIS DRAWING IS BASED ON SURVEY RESOURCES, INC. SURVEY DATED AUGUST 10, 1993.
REFERENCES
NUMBER
TITLE
D-334GA-59
SURFACE COMPLETION PLAN
D-334GA-60
CROSS-SECTIONS AND DETAIL
D-334GA-61
MISCELLANEOUS DETAILS
REVISIONS
NO.
DATE
DESCRIPTION
BY
CHKD.
APPD.
McBride-Ratcliff and Associates, Inc.
A RAYTHEON Company
RESPONSIBLE ENGINEER
TWJ
SIGNATURE
DRAWN BY
JRR/MLC
CHECKED
TWJ
APPROVED
DATE
9-1-93
PROJECT NO.
93-0275
SCALE
NOTED
SITE LAYOUT
CLASS I LANDFILL
CHOCOLATE BAYOU PLANT
ALVIN, TEXAS
MONSANTO CHEMICAL COMPANY
CAD REFERENCE NO.
930273_0005
DRAWING NO.
D-334GA-58
REVISION
0
SCALE
FEET
0
60
120


Appendix V.8.1
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas
CLASS I HAZARDOUS CELLS
CLASS I NON-HAZARDOUS CELL
115.50
111.50
2% FINAL SLOPE
EXISTING ROAD
EXISTING DIKE
GRADE TO DRAIN
MATCH EXISTING ROADWAY ELEVATION
SEE DRAWING D-334GA-61 FOR TYPICAL SECTION @ NEW ROAD
EXISTING MONITOR WELL TO BE EXTENDED TO ELEV. 114.50 MIN. (BY OTHERS)
EXISTING MONITOR WELL TO BE EXTENDED TO ELEV. 118.50 MIN. (BY OTHERS)
EXISTING SURFACE DRAINS TO BE ABANDONED. PLUG W/ CONCRETE AT BOTH ENDS AND COVER. SEE DWG D-334GA-58 FOR LOCATIONS (TYPICAL 13 PLACES)
SEE NOTE NO. 2
EXISTING LEACHATE RECOVERY WELL (TYPICAL 7 PLACES)
LEACHATE RECOVERY PIPE SEE DETAIL DWG. D-334GA-61 (TYP. 7 PLACES)
NEW COVER TO BE ADDED TO EXISTING LEACHATE RECOVERY WELLS (TYP. 7 PLACES) SEE DETAIL DWG. D-334GA-61
EXISTING MONITOR WELL (TYPICAL)
℄ NEW ROAD N 0+35-0
℄ NEW ROAD N 0+16-0
20' R MIN.
WORK TO CONFORM TO SPECIFICATIONS:
02223 EARTHWORK
02410 ROADWAY
02910 ROADWAY
LEGEND:
FINISH ELEVATION
EXISTING ELEVATION
EXISTING CONTOURS
EXISTING LEACHATE COLLECTION WELLS TO REMAIN
EXISTING MONITORING WELLS TO REMAIN
NOTES
1. FINISH ELEVATIONS SHOWN ON COVER ARE TOP OF TOP SOIL. TOP OF CLAY FINISH ELEVATIONS TO BE 1.50' BELOW THOSE SHOWN.
2. AREAS WHERE EXISTING SURFACE DRAINS TERMINATE ARE TO BE STRIPPED OF VEGETATION AND BACKFILLED WITH COMPACTED FILL TO LINES AND GRADE OF EXISTING SLOPES. EXISTING DRAIN PIPES ARE TO BE CUT BACK AS REQUIRED SO AS NOT TO EXTEND THROUGH THE FINISHED SLOPES.
REFERENCES
NUMBER TITLE
D-334GA-58 EXISTING SITE CONDITIONS
D-334GA-60 CROSS-SECTIONS AND DETAIL
D-334GA-61 MISC. DETAILS
REVISIONS
NO. DATE DESCRIPTION BY CHKD. APPD.
McBride-Ratcliff and Associates, Inc.
A RAYTHEON Company
SURFACE COMPLETION PLAN
CLASS I LANDFILL CLOSURE
CHOCOLATE BAYOU PLANT
ALVIN, TEXAS
MONSANTO CHEMICAL COMPANY
D-334GA-59
RESPONSIBLE ENGINEER TWJ
DRAWN BY JRR
CHECKED TWJ
DATE 8-23-93
PROJECT NO. 93-0273
SCALE NOTED
REVISION 0
9.10.93

Appendix V.8.1
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas



SECTION A–A'



SECTION B–B'

ESTIMATED QUANTITIES

ESTIMATED FILL

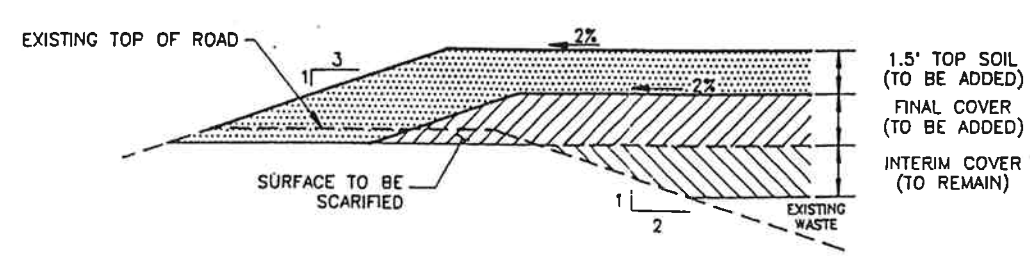
45,700	CUBIC YARDS	CLAY
29,800	CUBIC YARDS	TOPSOIL
5,400	CUBIC YARDS	STRUCTURAL FILL (BENEATH NEW ROAD)
520	CUBIC YARDS	CRUSHED ROCK

ESTIMATED CUT

630	CUBIC YARDS	CUT

MISCELLANEOUS

59,500	SQUARE YARDS	VEGETATION
600	LIN. FEET	2"ø HDPE PIPE
7	EACH	LEACHATE WELL COVERS PER DETAIL



DETAIL "A"
NTS

NOTE:
TOP 2" OF INTERIM COVER TO BE SCARIFIED PRIOR TO PLACEMENT OF FINAL COVER.

SCALE 0 25 50 100 FEET
HORIZONTAL

ROBERT M. JENNINGS 53437
9.10.93

NOTES	REFERENCES NUMBER	REFERENCES TITLE
	D-334GA-59	SURFACE COMPLETION PLAN

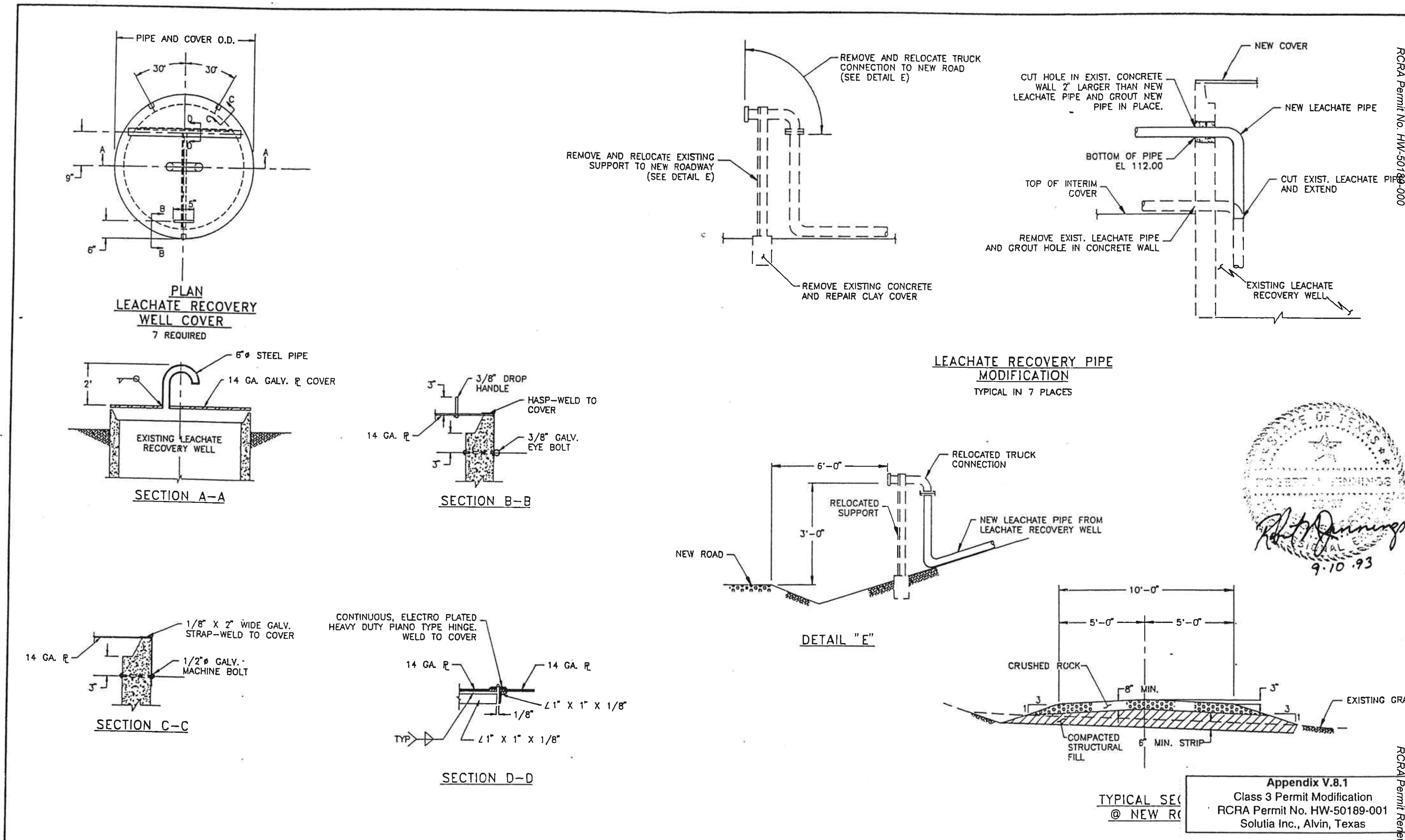
REVISIONS NO.	DATE	DESCRIPTION	BY	CHKD.	APPD.

McBride-Ratcliff and Associates, Inc.
A RAYTHEON Company

RESPONSIBLE ENGINEER	TWJ	SIGNATURE	
DRAWN BY	NLC/JRR	CHECKED TWJ	APPROVED
DATE	8-1-93	PROJECT NO. 93-0275	SCALE NOTED

CROSS-SECTIONS AND DETAIL
CLASS I LANDFILL CLOSURE
CHOCOLATE BAYOU PLANT
ALVIN, TEXAS
MONSANTO CHEMICAL COMPANY

CAD REFERENCE NO.	DRAWING NO.	REVISION
930275_0002	D-334GA-60	0



Appendix V.8.1
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

NOTES	REFERENCES		REVISIONS					
	NUMBER	TITLE	NO.	DATE	DESCRIPTION	BY	CHKD.	APPD.
ALL DIMENSIONS NOMINAL UNLESS OTHERWISE NOTED	D-334GA-59	SURFACE COMPLETION PLAN						

McBride-Ratcliff and Associates, Inc.
A RAYTHEON Company

RESPONSIBLE ENGINEER PB		SIGNATURE	
DRAWN BY MLC	CHECKED PB	APPROVED	
DATE 9-8-93	PROJECT NO. 93-0275	SCALE NTS	

MISCELLANEOUS DETAILS
CLASS I LANDFILL CLOSURE
CHOCOLATE BAYOU PLANT
ALVIN, TEXAS
MONSANTO CHEMICAL COMPANY

CAD REFERENCE NO.	DRAWING NO.	REVISION
930275_0008	D-334GA-61	0

ATTACHMENT V.6
ENGINEERING REPORT FOR
CLOSED LANDFILL (PERMIT UNIT 01)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.6.2

Appendix V.6.2 Closure Certification Report

APPENDIX A
INTERIM CLAY COVER

Appendix V.8.2
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

REPORT OF VERIFICATION FOR THE INTERIM CLAY COVER

Scope of Work

The purpose of the initial field investigation was to establish thickness and physical characteristics of the interim clay cover. The sampling layout is shown in Figure A-1. The investigation program was established in accordance with specified requirements and testing frequencies of the previously constructed test fill.

MRA drilled 62 exploratory soil probes to evaluate the characteristics of the clay cover material. MRA performed soil mechanics laboratory tests on selected samples recovered from the borings to measure properties of the clay soils.

Field Exploration

The field exploration for this project was performed on September 1, 1993 through September 3, 1993. A drilling rig was mobilized to the site to probe the clay cover. The probes were performed by pushing a 3-in. thin-walled tube in 1-ft intervals. Samples were obtained between the surface and 2-ft depth. The sampling intervals and location were noted and the samples were delivered to the MRA laboratory for testing. After the samples were obtained at each location the boring was advanced by continuous drilling to the proposed depth to verify top of waste elevations. Sampling locations along the perimeter roads were drilled to a depth of 3.5 ft and locations along the crest of the landfill were drilled to a depth of 5.0 ft. Borings between the crest of the landfill and the perimeter roads were drilled to a depth of 4.0 ft. Upon completion drilling each sampling-location was filled with bentonite chips, which were then hydrated with potable water.

Laboratory Testing

MRA performed soil mechanics laboratory tests on selected samples. The types, ASTM designation, and number of tests we performed are tabulated as follows:

• Dry Density	182
• Atterberg Limit (ASTM D 4318)	46
• Percent Passing the No. 200 Sieve (ASTM D 1140)	46
• Hydraulic Conductivity (ASTM D 5084)	4

Appendix V.8.2
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

The laboratory test results are presented in Table 1 - Summary of Laboratory Test Data.

Results

Density determinations were made for 182 individual samples of the in-place, upper two feet of interim cover. Each sample was assigned a maximum density and optimum moisture content using moisture-density relations which had been previously performed for on-site borrow soils. The results of the testing are provided in Table 1. The following summary compares the laboratory tests results to the criteria identified in Permit No. HW-50189-001, Section IIID2.

DRY DENSITY SUMMARY		
Lift No.	No. of Densities ≥ 95%	No. of Densities < 95%
A	41	1
B	40	2
C	43	6
D	43	6

ATTERBERG LIMIT SUMMARY		
Lift No.	No. of Tests with LL ≥ 30, PI ≥ 15	No. of Tests with LL < 30, PI < 15
A	10	0
B	12	0
C	12	0
D	12	0

PERCENT PASSING NO. 200 SIEVE SUMMARY		
Lift No.	No. of Tests with % -200 ≥ 30%	No. of Tests with % -200 < 30%
A	10	0
B	12	0
C	12	0
D	12	0

HYDRAULIC CONDUCTIVITY SUMMARY		
Lift No.	No. of Tests with k ≤ $1x10^{-7}$ cm/s	No. of Tests with k > $1x10^{-7}$ cm/s
A	1	0
B	1	0
C	1	0
D	0	1

The interim cover thickness and top of waste elevation at each sampling location was determined. This information is presented in the attached Table 2. In summary, the interim cover was less than two feet in thickness in five of the 62 measured locations. The ridge of the cap was moved about 35 ft to the north to allow the placement of at least 4 ft of clay over boring B-32, B-36 and B-44. Borings B-53 and B-54 were in a low area of the interim cover that allowed placement of at least 4 ft clay. The isopach shown on Figure 5 depicts the thickness of documented clay (interim and final) over the waste. It should be noted the undocumented clay in the interim cover that exists between the waste and the documented interim cover likely meets the same characteristics of the documented interim cover.

TABLE 2
TOP OF WASTE ELEVATION

Boring Number	Surface Elevation	Depth to Waste	Elevation Top of Waste
1	106.86	3.5	103.4
2	107.74	3.5	104.2
3	108.28	3.6	104.7
4	107.27	3.6	103.7
5	107.99	3.6	104.4
6	108.09	3.5	104.6
7	109.50	4.0	105.5
8	110.21	5.4	104.8
9	108.96	4.1	104.9
10	107.78	3.6	104.2
11	108.07	4.0	104.1
12	110.34	4.0	106.3
13	111.04	5.2	105.8
14	109.11	4.0	105.1
15	107.86	3.6	104.3
16	108.12	3.5	104.6
17	110.61	4.0	106.6
18	111.40	5.0	106.4
19	109.48	4.0	105.5
20	108.16	3.9	104.3
21	108.04	3.5	104.5
22	110.99	4.1	106.9
23	111.96	5.0	107.0
24	109.87	4.0	105.9
25	108.26	3.6	104.7
26	108.77	3.5	105.3
27	111.15	4.0	107.2
28	111.99	4.0	108.0
29	109.96	5.0	105.0

TABLE 2
TOP OF WASTE ELEVATION

Boring Number	Surface Elevation	Depth to Waste	Elevation Top of Waste
30	108.42	3.6	104.8
31	108.74	3.6	105.1
32	110.80	1.4	109.4
33	112.16	5.0	107.2
34	109.56	4.2	105.4
35	108.16	3.5	104.7
36	110.74	1.0	109.7
37	111.67	5.0	106.7
38	109.61	4.0	105.6
39	108.37	3.0	105.4
40	110.83	4.0	106.8
41	111.56	3.5	108.0
42	110.40	4.2	106.2
43	107.84	3.5	104.3
44	109.91	1.0	108.9
45	111.71	5.0	106.7
46	109.96	4.2	105.8
47	108.47	3.5	105.0
48	108.54	3.6	104.9
49	108.29	3.5	104.8
50	108.32	3.6	104.7
51	107.48	2.8	104.7
52	109.57	3.5	106.1
53	110.32	1.0	109.3
54	109.29	1.0	108.3
55	108.20	3.5	104.7
56	107.99	3.0	105.0
57	110.36	4.0	106.4
58	110.95	5.0	106.0

TABLE 2
TOP OF WASTE ELEVATION

Page 3 of 3

Boring Number	Surface Elevation	Depth to Waste	Elevation Top of Waste
59	108.39	3.5	104.9
60	108.18	3.7	104.5
61	110.56	4.1	106.5
62	110.80	5.0	105.8

TABLE 1
MONSANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT A (0'-0.5' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-7	20	100	90.9	26.4	-6.4	110	78	53	98	
B-8	27	99	96.9	25.4	1.6	102				
B-9	29	89	88.8	26.7	2.3	100				
B-10	24	94	94.0	26.0	-2.0	100	71	48	95	
B-12	33	93	94.0	26.0	7.0	99				
B-13	26	100	96.9	25.4	0.6	103				
B-14	27	107	90.9	26.4	0.6	118	76	53	97	
B-15	28	98	96.9	25.4	2.6	101				
B-17	32	92	90.9	26.4	5.6	101	80	55	98	
B-18	25	99	96.9	25.4	-0.4	102				
B-19	28	102	96.9	25.4	2.6	105				
B-20	30	94	94.0	26.0	4.0	100				
B-22	31	92	94.0	26.0	5.0	98				
B-23	22	100	96.9	25.4	-3.4	103				
B-24	34	87	90.9	26.4	7.6	96				
B-25	27	93	94.0	26.0	1.0	99				
B-27	31	90	94.0	26.0	5.0	96				
B-28	32	90	94.0	26.0	6.0	96				
B-29	29	95	94.0	26.0	3.0	101	74	51	97	
B-30	21	101	96.9	25.4	-4.4	104				1.5X10[illegible]
B-31	29	97	96.9	25.4	3.6	100				
B-32	24	97	96.9	25.4	-2.4	100				
B-33	28	97	96.9	25.4	2.6	100	68	45	95	
B-34	34	88	88.8	26.7	7.3	99				
B-35	31	98	96.9	25.4	5.6	101				
B-36	35	85	88.8	26.7	8.3	96				
B-37	19	104	107.4	15.4	3.6	97				
B-38	34	91	88.8	26.7	7.3	102				
B-39	32	89	90.9	26.4	5.6	98	76	48	99	
B-40	24	101	96.9	25.4	-1.4	104				
B-41	26	97	96.9	25.4	0.6	100				
B-42	32	97	96.9	25.4	6.6	100				
B-43	37	84	88.8	26.7	10.3	95				
B-44	30	93	94.0	26.0	4.0	99				
B-45	35	88	88.8	26.7	8.3	99				

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

TABLE 1
MONSANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT A (0'-0.5' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-46	28	94	94.0	26.0	2.0	100	74	48	94	
B-47	30	90	94.0	26.0	4.0	96	76	36	72	
B-48	29	80	88.8	26.7	2.3	90				
B-49	29	94	90.9	26.4	2.6	103	79	56	96	
B-50	26	96	96.9	25.4	0.6	99				
B-52	19	98	96.9	25.4	-6.4	101				
B-53	33	91	94.0	26.0	7.0	97				
B-54	35	77	88.8	26.7	8.3	88				
B-55	35	90	94.0	26.0	9.0	96				
B-57	29	88	88.8	26.7	2.3	99				
B-58	36	86	88.8	26.7	9.3	97				
B-59	29	91	94.0	26.0	3.0	97				
B-61	32	90	94.0	26.0	6.0	96				
B-62	28	95	94.0	26.0	2.0	101				

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

TABLE 1
MONSANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT B (0.5'-1.0' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-7	22	86	88.8	26.7	-4.7	97				
B-8	19	105	94.0	26.0	-7.0	112	69	47	96	
B-9	34	88	90.9	26.4	7.6	97				2.4X10^{-8}
B-10	23	106	94.0	26.0	-3.0	113				
B-12	322	102	90.9	26.4	-4.4	112	73	50	97	
B-13	21	108	96.9	25.4	-4.4	111				
B-14	20	111	96.9	25.4	-5.4	114	76	53	97	
B-15	35	88	90.9	26.4	8.6	97				
B-17	33	92	94.0	26.0	7.0	98	80	55	98	
B-18	23	101	94.0	26.0	-3.0	107				
B-19	21	100	90.9	26.4	-5.4	110	73	50	90	
B-20	23	92	94.0	26.0	-3.0	98				
B-22	21	104	88.8	26.7	-5.7	117	94	67	97	
B-23	24	98	94.0	26.0	-2.0	104				
B-24	32	85	88.8	26.7	5.3	96				
B-25	28	76	88.8	26.7	1.3	86				
B-27	30	94	94.0	26.0	4.0	100				
B-28	28	97	90.9	26.4	1.6	107	80	55	98	
B-29	31	86	88.8	26.7	4.3	97				
B-30	27	101	94.0	26.0	1.0	107				
B-31	22	104	94.0	26.0	-4.0	111				
B-32	27	96	96.9	25.4	1.6	99				
B-33	27	101	94.0	26.0	1.0	107	68	45	95	
B-34	21	99	94.0	26.0	-5.0	105				
B-35	20	108	107.4	15.4	4.6	101				
B-36	19	105	107.2	16.2	2.8	98				
B-37	19	104	107.4	15.4	3.6	97				
B-38	22	103	94.0	26.0	-4.0	110	68	44	98	
B-39	31	89	94.0	26.0	5.0	95				
B-40	23	104	94.0	26.0	-3.0	111	73	48	98	
B-41	21	103	107.4	15.4	5.6	96				
B-42	27	103	107.4	15.4	11.6	96				
B-43	22	96	94.0	26.0	-4.0	102				
B-44	28	92	94.0	26.0	2.0	98				
B-45	28	99	94.0	26.0	2.0	105	72	49	91	

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

TABLE 1
MONSANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT B (0.5'-1.0' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-46	27	93	94.0	26.0	1.0	99				
B-47	20	99	88.8	26.7	-6.7	100				
B-48	38	70	88.8	26.7	11.3	79				
B-49	29	90	94.0	26.0	3.0	96				
B-50	28	95	90.9	26.4	1.6	105	77	53	98	
B-52	28	91	88.8	26.7	1.3	102	90	64	97	
B-53	34	88	90.9	26.4	7.6	97				
B-54	32	95	94.0	26.0	6.0	101				
B-55	31	94	94.0	26.0	5.0	100	72	50	97	
B-57	23	102	107.2	16.2	6.8	95				
B-58	37	84	88.8	26.7	10.3	95	89	60	90	
B-59	28	98	96.9	25.4	2.6	101	77	54	97	
B-61	33	86	88.8	26.7	6.3	97				
B-62	27	91	90.9	26.4	0.6	100	74	51	98	

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

TABLE 1
MONSANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT C (1.0'-1.5' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-7	32	89	90.9	26.4	5.6	98	79	52	96	
B-8	25	100	96.9	25.4	-0.4	103				
B-9	31	90	90.9	26.4	4.6	99				
B-10	32	94	96.9	25.4	6.6	97				
B-12	292	95	96.9	25.4	3.6	98				
B-13	35	92	96.9	25.4	9.6	95				
B-14	39	83	88.8	26.7	12.3	93				
B-15	32	84	90.9	26.5	5.5	92	78	54	96	
B-17	23	96	96.9	25.4	-2.4	99				
B-18	25	98	88.8	26.7	-1.7	110	87	61	89	
B-19	26	99	96.9	25.4	0.6	102				
B-20	32	91	90.9	26.4	5.6	100				
B-22	37	85	88.8	26.7	10.3	96				
B-23	32	90	88.8	26.7	5.3	101				
B-24	27	94	94.0	26.0	1.0	100				
B-25	32	89	88.8	26.7	5.3	100				
B-27	22	89	88.8	26.7	-4.7	111	87	59	97	
B-28	32	91	90.9	26.4	5.6	100				
B-29	33	87	90.9	26.4	6.6	96	76	51	98	
B-30	28	93	94.0	26.0	2.0	99				
B-31	38	84	88.8	26.7	11.3	95				
B-33	34	88	88.8	26.7	7.3	99				
B-34	34	85	88.8	26.7	7.3	96				
B-35	32	92	94.0	26.0	6.0	98				
B-37	27	94	94.0	26.0	1.0	100				2.4X10[illegible]
B-38	30	95	94.0	26.0	4.0	101	71	49	91	
B-39	35	84	88.8	26.7	8.3	95				
B-40	29	91	90.9	26.4	2.6	100				
B-41	31	91	90.9	26.4	4.6	100	83	59	94	
B-42	31	92	90.9	26.4	4.6	101				
B-43	36	82	88.8	26.7	9.3	92				
B-45	37	90	90.9	26.4	10.6	99	86	61	97	
B-46	28	96	94.0	26.0	2.0	102				
B-47	35	84	88.8	26.7	8.3	95	69	16	71	
B-48	36	75	88.8	26.7	9.3	84				

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

Appendix V.8.2
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

TABLE 1 MONSANTO LANDFILL INTERIM COMPACTED CLAY COVER LIFT C (1.0'-1.5' DEPTH)										
Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-49	26	96	96.9	25.4	0.6	99				
B-50	29	91	90.9	26.4	2.6	100				
B-52	30	91	90.9	26.4	3.6	100	77	53	96	
B-55	15	109	107.4	15.4	-0.4	101				
B-57	39	76	88.8	26.7	12.3	86				
B-61	32	84	88.8	26.7	5.3	95				
B-62	36	84	88.8	26.7	9.3	95	79	15	52	

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

TABLE 1
MONSANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT D (1.5'-2.0' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-7	33	88	88.8	26.7	6.3	99				
B-8	29	95	94.0	26.0	3.0	101	65	41	97	
B-9	26	93	94.0	26.0	0.0	99				
B-10	29	96	94.0	26.0	3.0	102	75	51	97	
B-12	28	100	96.9	25.4	2.6	103				
B-13	27	94	94.0	26.0	1.0	100				
B-14	39	83	88.8	26.7	12.3	93				
B-15	32	93	94.0	26.0	6.0	99				
B-17	25	105	107.2	15.4	9.6	98	48	15	83	
B-18	26	104	107.2	15.4	10.6	97				
B-19	24	104	107.2	15.4	8.6	97				
B-20	30	99	96.9	25.4	4.6	102				
B-22	34	80	88.8	26.7	7.3	90				
B-23	28	90	88.8	26.7	1.3	101				
B-24	26	98	90.9	26.4	-0.4	108	81	56	95	
B-25	31	90	94.0	26.0	5.0	96				
B-27	36	90	94.0	26.0	10.0	96				
B-28	33	89	88.8	26.7	6.3	100				
B-29	34	93	94.0	26.0	8.0	99				
B-30	26	96	96.9	25.4	0.6	99				
B-31	37	82	88.8	26.7	10.3	92				
B-33	34	89	94.0	26.0	8.0	95	73	50	95	
B-34	28	95	94.0	26.0	2.0	101				
B-35	26	98	90.9	26.4	-0.4	108	81	55	91	
B-37	33	91	94.0	26.0	7.0	97				
B-38	21	106	107.2	16.2	4.8	99				
B-39	25	89	94.0	26.0	-1.0	95				
B-40	19	94	94.0	26.0	-7.0	100	70	49	98	
B-41	27	93	94.0	26.0	1.0	99				
B-42	27	95	94.0	26.0	1.0	101	72	49	98	
B-43	38	84	88.8	26.7	11.3	95				
B-45	35	85	88.8	26.7	8.3	96				
B-46	31	108	107.4	15.4	15.6	101				
B-47	33	97	94.0	26.0	7.0	103				
B-48	32	79	88.8	26.7	5.3	89	87	63	98	

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

TABLE 1
MONSANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT D (1.5'-2.0' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-49	25	100	94.0	26.0	-1.0	106	71	45	90	
B-50	18	107	107.2	16.2	2.8	100	72	48	96	
B-52	28	92	94.0	26.0	2.0	98				
B-55	13	108	96.9	25.4	12.4	111	58	39	90	
B-57	42	71	88.8	26.7	15.3	80				
B-61	47	69	88.8	26.7	20.3	78				$>1X10^{-7}$
B-62	46	64	88.8	26.7	19.3	72				

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

TABLE 1
MONSTANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT A (0'-0.5' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Platicity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-7	20	100	90.9	26.4	-6.4	110	78	53	98	
B-8	27	99	96.9	25.4	1.6	102				
B-9	29	89	88.8	26.7	2.3	100				
B-10	24	94	94.0	26.0	-2.0	100	71	48	95	
B-12	33	93	94.0	26.0	7.0	99				
B-13	26	100	96.9	25.4	0.6	103				
B-14	27	107	90.9	26.4	0.6	118	76	53	97	
B-15	28	98	96.9	25.4	2.6	101				
B-17	32	92	90.9	26.4	5.6	101	80	55	98	
B-18	25	99	96.9	25.4	-0.4	102				
B-19	28	102	96.9	25.4	2.6	105				
B-20	30	94	94.0	26.0	4.0	100				
B-22	31	92	94.0	26.0	5.0	98				
B-23	22	100	96.9	25.4	-3.4	103				
B-24	34	87	90.9	26.4	7.6	96				
B-25	27	93	94.0	26.0	1.0	99				
B-27	31	90	94.0	26.0	5.0	96				
B-28	32	90	94.0	26.0	6.0	96				
B-29	29	95	94.0	26.0	3.0	101	74	51	97	
B-30	21	101	96.9	25.4	-4.4	104				$1.5X10^{-8}$
B-31	29	97	96.9	25.4	3.6	100				
B-32	24	97	96.9	25.4	-2.4	100				
B-33	28	97	96.9	25.4	2.6	100	68	45	95	
B-34	34	88	88.8	26.7	7.3	99				
B-35	31	98	96.9	25.4	5.6	101				
B-36	35	85	88.8	26.7	8.3	96				
B-37	19	104	107.4	15.4	3.6	97				
B-38	34	91	88.8	26.7	7.3	102				
B-39	32	89	90.9	26.4	5.6	98	76	48	99	
B-40	24	101	96.9	25.4	-1.4	104				
B-41	26	97	96.9	25.4	0.6	100				
B-42	32	97	96.9	25.4	6.6	100				
B-43	37	84	88.8	26.7	10.3	95				
B-44	30	93	94.0	26.0	4.0	99				
B-45	35	88	88.8	26.7	8.3	99				

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

TABLE 1
MONSTANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT A (0'-0.5' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Platicity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-46	28	94	94.0	26.0	2.0	100	74	48	94	
B-47	30	90	94.0	26.0	4.0	96	76	36	72	
B-48	29	80	88.8	26.7	2.3	90				
B-49	29	94	90.9	26.4	2.6	103	79	56	96	
B-50	26	96	96.9	25.4	0.6	99				
B-52	19	98	96.9	25.4	-6.4	101				
B-53	33	91	94.0	26.0	7.0	97				
B-54	35	77	88.8	26.7	8.3	88				
B-55	35	90	94.0	26.0	9.0	96				
B-57	29	88	88.8	26.7	2.3	99				
B-58	36	86	88.8	26.7	9.3	97				
B-59	29	91	94.0	26.0	3.0	97				
B-61	32	90	94.0	26.0	6.0	96				
B-62	28	95	94.0	26.0	2.0	101				

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

TABLE 1
MONSTANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT B (0.5'-1.0' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Platicity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-7	22	86	88.8	26.7	-4.7	97				
B-8	19	105	94.0	26.0	-7.0	112	69	47	96	
B-9	34	88	90.9	26.4	7.6	97				$2.4X10^{-8}$
B-10	23	106	94.0	26.0	-3.0	113				
B-12	322	102	90.9	26.4	-4.4	112	73	50	97	
B-13	21	108	96.9	25.4	-4.4	111				
B-14	20	111	96.9	25.4	-5.4	114	76	53	97	
B-15	35	88	90.9	26.4	8.6	97				
B-17	33	92	94.0	26.0	7.0	98	80	55	98	
B-18	23	101	94.0	26.0	-3.0	107				
B-19	21	100	90.9	26.4	-5.4	110	73	50	90	
B-20	23	92	94.0	26.0	-3.0	98				
B-22	21	104	88.8	26.7	-5.7	117	94	67	97	
B-23	24	98	94.0	26.0	-2.0	104				
B-24	32	85	88.8	26.7	5.3	96				
B-25	28	76	88.8	26.7	1.3	86.				
B-27	30	94	94.0	26.0	4.0	100				
B-28	28	97	90.9	26.4	1.6	107	80	55	98	
B-29	31	86	88.8	26.7	4.3	97				
B-30	27	101	94.0	26.0	1.0	107				
B-31	22	104	94.0	26.0	-4.0	111				
B-32	27	96	96.9	25.4	1.6	99				
B-33	27	101	94.0	26.0	1.0	107	68	45	95	
B-34	21	99	94.0	26.0	-5.0	105				
B-35	20	108	107.4	15.4	4.6	101				
B-36	19	105	107.2	16.2	2.8	98				
B-37	19	104	107.4	15.4	3.6	97				
B-38	22	103	94.0	26.0	-4.0	110	66	44	98	
B-39	31	89	94.0	26.0	5.0	95				
B-40	23	104	94.0	26.0	-3.0	111	73	48	98	
B-41	21	103	107.4	15.4	5.6	96				
B-42	27	103	107.4	15.4	11.6	96				
B-43	22	98	94.0	26.0	-4.0	102				
B-44	28	92	94.0	26.0	2.0	98				
B-45	28	99	94.0	26.0	2.0	105	72	49	91	

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed

TABLE 1
MONSTANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT B (0.5'-1.0' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Platicity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-46	27	93	94.0	26.0	1.0	99				
B-47	20	99	88.8	26.7	-6.7	100				
B-48	38	70	88.8	26.7	11.3	79				
B-49	29	90	94.0	26.0	3.0	96				
B-50	28	95	90.9	26.4	1.6	105	77	53	98	
B-52	28	91	88.8	26.7	1.3	102	90	64	97	
B-53	34	88	90.9	26.4	7.6	97				
B-54	32	95	94.0	26.0	6.0	101				
B-55	31	94	94.0	26.0	5.0	100	72	50	97	
B-57	23	102	107.2	16.2	6.8	95				
B-58	37	84	88.8	26.7	10.3	95	89	60	90	
B-59	28	98	96.9	25.4	2.6	101	77	54	97	
B-61	33	86	88.8	26.7	6.3	97				
B-62	27	91	90.9	26.4	0.6	100	74	51	98	

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

TABLE 1
MONSTANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT C (1.0'-1.5' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Platicity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-7	32	89	90.9	26.4	5.6	98	79	52	96	
B-6	25	100	96.9	25.4	-0.4	103				
B-9	31	90	90.9	26.4	4.6	99				
B-10	32	94	96.9	25.4	6.6	97				
B-12	292	95	96.9	25.4	3.6	98				
B-13	35	92	96.9	25.4	9.6	95				
B-14	39	83	88.8	26.7	12.3	93				
B-15	32	84	90.9	26.5	5.5	92	78	54	96	
B-17	23	96	96.9	25.4	-2.4	99				
B-16	25	98	88.8	26.7	-1.7	110	87	61	89	
B-19	26	99	96.9	25.4	0.6	102				
B-20	32	91	90.9	26.4	5.6	100				
B-22	37	85	88.8	26.7	10.3	96				
B-23	32	90	88.8	26.7	5.3	101				
B-24	27	94	94.0	26.0	1.0	100				
B-25	32	89	88.8	26.7	5.3	100				
B-27	22	89	88.8	26.7	-4.7	111	87	59	97	
B-28	32	91	90.9	26.4	5.6	100				
B-29	33	87	90.9	26.4	6.6	96	76	51	98	
B-30	28	93	94.0	26.0	2.0	99				
B-31	38	84	88.8	26.7	11.3	95				
B-33	34	88	88.8	26.7	7.3	99				
B-34	34	85	88.8	26.7	7.3	96				
B-35	32	92	94.0	26.0	6.0	98				
B-37	27	94	94.0	26.0	1.0	100				$2.4X10^{-8}$
B-38	30	95	94.0	26.0	4.0	101	71	49	91	
B-39	35	84	88.8	26.7	8.3	95				
B-40	29	91	90.9	26.4	2.6	100				
B-41	31	91	90.9	26.4	4.6	100	83	59	94	
B-42	31	92	90.9	26.4	4.6	101				
B-43	36	82	88.8	26.7	9.3	92				
B-45	37	90	90.9	26.4	10.6	99	86	61	97	
B-46	28	96	94.0	26.0	2.0	102				
B-47	35	84	88.8	26.7	8.3	95	69	16	71	
B-48	36	75	88.8	26.7	9.3	84				

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed

TABLE 1
MONSTANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT C (1.0'-1.5' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Platicity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-49	26	96	96.9	25.4	0.6	99				
B-50	29	91	90.9	26.4	2.6	100				
B-52	30	91	90.9	26.4	3.6	100	77	53	96	
B-55	15	109	107.4	15.4	-0.4	101				
B-57	39	76	88.8	26.7	12.3	86				
B-61	32	84	88.8	26.7	5.3	95				
B-62	36	84	88.8	26.7	9.3	95	79	15	52	

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

TABLE 1
MONSTANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT D (1.5'-2.0' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Platicity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-7	33	88	88.8	26.7	6.3	99				
B-8	29	95	94.0	26.0	3.0	101	65	41	97	
B-9	26	93	94.0	26.0	0.0	99				
B-10	29	96	94.0	26.0	3.0	102	75	51	97	
B-12	28	100	96.9	25.4	2.6	103				
B-13	27	94	94.0	26.0	1.0	100				
B-14	39	83	88.8	26.7	12.3	93				
B-15	32	93	94.0	26.0	6.0	99				
B-17	25	105	107.2	15.4	9.6	98	48	15	83	
B-18	26	104	107.2	15.4	10.6	97				
B-19	24	104	107.2	15.4	8.6	97				
B-20	30	99	96.9	25.4	4.6	102				
B-22	34	80	88.8	26.7	7.3	90				
B-23	28	90	88.8	26.7	1.3	101				
B-24	26	98	90.9	26.4	-0.4	108	81	56	95	
B-25	31	90	94.0	26.0	5.0	96				
B-27	36	90	94.0	26.0	10.0	96				
B-28	33	89	88.8	26.7	6.3	100				
B-29	34	93	94.0	26.0	8.0	99				
B-30	26	96	96.9	25.4	0.6	99				
B-31	37	82	88.8	26.7	10.3	92				
B-33	34	89	94.0	26.0	8.0	95	73	50	95	
B-34	28	95	94.0	26.0	2.0	101				
B-35	26	96	90.9	26.4	-0.4	106	81	55	91	
B-37	33	91	94.0	26.0	7.0	97				
B-38	21	106	107.2	16.2	4.8	99				
B-39	25	89	94.0	26.0	-1.0	95				
B-40	19	94	94.0	26.0	-7.0	100	70	49	98	
B-41	27	93	94.0	26.0	1.0	99				
B-42	27	95	94.0	26.0	1.0	101	72	49	98	
B-43	38	84	88.8	26.7	11.3	95				
B-45	35	85	88.8	26.7	8.3	96				
B-46	31	108	107.4	15.4	15.6	101				
B-47	33	97	94.0	26.0	7.0	103				
B-48	32	79	88.8	26.7	5.3	89	87	63	98	

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

TABLE 1
MONSTANTO LANDFILL
INTERIM COMPACTED CLAY COVER
LIFT D (1.5'-2.0' DEPTH)

Sample Test Number	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Platicity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity K cm/sec
B-49	25	100	94.0	26.0	-1.0	106	71	45	90	
B-50	18	107	107.2	16.2	2.8	100	72	48	96	
B-52	28	92	94.0	26.0	2.0	98				
B-55	13	108	96.9	25.4	12.4	111	58	39	90	
B-57	42	71	88.8	26.7	15.3	80				
B-61	47	69	88.8	26.7	20.3	78				$>1X10^{-7}$
B-62	46	64	88.8	26.7	19.3	72				

Actual tested intervals of samples within lifts may vary. Correlation of depth interval and lift number is assumed.

TABLE 2
TOP OF WASTE ELEVATION

Boring Number	Surface Elevation	Depth to Waste	Elevation Top of Waste
1	106.86	3.5	103.4
2	107.74	3.5	104.2
3	108.28	3.6	104.7
4	107.27	3.6	103.7
5	107.99	3.6	104.4
6	108.09	3.5	104.6
7	109.50	4.0	105.5
8	110.21	5.4	104.8
9	108.96	4.1	104.9
10	107.78	3.6	104.2
11	108.07	4.0	104.1
12	110.34	4.0	106.3
13	111.04	5.2	105.8
14	109.11	4.0	105.1
15	107.86	3.6	104.3
16	108.12	3.5	104.6
17	110.61	4.0	106.6
18	111.40	5.0	106.4
19	109.48	4.0	105.5
20	108.16	3.9	104.3
21	108.04	3.5	104.5
22	110.99	4.1	106.9
23	111.96	5.0	107.0
24	109.87	4.0	105.9
25	108.26	3.6	104.7
26	108.77	3.5	105.3
27	111.15	4.0	107.2
28	111.99	4.0	108.0
29	109.96	5.0	105.0

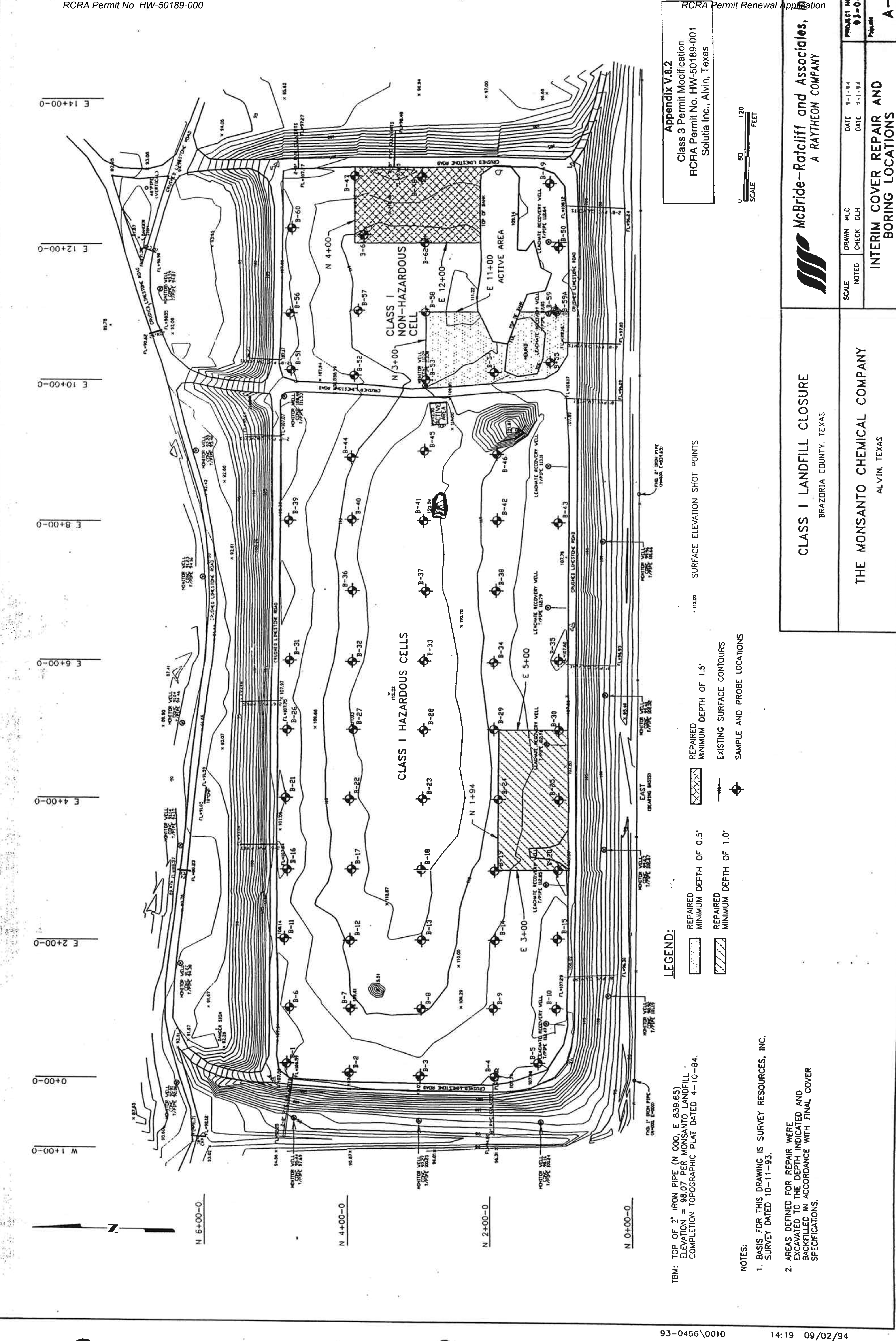
TABLE 2
TOP OF WASTE ELEVATION

Boring Number	Surface Elevation	Depth to Waste	Elevation Top of Waste
30	108.42	3.6	104.8
31	108.74	3.6	105.1
32	110.80	1.4	109.4
33	112.16	5.0	107.2
34	109.56	4.2	105.4
35	108.16	3.5	104.7
36	110.74	1.0	109.7
37	111.67	5.0	106.7
38	109.61	4.0	105.6
39	108.37	3.0	105.4
40	110.83	4.0	106.8
41	111.56	3.5	108.0
42	110.40	4.2	106.2
43	107.84	3.5	104.3
44	109.91	1.0	108.9
45	111.71	5.0	106.7
46	109.96	4.2	105.8
47	108.47	3.5	105.0
48	108.54	3.6	104.9
49	108.29	3.5	104.8
50	108.32	3.6	104.7
51	107.48	2.8	104.7
52	109.57	3.5	106.1
53	110.32	1.0	109.3
54	109.29	1.0	108.3
55	108.20	3.5	104.7
56	107.99	3.0	105.0
57	110.36	4.0	106.4
58	110.95	5.0	106.0

Appendix V.6.2

TABLE 2
TOP OF WASTE ELEVATION

Boring Number	Surface Elevation	Depth to Waste	Elevation Top of Waste
59	108.39	3.5	104.9
60	108.18	3.7	104.5
61	110.56	4.1	106.5
62	110.80	5.0	105.8


Appendix V.8.2
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas
CLASS I NON-HAZARDOUS CELL
ACTIVE AREA
CLASS I HAZARDOUS CELLS
LEGEND:
REPAIRED MINIMUM DEPTH OF 0.5'
REPAIRED MINIMUM DEPTH OF 1.0'
REPAIRED MINIMUM DEPTH OF 1.5'
EXISTING SURFACE CONTOURS
SAMPLE AND PROBE LOCATIONS
SURFACE ELEVATION SHOT POINTS
TBM: TOP OF 2" IRON PIPE (N 000, E 839.65)
ELEVATION = 98.07 PER MONSANTO LANDFILL
COMPLETION TOPOGRAPHIC PLAT DATED 4-10-84.
NOTES:
1. BASIS FOR THIS DRAWING IS SURVEY RESOURCES, INC. SURVEY DATED 10-11-93.
2. AREAS DEFINED FOR REPAIR WERE EXCAVATED TO THE DEPTH INDICATED AND BACKFILLED IN ACCORDANCE WITH FINAL COVER SPECIFICATIONS.
CLASS I LANDFILL CLOSURE
BRAZORIA COUNTY, TEXAS
THE MONSANTO CHEMICAL COMPANY
ALVIN, TEXAS
McBride-Ratcliff and Associates, Inc.
A RAYTHEON COMPANY
INTERIM COVER REPAIR AND BORING LOCATIONS
SCALE NOTED
DRAWN HLC
CHECK DLH
DATE 9-1-94
DATE 9-1-94
PROJECT NO 93-0466
A-1
93-0466\0010
14:19 09/02/94

APPENDIX B

FINAL CLAY COVER

Appendix V.8.2

**MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA**

Sample Test Number	Date 1994	Grid Location		Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
		E	N													
17	1-27	1+35	3+70	1	33.5	83.9	88.4	29.1	+4.4	94.9					F	
17R	2-2	1+35	3+70	1	30.6	87.4	88.4	29.1	+1.5	98.8					P	
18	1-27	1+65	4+50	1	32.3	83.2	88.4	29.1	+3.2	94.1					F	
18R	2-2	1+65	4+50	1	29.9	89.4	88.4	29.1	+0.8	100+	101	76	98	4.6 x 10^{9}	P	Sample
19	1-27	0+50	4+30	1	24.1	83.4	88.4	29.1	+5.0	94.3					F	
19R	2-2	0+50	4+30	1	32.7	83.8	88.4	29.1	+3.6	94.8					F	
20	1-27	0+25	3+75	1	33.8	82.2	88.4	29.1	+4.7	93.0					F	
20R	2-1	0+25	3+75	1	30.9	87.3	88.4	29.1	+1.8	98.7					P	
21	2-1	2+45	5+00	1	30.8	87.4	88.4	29.1	+1.7	98.8					P	
22	2-1	2+55	4+00	1	31.0	87.8	88.4	29.1	+1.9	99.3					P	
23	2-2	1+85	2+35	1	33.6	83.6	88.4	29.1	+4.5	94.5					F	
24	2-2	0+25	2+50	1	32.8	86.8	88.4	29.1	+3.7	98.2					P	
25	2-2	0+70	1+60	1	31.2	87.7	88.4	29.1	+2.1	99.2	91	63	98	5.5 x 10^{9}	P	Sample
26	2-2	1+80	1+35	1	33.0	84.0	88.4	29.1	+3.9	95.0					P	
27	2-2	2+45	1+65	1	30.9	87.3	88.4	29.1	+1.8	98.7					P	
28	2-2	2+40	2+50	1	31.1	87.4	88.4	29.1	+2.0	98.8					P	
29	2-2	2+10	3+10	1	31.7	84.8	88.4	29.1	+2.6	95.9				9.2 x 10^{9}	P	Sa
30	2-2	0+50	4+30	1	30.2	86.3	88.4	29.1	+1.1	97.6					P	
111	2-21	3+55	4+30	1	31.0	87.4	88.4	29.1	+1.9	98.8				4.6 x 10^{9}	P	Sa
112	2-21	3+30	3+50	1	29.7	89.1	88.4	29.1	+0.6	100+					P	
113	2-21	4+25	3+45	1	29.8	88.0	88.4	29.1	+0.7	99.5					P	
114	2-21	4+30	4+80	1	31.8	87.2	88.4	29.1	+2.7	98.6					P	
115	2-22	3+60	2+40	1	29.3	88.5	88.4	29.1	+0.2	100+					P	
116	2-22	3+60	1+40	1	32.0	86.5	88.4	29.1	+2.9	97.8					P	Sa

Appendix V.6.2
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location		Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
		E	N													
117	2-22	3+00	1+30	1	28.3	91.3	94.7	24.6	+3.7	96.4	72	49	98	4.6×10^{8}	P	Sample
		3+00	1+30											2.3×10^{8}		
118	2-22	4+65	2+60	1	27.1	91.2	94.7	24.6	+2.5	96.3					P	
119	2-22	4+60	1+40	1	26.8	92.8	94.7	24.6	+2.2	98.0				2.2×10^{8}	P	Sample
		4+60	1+40											2.2×10^{8}		
120	2-22	5+90	4+20	1	25.2	94.8	94.7	24.6	+0.6	100+					P	
121	2-24	5+50	3+50	1	27.1	92.8	94.7	24.6	+2.5	98.0				2.3×10^{8}	P	Sample
122	2-24	6+60	3+45	1	25.0	94.5	94.7	24.6	+0.4	99.7					P	
123	2-24	6+40	4+75	1	25.9	93.9	94.7	24.6	+1.3	99.1				4.7×10^{8}	P	Sample
124	2-24	6+45	2+20	1	25.1	95.6	94.7	24.6	+0.5	100+					P	
125	2-24	6+25	1+10	1	24.9	94.0	94.7	24.6	+0.3	99.2	90	62	98	4.5×10^{8}	P	Sample
126	2-24	5+50	1+80	1	27.8	92.7	94.7	24.6	+3.2	97.9				4.5×10^{8}	P	Sample
127	2-24	5+50	2+40	1	28.1	91.5	94.7	24.6	+3.5	96.6					P	
240	3-12	9+65	4+70	1	27.7	91.5	94.7	24.6	+3.1	96.6	84	60	98		P	Sample
241	3-12	9+45	3+30	1	25.7	93.6	94.7	24.6	+1.1	98.8					P	
242	3-12	8+80	3+80	1	27.5	91.6	94.7	24.6	+2.9	96.7					P	Sample
243	3-12	8+40	4+50	1	27.3	91.9	94.7	24.6	+2.7	97.0					P	
244	3-12	7+45	4+30	1	26.2	93.3	94.7	24.6	+1.6	98.5					P	
245	3-12	6+75	4+00	1	26.5	93.2	94.7	24.6	+1.9	98.4					P	
246	3-12	7+80	3+35	1	27.6	92.9	94.7	24.6	+3.0	98.1	81	57	99		P	Sam
247	3-13	8+15	2+65	1	26.3	93.0	94.7	24.6	+1.7	98.2					P	
248	3-13	9+45	1+50	1	27.6	93.4	94.7	24.6	+3.0	98.6				2.3×10^{8}	P	Sam
249	3-13	8+40	0+95	1	27.3	91.3	94.7	24.6	+2.7	96.4					P	
250	3-13	7+90	1+90	1	27.4	92.6	94.7	24.6	+2.8	97.7					P	
251	3-13	7+00	1+35	1	27.4	91.8	94.7	24.6	+2.8	96.9				2.4×10^{8}	P	Sam
252	3-13	7+00	2+50	1	26.0	94.3	94.7	24.6	+1.4	99.5					P	
253	3-13	7+50	2+65	1	27.2	93.2	94.7	24.6	+2.6	98.4					P	
254	3-13	8+40	2+65	1	26.6	93.9	94.7	24.6	+2.0	99.1					P	Sam

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
343	4-7	12+00	3+60	1	27.0	95.0	96.0	24.3	+2.7	98.9					P	
344	4-7	11+00	3+50	1	29.8	89.0	88.4	29.1	+0.7	100+				4.8×10^{-9}	P	Sample
345	4-7	9+90	3+65	1	30.1	90.1	88.4	29.1	+1.0	100+					P	
346	4-7	10+30	4+80	1	30.5	88.2	88.4	29.1	+1.4	99.7				2.3×10^{-9}	P	Sample
347	4-8	11+75	4+80	1	29.0	88.4	88.4	29.1	-0.1	100+					F	
347R	4-8	11+75	4+80	1	30.2	87.2	88.4	29.1	+1.1	98.6					P	
348	4-8	12+70	4+70	1	28.4	90.8	94.7	24.6	+3.8	95.8					P	Sample
349	4-8	11+00	3+00	1	27.0	92.8	94.7	24.6	+2.4	98.0					P	
350	4-8	12+10	1+90	1	24.2	95.2	94.7	24.6	-0.4	100+					F	
350R	4-8	12+10	1+90	1	26.0	93.4	94.7	24.6	+1.4	98.8				2.4×10^{-9}	P	Sample
351	4-8	10+20	2+55	1	26.6	93.5	94.7	24.6	+2.0	98.7	96	68	98	2.4×10^{-9}	P	Sample
352	4-9	9+85	1+20	1	25.0	97.0	94.7	24.6	+0.4	100+					P	
353	4-9	10+60	1+60	1	25.2	94.0	94.7	24.6	+0.6	99.2					P	
354	4-9	12+50	1+45	1	25.0	95.0	94.7	24.6	+0.4	100+	88	60	97	2.3×10^{-9}	P	Sample
355	4-9	12+70	2+35	1	27.7	90.9	94.7	24.6	+3.1	95.9					P	

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
31	2-7	0+40	3+30	2	31.6	85.2	88.4	29.1	+2.5	96.3				4.6×10^{-8}	P	Sample
32	2-7	0+25	4+85	2	30.1	83.4	88.4	29.1	+1.0	94.3					F	
32R	2-7	0+25	4+85	2	30.4	88.2	88.4	29.1	+1.3	99.7					P	
33	2-7	0+80	4+40	2	29.4	86.5	88.4	29.1	+0.3	97.8	89	62	98	2.3×10^{-8}	P	Sample
34	2-7	1+50	4+65	2	30.1	87.0	88.4	29.1	+1.0	98.4				3.6×10^{-8}	P	Sample
35	2-7	2+60	4+70	2	30.3	85.4	88.4	29.1	+1.2	96.6	94	66	98	2.2×10^{-8}	P	Sample
36	2-8	1+90	3+50	2	32.4	85.9	88.4	29.1	+3.3	97.1					P	
37	2-8	2+45	2+60	2	32.9	85.5	88.4	29.1	+3.8	96.7					P	
38	2-8	0+85	2+55	2	33.6	85.4	88.4	29.1	+4.5	96.6					P	
39	2-8	1+50	2+00	2	31.8	84.5	88.4	29.1	+2.7	85.5				4.6×10^{-8}	P	Sample
40	2-8	1+00	1+40	2	32.9	85.2	88.4	29.1	+3.8	96.4					P	
41	2-8	0+40	1+40	2	31.7	84.6	88.4	29.1	+2.6	95.7	90	61	96	4.5×10^{-8}	P	Sample
42	2-8	2+00	1+30	2	31.9	87.5	88.4	29.1	+2.8	98.9					P	
128	2-24	2+85	1+90	2	26.1	91.8	96.4	24.2	+1.9	95.2					P	
129	2-24	3+90	1+40	2	26.0	92.3	96.4	24.2	+1.8	95.7				2.2×10^{-8}	P	Sample
130	2-24	4+20	2+20	2	25.9	94.1	96.4	24.2	+1.7	97.6					P	
131	2-24	4+65	1+50	2	25.4	93.9	96.4	24.2	+1.2	97.4					P	Sample
132	2-24	4+80	3+00	2	27.2	93.3	96.4	24.2	+3.0	96.8					P	
133	2-24	3+55	2+70	2	25.3	94.0	96.4	24.2	+1.1	97.5				2.3×10^{-8}	P	
	4-4	3+55	2+70	2										2.3×10^{-8}	P	
134	2-24	4+00	2+60	2	24.8	93.7	96.4	24.2	+0.6	97.2					P	
135	2-25	4+35	4+70	2	26.7	92.3	96.4	24.2	+2.5	95.7					P	
136	2-25	5+05	3+40	2	25.6	97.1	96.4	24.2	+1.4	100+					P	
137	2-25	2+90	4+00	2	26.9	95.7	96.4	24.2	+2.7	99.2				6.0×10^{-8}	P	
138	2-25	5+00	3+95	2	26.5	95.2	96.4	24.2	+2.3	98.7					P	
139	2-25	5+25	4+45	2	24.5	97.6	96.4	24.2	+0.3	100+				2.3×10^{-8}	P	
140	2-25	6+25	4+55	2	26.1	96.4	96.4	24.2	+1.9	100					P	
141	2-25	6+40	3+20	2	25.1	97.0	96.4	24.2	+0.9	100+					P	

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SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location		Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
		E	N													
142	2-25	5+50	3+55	2	26.5	95.9	96.4	24.2	+2.3	99.5					P	
143	2-25	6+50	2+50	2	25.2	97.0	96.4	24.2	+1.0	100+					P	
144	2-25	6+20	1+80	2	24.6	97.6	96.4	24.2	+0.4	100+				4.5 X 10^{-9}	P	Sample
145	2-25	5+45	0+90	2	24.4	98.0	96.4	24.2	+0.2	100+					P	
255	3-13	9+70	4+70	2	27.4	91.9	94.7	24.6	+2.8	97.0				4.5 x 10^{-9}	P	Sample
256	3-13	9+00	4+00	2	25.6	95.1	94.7	24.6	+1.0	100+					P	
257	3-13	8+00	3+75	2	27.5	92.9	94.7	24.6	+2.9	98.1	88	62	98	2.3 x 10^{-9}	P	Sample
258	3-13	7+10	3+70	2	26.6	93.0	94.7	24.6	+2.0	98.2					P	
259	3-13	6+5	4+40	2	25.7	93.5	94.7	24.6	+1.1	98.7					P	
260	3-13	7+45	4+80	2	27.2	92.2	94.7	24.6	+2.6	97.3					P	
261	3-13	8+60	4+75	2	26.5	92.2	94.7	24.6	+1.9	97.3				2.1 x 10^{-9}	P	Sample
262	3-13	9+60	3+25	2	27.7	93.4	94.7	24.6	+3.1	98.6	87	63	97	2.2 x 10^{-9}	P	Sample
263	3-14	9+15	2+55	2	27.5	91.2	94.7	24.6	+2.9	96.3					P	
264	3-14	8+30	2+55	2	27.7	92.9	94.7	24.6	+3.1	98.1				2.2 x 10^{-9}	P	Sample
265	3-14	7+25	2+85	2	26.7	93.6	94.7	24.6	+2.1	98.8					P	
281	3-20	9+60	1+40	2	30.8	88.0	88.4	29.1	+1.7	99.5					P	
282	3-20	8+40	1+75	2	30.3	88.1	88.4	29.1	+1.2	99.6					P	
283	3-20	7+15	1+90	2	31.0	88.5	88.4	29.1	+1.9	100+				2.3 x 10^{-9}	P	Sa[illegible]
284	3-20	6+90	0+95	2	29.3	89.3	88.4	29.1	+0.2	100+					P	
370	4-14	10+00	4+35	2	28.5	92.0	94.7	24.6	+3.9	97.1	110	84	97	4.2 x 10^{-9}	P	S
371	4-14	10+90	4+80	2	27.6	90.0	94.7	24.6	+3.0	95.0					P	
372	4-14	11+05	3+65	2	29.3	88.7	94.7	24.6	+4.7	93.6					F	
373	4-14	11+55	3+65	2	25.5	93.7	94.7	24.6	+1.1	98.9				2.2 x 10^{-9}	P	S
374	4-14	12+00	4+35	2	27.7	91.9	94.7	24.6	+3.1	97.0					P	
375	4-14	12+80	4+40	2	27.3	93.1	94.7	24.6	+2.7	98.3				4.4 x 10^{-9}	P	S
376	4-14	11+05	3+65	2	27.2	90.8	94.7	24.6	+2.6	95.8					P	

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SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
425	4-25	10+10	3+05	2	27.7	90.3	94.7	24.6	+3.1	95.3					P	Sample
426	4-25	11+20	3+30	2	29.0	91.2	94.7	24.6	+4.4	96.3					P	
427	4-25	12+35	3+00	2	24.7	96.1	94.7	24.6	+0.1	100+					P	
428	4-25	13+05	2+85	2	28.0	91.5	94.7	24.6	+3.4	96.6	99	71	99	4.4×10^{-9}	P	Sample
429	4-25	12+00	2+30	2	28.0	96.4	94.7	24.6	+1.4	100+					P	
430	4-25	10+70	2+35	2	28.0	93.7	94.7	24.6	+3.4	98.9					P	
439	4-26	9+90	1+40	2	25.2	95.9	94.7	24.6	+0.6	100+					P	
440	4-26	10+50	1+00	2	26.6	90.6	94.7	24.6	+2.0	95.6					P	
441	4-26	11+25	1+50	2	27.5	93.3	94.7	24.6	+2.9	98.5	91	74	98	4.4×10^{-9}	P	Sample
442	4-26	12+00	1+15	2	29.3	91.9	94.7	24.6	+4.7	97.0					P	
443	4-26	12+85	1+75	2	28.2	92.3	94.7	24.6	+3.5	97.4					P	

Appendix V.8.2
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

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SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
43	2-9	2+05	3+30	3	27.4	90.6	94.7	24.6	+2.8	95.6				4.6 x 10^{8}	P	Sampe
44	2-9	0+50	3+30	3	29.6	87.9	94.7	24.6	+5.0	92.8					F	
45	2-9	0+20	4+70	3	28.8	90.8	94.7	24.6	+4.2	95.8					P	
46	2-9	1+20	4+40	3	28.3	90.9	94.7	24.6	+3.7	95.9	78	55	96	2.3 x 10^{8}	P	Sample
47	2-9	1+65	5+00	3	28.7	90.1	94.7	24.6	+4.1	95.1					P	
48	2-9	2+50	4+15	3	27.9	91.2	94.7	24.6	+3.3	96.3					P	
49	2-14	0+50	3+30	3	28.2	90.3	94.7	24.6	+3.6	95.3					P	
50	2-14	0+45	2+40	3	30.6	88.6	94.7	24.6	+6.0	93.5					F	
51	2-14	1+85	2+70	3	25.3	93.6	96.0	24.3	+1.0	97.5					P	
52	2-14	1+05	1+90	3	27.6	91.0	94.7	24.6	+3.0	96.0					P	
53	2-14	0+35	1+35	3	29.6	90.4	94.7	24.6	+5.0	95.4					P	
54	2-14	2+40	1+40	3	28.7	91.7	94.7	24.6	+4.1	96.8	97	67	98	4.4 x 10^{9}	P	Sample
55	2-14	0+45	2+40	3	27.5	91.7	94.7	24.6	+2.9	96.8	82	58	98	1.6 x 10^{9}	P	Sample
146	2-25	2+85	0+95	3	26.0	93.3	96.4	24.2	+1.8	96.8					P	
147	2-25	3+80	1+50	3	26.5	93.3	96.4	24.2	+2.3	96.8					P	
148	2-25	3+20	2+20	3	24.8	95.4	96.4	24.2	+0.6	98.9				2.3 x 10^{9}	P	Sample
149	3-28	3+20	2+20	3										2.4 x 10^{9}	P	
150	2-25	3+50	3+50	3	27.5	92.0	96.4	24.2	+3.3	95.4					P	
151	2-25	3+75	3+75	3	25.9	94.2	96.4	24.2	+1.7	97.7				4.6 x 10^{9}	P	
152	2-26	4+55	1+65	3	25.9	93.5	96.4	24.2	+1.7	97.0					P	
153	2-26	5+30	1+30	3	25.1	94.2	96.4	24.2	+0.9	97.7				2.2 x 10^{9}	P	
154	2-26	6+20	1+60	3	24.8	94.5	96.4	24.2	+0.6	98.0					P	
155	2-26	6+50	2+70	3	26.6	93.5	96.4	24.2	+2.4	97.0					P	
156	2-26	5+15	2+55	3	28.8	92.5	96.4	24.2	+4.6	95.9				4.6 x 10^{9}	P	
	3-23	5+15	2+55	3										2.4 x 10^{6}	P	
157	2-26	4+15	2+85	3	27.1	93.3	96.4	24.2	+2.9	96.8					P	
158	2-26	6+35	4+00	3	28.3	92.2	96.4	24.2	+4.1	95.6					P	

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SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location		Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
		E	N													
159	2-26	5+30	4+70	3	27.3	93.0	96.4	24.2	+3.1	96.4				2.3 x 10[illegible]	P	Sample
160	2-26	4+30	4+60	3	25.8	95.0	96.4	24.2	+1.6	98.5					P	
161	2-26	3+40	4+85	3	25.3	95.0	96.4	24.2	+1.1	98.5					P	
162	2-26	2+90	4+25	3	26.7	95.7	96.4	24.2	+2.5	99.2					P	
163	2-26	4+35	3+75	3	24.5	97.1	96.4	24.2	+0.3	100+	99	72	98	2.3 x 10[illegible]	P	Sample
164	2-26	5+40	3+50	3	25.4	96.7	96.4	24.2	+1.2	100+					P	
278	3-19	9+75	4+50	3	26.6	93.5	94.7	24.6	+2.0	98.7					P	
279	3-19	8+55	4+80	3	27.5	91.3	94.7	246	+2.9	96.4				2.2 x 10[illegible]	P	
280	3-19	7+35	4+45	3	26.5	92.6	94.7	24.6	+1.9	97.7					P	
285	3-20	7+00	3+30	3	24.6	95.7	94.7	24.6	+0.0	100+				4.4 x 10[illegible]	P	
286	3-20	8+00	3+75	3	26.5	94.7	94.7	24.6	+1.9	100+					P	
287	3-20	8+75	3+05	3	26.0	93.5	94.7	24.6	+1.4	98.7					P	
288	3-20	9+40	3+40	3	26.3	93.7	94.7	24.6	+1.7	98.9					P	
293	3-21	8+50	2+50	3	27.3	93.5	94.7	24.6	+2.7	98.7	85	58	97	2.2 x 10[illegible]	P	
294	3-21	9+55	2+30	3	26.1	93.8	94.7	24.6	+1.5	99.0					P	
295	3-21	9+50	1+25	3	27.8	92.5	94.7	24.6	+3.2	97.6	87	58	98	2.2 x 10[illegible]	P	
296	3-21	8+65	1+00	3	29.4	88.7	94.7	24.6	+4.8	93.6					F	
297	3-21	7+95	1+75	3	30.1	89.3	94.7	24.6	+5.5	94.3					F	
298	3-21	8+65	1+00	3	25.1	95.2	94.7	24.6	+0.5	100+					P	
299	3-21	7+95	1+75	3	26.2	93.6	94.7	24.6	+1.6	98.8					P	
300	3-21	6+85	1+40	3	27.5	93.1	94.7	24.6	+2.9	98.3				4.5 x 10[illegible]	P	
301	3-21	6+70	2+60	3	25.8	93.9	94.7	24.6	+1.2	99.1					P	
302	3-21	7+55	2+60	3	27.2	92.7	94.7	24.6	+2.6	97.8					P	
388	4-19	10+15	4+55	3	27.5	91.9	94.7	24.6	+2.9	97.0					P	
389	4-19	11+20	4+95	3	26.0	94.5	94.7	24.6	+1.4	99.7	96	67	99	2.3 x 10[illegible]	P	
390	4-19	11+00	3+60	3	27.9	90.7	94.7	24.6	+3.3	95.8					P	

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SUMMARY OF FIELD & LABORATORY TEST DATA

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400	4-19	12+05	3+40	3	26.3	91.0	94.7	24.6	+1.7	96.0	94	65	98	2.3 x 10^{9}	P	
401	4-19	13+00	4+80	3	26.9	91.1	94.7	24.6	+2.3	96.1					P	
449	4-28	11+85	3+00	3	26.1	90.5	94.7	24.6	+1.5	95.5					P	
450	4-28	11+00	3+15	3	26.0	92.8	96.0	24.3	+1.7	96.6				4.3 X 10^{9}	P	
451	4-28	10+30	2+30	3	28.4	92.9	94.7	24.6	+3.8	98.1					P	
452	4-28	12+70	2+80	3	26.6	93.8	94.7	24.6	+2.0	99.0					P	
453	4-28	10+20	2+00	3	30.3	86.5	94.7	24.6	+5.7	91.3					F	
454	4-28	11+00	1+90	3	25.5	96.5	96.0	24.3	+1.2	100+				4.2 X 10^{9}	P	
455	4-28	11+80	1+75	3	26.1	94.8	94.7	24.6	+1.5	100+					P	
456	4-28	13+00	0+95	3	25.2	93.0	94.7	24.6	+0.6	98.2				2.2 X 10^{9}	P	
457	4-28	11+50	1+00	3	27.3	92.2	94.7	24.6	+2.7	97.3					P	
458	4-28	10+25	1+10	3	25.6	94.9	94.7	24.6	+1.0	100+					P	
459	4-28	10+20	2+00	3	27.2	90.7	94.7	24.6	+2.6	95.7					P	

MONSANTO LANDFILL
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SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/Fail	Remarks
56	2-16	0+50	4+75	4	30.8	86.9	88.4	29.1	+1.7	98.4	94	69	98	4.7 x 10^{-8}	P	
57	2-16	1+95	5+00	4	32.6	86.0	88.4	29.1	+3.5	97.3					P	
58	2-16	2+50	4+50	4	27.5	91.3	96.0	24.3	+3.2	95.1					P	
59	2-16	1+75	3+80	4	26.3	89.9	94.7	24.6	+1.7	94.9					F	
60	2-16	0+00	3+20	4	27.5	92.4	96.0	24.3	+3.2	96.2					P	
61	2-16	2+15	3+05	4	28.5	90.7	94.7	24.6	+3.9	95.7					P	
62	2-16	1+75	3+80	4	26.3	91.0	94.7	24.6	+1.7	96.0				2.3 x 10^{-8}	P	
63	2-16	2+60	3+35	4	27.4	91.6	96.0	24.3	+3.1	05.4					P	
64	2-16	0+60	2+55	4	25.3	94.0	96.0	24.3	+1.0	97.9				4.6x10^{-9}	P	
65	2-16	1+55	2+20	4	24.6	94.2	96.0	24.3	+0.3	98.1					P	
66	2-16	2+60	1+60	4	26.7	92.4	96.0	24.3	+2.4	96.2				4.7 x 10^{-8}	P	
67	2-16	1+35	1+50	4	26.1	94.1	96.0	24.3	+1.8	98.0	84	60	98	2.2 x 10^{-8}	P	
68	2-16	0+70	1+65	4	26.8	92.2	96.0	24.3	+2.5	96.0					P	
165	2-27	3+30	1+30	4	25.8	96.1	94.7	24.6	+1.5	100+					P	
166	2-27	3+60	2+60	4	24.9	97.3	94.7	24.6	+0.3	100+					P	
167	2-27	4+50	2+50	4	25.0	94.9	94.7	24.6	+0.4	100+				2.4 x 10^{-9}	P	
168	2-27	4+65	0+95	4	24.8	95.1	94.7	24.6	+0.2	100+					P	
169	2-27	6+30	1+40	4	25.5	93.6	94.7	24.6	+0.9	98.8				2.3 x 10^{-9}	P	
170	2-27	5+75	2+00	4	29.2	88.4	88.4	29.1	+0.1	100					P	
171	2-27	6+35	2+75	4	32.4	84.0	88.4	29.1	+3.3	95.0					P	
172	2-28	2+80	3+00	4	29.7	86.3	88.4	29.1	+0.6	97.6					P	
173	2-28	3+15	4+55	4	30.0	86.4	88.4	29.1	+0.9	97.7				2.7 x 10^{-8}	P	
174	2-28	3+15	4+55	4	30.0	86.4	88.4	29.1	+0.9	97.7				4.4 x 10^{-9}	P	
175	2-28	4+45	3+35	4	31.3	85.1	88.4	29.1	+2.2	96.2					P	
176	2-28	3+65	3+50	4	31.2	85.5	88.4	29.1	+2.1	96.7					P	
177	2-28	4+45	3+35	4	31.3	85.1	88.4	29.1	+2.2	96.2					P	

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
178	2-28	5+00	3+95	4	30.9	85.5	88.4	29.1	+1.8	96.7					P	
179	2-28	4+70	4+60	4	32.4	84.4	88.4	29.1	+3.3	95.4				2.2 x 10^[illegible]	P	
180	2-28	4+70	4+60	4	32.4	84.4	88.4	29.1	+303	95.4				2.2 x 10^[illegible]	P	
181	2-28	5+35	5+05	4	30.3	86.0	88.4	29.1	+1.2	97.2					P	
182	2-28	5+75	4+25	4	32.5	85.5	88.4	29.1	+3.4	96.7					P	
183	2-28	6+45	4+45	4	32.0	85.0	88.4	29.1	+2.9	96.1					P	
184	2-28	6+40	3+55	4	30.5	90.6	88.4	29.1	+1.4	100+	71	49	98	2.3 x 10^[illegible]	P	
185	2-28	5+60	3+30	4	29.5	91.4	88.4	29.1	+0.4	100+					P	
217	3-7	6+20	1+00	4	28.0	93.1	94.7	24.6	+3.4	98.3					P	
218	3-7	5+30	2+65	4	27.1	92.0	94.7	24.6	+2.5	97.1					P	
303	3-22	9+30	3+70	4	27.5	93.2	94.7	24.6	+2.5	98.4					P	
304	3-22	8+55	3+35	4	26.9	93.1	94.7	24.6	+2.3	98.3				4.5 x 10^[illegible]	P	
305	3-22	7+50	3+70	4	30.0	88.8	94.7	24.6	+5.4	93.7					F	
306	3-22	6+90	4+70	4	29.6	89.4	94.7	24.6	+5.0	94.4					F	
307	3-22	7+65	4+60	4	29.1	89.3	94.7	24.6	+4.5	94.3					F	
308	3-22	8+40	4+25	4	29.9	88.8	94.7	24.6	+5.3	93.7					F	
309	3-22	9+95	4+10	4	32.5	86.3	88.4	29.1	+3.4	97.7					P	
310	3-22	10+65	3+65	4	29.7	89.3	88.4	29.1	+0.6	100+					P	
311	3-22	11+25	4+35	4	30.1	88.2	88.4	29.1	+1.0	99.8	104	75	97	2.2 x 10^[illegible]	P	
312	3-22	10+30	4+80	4	30.3	88.2	88.4	29.1	+1.2	99.8					P	
331	3-29	9+75	2+85	4	26.7	92.5	94.7	24.6	+2.1	97.6				2.2 x 10^[illegible]	P	
332	3-29	9+15	1+45	4	25.4	94.2	94.7	24.6	+0.8	99.4					P	
333	3-29	8+15	1+90	4	26.3	92.4	94.7	24.6	+1.7	97.5				4.5 x 10^[illegible]	P	
334	3-29	7+20	1+10	4	26.3	92.6	94.7	24.6	+1.7	97.7					P	
335	3-29	6+80	2+45	4	25.4	93.8	94.7	24.6	+0.8	99.0				4.5 x 10^[illegible]	P	
336	3-29	7+35	2+95	4	25.0	94.0	94.7	24.6	+0.4	99.2					P	
337	3-29	8+55	2+70	4	25.8	93.1	94.7	24.6	+1.2	98.3					P	

Appendix V.6.2
RCRA Permit Renewal Application

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
338	4-5	6+90	4+70	4	26.6	93.3	94.7	24.6	+2.0	98.5					P	
339	4-5	7+50	3+70	4	25.0	94.9	94.7	24.6	+0.4	100+					P	
340	4-5	8+40	4+25	4	27.3	93.3	94.7	24.6	+2.7	98.5					P	
341	4-5	7+65	4+60	4	25.3	93.0	94.7	24.6	+0.7	98.2					P	
342	4-5	9+35	4+90	4	27.8	91.6	94.7	24.6	+3.2	96.7	93	64	98	9.5×10^{-9}	P	
422	4-24	11+85	3+70	4	29.4	89.3	88.4	29.1	+0.3	100+					P	
423	4-24	13+00	4+15	4	29.9	88.8	88.4	29.1	+0.8	100+	96	78	97	4.3×10^{-9}	P	
424	4-24	12+20	4+95	4	29.1	91.0	88.4	29.1	+0.0	100+					P	
470	5-5	10+25	3+25	4	28.4	90.5	94.7	24.6	+3.8	95.5				2.2×10^{-9}	P	
471	5-5	11+00	2+70	4	28.4	91.6	94.7	24.6	+3.8	96.7					P	
472	5-5	11+60	3+00	4	27.3	92.1	94.7	24.6	+2.7	97.2					P	
473	5-6	12+65	3+30	4	30.1	88.2	88.4	29.1	+1.0	99.7				4.4×10^{-9}	P	
474	5-6	12+70	2+30	4	30.8	87.9	88.4	29.1	+1.7	99.5					P	
475	5-7	11+45	2+00	4	28.4	90.8	94.7	24.6	+3.8	95.8	104	74	99	2.2×10^{-9}	P	
476	5-7	12+50	1+60	4	29.0	90.1	94.7	24.6	+4.2	95.1					P	
486	5-9	10+30	0+95	4	25.5	93.9	94.7	246	+0.9	99.2					P	
487	5-9	12+00	1+15	4	25.5	94.8	94.7	24.6	+0.9	100+					P	

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location		Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
		E	N													
69	2-17	0+00	4+70	5	25.4	94.1	96.0	24.3	+10.1	98.0					P	
70	2-17	2+00	4+80	5	25.8	94.4	96.0	24.3	+1.5	98.3	73	47	98	4.4×10^{-8}	P	
71	2-17	2+00	4+80	5	25.8	94.4	96.0	24.3	+1.5	95.7				4.5×10^{-8}	P	
72	2-17	1+50	3+75	5	26.7	90.6	94.7	24.6	+2.0	95.7					P	
73	2-17	2+60	4+10	5	26.7	91.1	94.7	24.6	+2.1	96.1					P	
74	2-17	2+10	3+25	5	27.0	90.9	94.7	24.6	+2.8	95.9					P	
75	2-17	0+60	3+40	5	27.9	90.1	94.7	24.6	+3.3	95.1					P	
76	2-17	1+60	2+70	5	26.8	90.9	94.7	24.6	+2.2	95.9					P	
77	2-17	2+35	2+50	5	26.7	92.0	94.7	24.6	+2.1	97.1	86	49	100	2.2×10^{-8}	P	
78	2-17	2+35	2+50	5	26.7	92.0	94.7	24.6	+2.1	97.1				4.5×10^{-8}	P	
79	2-17	0+35	2+35	5	27.4	88.2	94.7	24.6	+2.8	93.1					P	
80	2-17	0+35	2+35	5	27.3	90.3	94.7	24.6	+2.7	95.3					P	
81	2-18	0+45	1+00	5	27.1	92.2	94.7	24.6	+2.5	97.3					P	
82	2-18	1+50	1+70	5	27.6	91.0	94.7	24.6	+3.0	96.0					P	
83	2-18	2+55	1+30	5	27.9	91.3	94.7	24.6	+3.3	96.4					P	
186	2-28	6+50	1+05	5	29.7	91.0	88.4	29.1	+0.6	100+					P	
187	2-28	5+75	1+65	5	29.4	91.3	88.4	29.1	+0.3	100+					P	
188	2-28	6+05	2+65	5	29.3	87.4	88.4	29.1	+0.2	98.8				4.5×10^{-8}	P	
189	2-28	6+45	3+30	5	31.5	85.1	88.4	29.1	+2.1	96.2					P	
190	2-28	5+40	3+50	5	32.8	85.0	88.4	29.1	+3.9	96.1					P	
191	2-28	5+00	3+10	5	30.9	85.9	88.4	29.1	+1.8	97.1	93	66	98	4.5×10^{-8}	P	
192	2-28	6+00	4+00	5	31.0	86.2	88.4	29.1	+1.9	97.5					P	
193	2-28	6+25	4+80	5	30.0	86.9	88.4	29.1	+0.9	98.3					P	
194	3-1	5+30	4+60	5	30.2	86.8	88.4	29.1	+1.1	98.2					P	
195	3-1	4+25	4+40	5	24.4	95.1	94.7	24.6	-0.2	100+					F	
196	3-1	2+80	4+70	5	25.7	94.1	94.7	24.6	+1.1	99.3				4.8×10^{-8}	P	

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
197	3-1	3+80	4+10	5	27.2	92.0	94.7	24.6	+2.6	97.1					P	
198	3-1	3+80	3+50	5	26.1	93.2	94.7	24.6	+1.5	98.4					P	
203	3-5	2+75	2+20	5	26.4	93.3	94.7	24.6	+1.8	98.5					P	
204	3-5	3+60	2+60	5	25.9	93.7	94.7	24.6	+1.3	98.9					P	
205	3-5	3+50	1+50	5	26.1	93.9	94.7	24.6	+1.5	99.1	84	60	97	4.6×10^{9}	P	
206	3-5	4+55	1+65	5	28.1	92.5	94.7	24.6	+3.5	97.6					P	
207	3-5	4+25	4+40	5	26.1	94.3	94.7	24.6	+1.5	99.5					P	
208	3-5	4+55	2+50	5	26.7	93.7	94.7	24.6	+2.1	98.9					P	
219	3-7	5+15	2+55	5	27.0	91.6	94.7	24.6	+2.4	96.7					P	
220	3-7	5+35	1+10	5	26.7	92.7	94.7	24.6	+2.1	97.8	90	63	97	4.6×10^{9}	P	
356	4-10	9+75	2+85	5	30.6	87.3	88.4	29.1	+1.5	98.7					P	
357	4-10	6+80	2+55	5	30.8	85.6	88.4	29.1	+1.7	96.8					P	
358	4-10	7+35	2+75	5	30.0	91.5	88.4	29.1	+0.9	100+					P	
359	4-10	6+50	2+00	5	25.1	97.4	94.7	24.6	+0.5	100+					P	
360	4-10	8+90	1+50	5	32.4	85.3	88.4	29.1	+3.3	96.5					P	
361	4-10	8+00	1+50	5	25.2	94.8	94.7	24.6	+0.6	100+	99	69	98	9.5×10^{9}	P	
362	4-10	7+00	1+20	5	27.8	91.8	94.7	24.6	+3.2	96.9				2.2×10^{9}	P	
363	4-11	6+50	4+70	5	24.8	96.5	94.7	24.6	+0.2	100+					P	
364	4-11	9+45	4+90	5	26.6	92.0	94.7	24.6	+2.0	97.1	99	68	98	4.5×10^{9}	P	
365	4-11	9+70	3+90	5	27.7	90.3	94.7	24.6	+3.1	95.3					P	
366	4-11	8+65	3+70	5	30.2	87.6	88.4	29.1	+1.1	99.1				2.3×10^{9}	P	
367	4-11	7+00	4+00	5	24.9	96.8	94.7	24.6	+0.3	100+					P	
368	4-11	6+75	3+40	5	28.2	92.6	94.7	24.6	+3.6	97.7				2.2×10^{9}	P	
369	4-11	8+00	3+40	5	28.5	91.8	94.7	24.6	+3.9	96.9					P	
402	4-19	9+00	3+05	5	27.4	91.6	94.7	24.6	+2.8	96.6					P	
403	4-19	7+00	3+00	5	26.6	92.8	94.7	24.6	+2.0	98.0					P	

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location		Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
		E	N													
444	4-27	9+80	4+50	5	30.8	85.4	88.4	29.1	+1.7	96.6				2.2×10^{-9}	P	
445	4-27	10+65	4+85	5	27.3	92.0	94.7	24.6	+2.7	97.1					P	
446	4-27	11+50	4+90	5	25.1	93.4	94.7	24.6	+0.5	98.6	102	75	98	4.5×10^{-9}	P	
447	4-27	10+90	3+75	5	30.5	87.5	88.4	29.1	+1.4	99.3					P	
448	4-27	10+00	3+70	5	31.3	85.1	88.4	29.1	+2.2	96.2					P	
449	4-27	11+85	3+90	5	27.4	91.0	94.7	24.6	+2.8	96.0					P	
476	5-7	12+80	3+65	5	28.3	90.3	94.7	24.6	+3.7	95.0				4.4×10^{-9}	P	
477	5-7	10+60	3+00	5	26.1	90.2	94.7	24.6	+1.5	95.2					P	
478	5-7	10+15	2+80	5	27.2	91.8	94.7	24.6	+2.6	96.9	103	75	98	2.1×10^{-9}	P	
480	5-8	11+65	3+20	5	26.6	93.4	94.7	24.6	+2.0	98.6	102	72	98	2.2×10^{-9}	P	
481	5-8	11+15	2+50	5	26.2	91.1	94.7	24.6	+1.6	96.1					P	
482	5-8	10+70	1+50	5	29.9	84.0	88.4	29.1	+0.8	95.0					P	
483	5-8	11+15	1+70	5	30.9	87.9	88.4	29.1	+1.8	99.4					P	
484	5-8	9+80	1+00	5	28.3	90.3	94.7	24.6	+3.7	95.3					P	
488	5-9	12+00	1+85	5	26.7	94.2	94.7	24.6	+2.1	99.4	96	78	98	4.6×10^{-9}	P	
489	5-9	12+90	1+15	5	26.6	92.4	94.7	24.6	+2.0	97.5					P	

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
84	2-18	1+55	1+70	6	28.0	91.2	94.7	24.6	+1.4	96.3					P	
85	2-18	1+60	2+60	6	27.5	91.4	94.7	24.6	+2.9	96.5	92	64	98	4.6×10^{-8}	P	
86	2-19	1+60	2+60	6	27.5	91.4	94.7	24.6	+2.9	96.5				4.5×10^{-8}	P	
87	2-19	2+00	2+80	6	26.2	93.0	94.7	24.6	+1.6	98.2					P	
88	2-19	2+35	3+75	6	25.7	93.9	94.7	24.6	+1.1	99.1					P	
89	2-19	2+70	4+35	6	25.8	93.7	94.7	24.6	+1.2	98.9					P	
90	2-19	2+70	4+35	6	25.8	93.7	94.7	24.6	+1.2	98.9	86	60	98	4.5×10^{-8}	P	
91	2-19	1+20	4+80	6	25.6	94.3	94.7	24.6	+1.0	99.5				4.3×10^{-8}	P	
209	3-6	6+55	1+05	6	28.9	90.7	94.7	24.6	+4.3	95.7					P	
210	3-6	6+00	1+80	6	27.8	91.6	94.7	24.6	+3.2	96.7	90	64	98	4.5×10^{-8}	P	
211	3-6	6+35	2+75	6	27.6	91.2	94.7	24.6	+3.0	96.3					P	
212	3-6	5+55	3+35	6	26.6	94.4	94.7	24.6	+2.0	99.7					P	
213	3-6	6+20	3+45	6	26.9	93.9	94.7	24.6	+2.3	99.1				2.2×10^{-8}	P	
214	3-6	6+30	4+80	6	29.7	88.9	94.7	24.6	+5.1	93.9					F	
215	3-6	6+30	4+80	6	27.3	91.2	94.7	24.6	+2.7	96.3					P	
216	3-6	5+55	4+05	6	29.2	87.2	94.7	24.6	+4.6	92.1					F	
221	3-8	4+70	3+70	6	30.1	86.5	94.7	24.6	+5.5	91.3					F	
222	3-8	4+45	4+45	6	29.1	87.7	94.7	24.6	+4.5	92.6					F	
223	3-8	3+25	4+30	6	25.2	96.0	94.7	24.6	+0.6	100+					P	
224	3-8	5+55	4+05	6	27.2	93.9	94.7	24.6	+2.6	99.1					P	
225	3-8	4+70	3+70	6	25.1	95.7	94.7	24.6	+0.5	100+					P	
226	3-8	4+45	4+45	6	25.6	94.3	94.7	24.6	+1.0	99.6	94	64	98	4.4×10^{-8}	P	
227	3-8	3+20	3+70	6	24.6	95.0	94.7	24.6	+0.0	100+				2.2×10^{-8}	P	
266	3-19	4+50	4+45	6	24.8	95.7	94.7	24.6	+0.2	100+					P	
267	3-19	3+50	3+65	6	27.5	95.9	94.7	24.6	+2.9	100+					P	
268	3-19	2+80	2+95	6	24.8	96.6	94.7	24.6	+0.2	100+				4.6×10^{-9}	P	

Appendix V.6.2

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location		Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
		E	N													
269	3-19	4+00	1+40	6	27.0	92.9	94.7	24.6	+2.4	98.1					P	
270	3-19	5+20	2+45	6	26.0	93.8	94.7	24.6	+1.4	99.0				4.5×10^{8}	P	
271	3-19	4+90	1+70	6	28.1	90.9	94.7	24.6	+3.5	96.0					P	
377	4-14	7+25	1+65	6	28.4	91.2	94.7	24.6	+3.8	96.2					P	
378	4-14	8+20	1+25	6	26.8	93.1	94.7	24.6	+2.2	98.3	97	71	98	4.3×10^{8}	P	
379	4-14	9+50	2+10	6	26.1	92.6	94.7	24.6	+1.5	97.8					P	
380	4-15	8+95	2+50	6	30.1	90.5	94.7	24.6	+5.5	95.5					P	
381	4-15	8+05	2+25	6	28.0	91.8	94.7	24.6	+3.4	96.9					P	
382	4-15	7+05	2+45	6	28.3	91.1	94.7	24.6	+3.7	96.2				2.2×10^{8}	P	
383	4-15	7+10	4+50	6	25.3	93.5	94.7	24.6	+0.7	98.7					P	
384	4-15	8+00	4+00	6	28.7	90.6	94.7	24.6	+4.1	95.6					P	
385	4-15	8+90	4+00	6	27.9	91.4	94.7	24.6	+3.3	96.4	92	65	98	2.3×10^{8}	P	
386	4-15	9+45	4+75	6	27.8	91.6	94.7	24.6	+3.2	96.7					P	
387	4-15	7+90	4+95	6	28.6	90.8	94.7	24.6	+4.0	95.8					P	
404	4-19	7+15	3+00	6	32.1	84.0	94.7	24.6	+7.5	88.7					F	
405	4-19	8+05	2+90	6	24.6	96.4	94.7	24.6	+0.0	100+					P	
406	4-19	9+20	2+80	6	26.7	90.5	94.7	24.6	+2.1	95.5					P	
407	4-20	7+15	3+00	6	28.3	91.9	94.7	24.6	+3.7	97.0					P	
408	4-20	6+65	3+70	6	27.4	90.3	94.7	24.6	+2.8	95.3					P	
409	4-20	7+75	3+40	6	27.8	92.6	94.7	24.6	+3.2	97.8	97	71	98	2.1×10^{8}	P	
410	4-20	9+30	3+55	6	30.1	88.4	94.7	24.6	+5.5	93.3					F	
411	4-20	9+30	3+55	6	27.8	90.7	94.7	24.6	+5.5	95.7					P	
460	4-29	11+10	3+65	6	28.7	90.5	94.7	24.6	+4.1	95.5	99	73	99	4.5×10^{8}	P	
461	4-29	11+00	4+80	6	27.2	92.1	94.7	24.6	+2.6	97.2					P	
462	4-29	10+05	3+30	6	25.8	96.2	94.7	24.6	+1.2	100+					P	
463	4-29	10+15	4+85	6	27.6	91.0	94.7	24.6	+3.0	98.1	98	72	99	4.3×10^{8}	P	

Appendix V.6.2
RCRA Permit Renewal Application

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location		Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
		E	N													
464	4-29	11 + 85	4 + 70	6	28.5	90.6	94.7	24.6	+ 3.9	95.7					P	
465	4-29	12 + 95	4 + 40	6	28.4	92.6	94.7	24.6	+ 3.8	97.7					P	
466	4-29	12 + 35	3 + 70	6	34.2	83.6	94.7	24.6	+ 5.1	94.5					F	
467	4-29	12 + 35	3 + 70	6	32.0	84.8	94.7	24.6	+ 2.9	95.9					P	
490	5-9	9 + 95	2 + 05	6	28.3	91.0	94.7	24.6	+ 3.7	96.1					P	
491	5-9	10 + 10	1 + 85	6	26.3	92.9	94.7	24.6	+ 1.7	98.0	93	66	98	2.2×10^{-9}	P	
492	5-9	10 + 25	3 + 05	6	27.0	92.5	94.7	24.6	+ 2.4	97.6					P	
493	5-11	11 + 30	2 + 95	6	29.6	88.4	94.7	24.6	+ 0.5	100 +					P	
494	5-11	11 + 45	1 + 75	6	25.8	93.7	94.7	24.6	+ 1.2	98.9					P	
495	5-11	10 + 80	2 + 80	6	26.2	92.4	94.7	24.6	+ 1.6	97.5					P	
496	5-11	12 + 95	1 + 90	6	27.9	90.1	94.7	24.6	+ 3.3	95.1	100	74	98	4.4×10^{-9}	P	
497	5-11	12 + 60	3 + 25	6	25.5	94.2	94.7	24.6	+ 0.9	99.4				2.2×10^{-9}	P	
498	5-11	12 + 55	2 + 45	6	26.4	93.1	94.7	24.6	+ 1.8	98.3						

Appendix V.6.2
RCRA Permit Renewal Application

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
100	2-20	1+20	3+30	7	26.0	93.1	94.7	24.6	+1.4	98.3	91	64	99	4.5 x 10^{5}	P	
101	2-20	1+20	3+30	7	26.0	93.1	94.7	24.6	+1.4	98.3				4.7 X 10^{8}		
102	2-20	2+20	4+00	7	27.5	90.9	94.7	24.6	+2.9	95.9					P	
103	2-20	2+45	3+80	7	25.1	95.2	94.7	24.6	+0.5	100+					P	
104	2-21	0+70	2+30	7	26.1	94.8	94.7	24.6	+1.5	100+	91	64	99	2.6 x 10^{8}	P	
105	2-21	2+00	2+20	7	27.8	90.2	94.7	24.6	+3.2	95.2					P	
106	2-21	1+80	1+20	7	25.4	92.3	94.7	24.6	+0.8	97.4	88	60	98	4.5 x 10^{9}	P	
272	3-19	4+50	2+65	7	29.5	88.7	88.4	29.1	+0.4	100+					P	
273	3-19	4+45	3+70	7	30.4	89.2	88.4	29.1	+1.3	100+				4.5 x 10^{8}	P	
274	3-19	5+85	3+40	7	31.5	88.1	88.4	29.1	+2.4	99.6					P	
275	3-19	6+00	2+70	7	30.5	88.2	88.4	29.1	+1.4	99.8					P	
276	3-19	2+45	3+80	7	30.2	88.8	88.4	29.1	+1.1	100+	88	63	99	4.5 x 10^{9}	P	
277	3-19	3+40	2+55	7	30.3	88.0	88.4	29.1	+1.2	99.5					P	
412	4-20	8+80	2+55	7	31.6	85.2	88.4	29.1	+2.5	96.3	107	80	98	4.3 x 10^{9}	P	
413	4-20	7+70	3+00	7	31.1	86.8	88.4	29.1	+2.0	98.2					P	
414	4-20	9+40	2+65	7	30.3	87.9	88.4	29.1	+1.2	99.4					P	
415	4-21	6+60	3+40	7	29.8	91.5	88.4	29.1	+0.7	100+					P	
416	4-21	8+00	3+55	7	24.5	97.3	96.4	24.2	+0.3	100+				4.4 x 10^{8}	P	
431	4-25	7+65	1+20	7	29.6	89.0	88.4	29.1	+0.5	100+	104	77	99	4.4 x 10^{5}	P	
432	4-25	6+70	1+10	7	29.9	90.0	88.4	29.1	+0.8	100+					P	
433	4-25	7+25	5+00	7	32.0	86.9	88.4	29.1	+2.9	98.4	92	63	98	4.5 x 10^{8}	P	
434	4-25	8+60	4+80	7	28.4	92.6	94.7	24.6	+3.8	97.8					P	
435	4-25	9+75	4+35	7	27.7	92.8	94.7	24.6	+3.1	98.0	96	72	98	1.9 x 10^{8}	P	
436	4-25	9+40	3+80	7	30.3	87.0	88.4	29.1	+1.2	98.9					P	
437	4-25	8+40	4+05	7	30.8	87.3	88.4	29.1	+1.7	98.7					P	
438	4-25	6+85	4+30	7	26.8	92.0	94.7	24.6	+2.2	97.1					P	

MONSANTO LANDFILL
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SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
479	5-7	10+00	3+65	7	25.3	91.7	94.7	24.6	+0.7	96.7	92	63	99	2.2×10^{-8}	P	
485	5-8	11+55	3+60	7	32.2	85.2	88.4	24.6	+3.1	96.4					P	
489	5-11	10+80	2+80	7	26.6	92.8	94.7	24.6	+2.0	97.9					P	
500	5-13	10+75	1+75	7	26.9	93.4	94.7	24.6	+2.3	98.5					P	
502	5-20	10+60	4+40	7	26.0	91.3	94.7	24.6	+1.4	96.4					P	
503	5-20	11+50	4+70	7	26.3	92.3	94.7	24.6	+1.7	97.4	93	66	98	4.2×10^{-8}	P	

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SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
199	3-1	1+10	2+40	8	26.7	93.8	94.7	24.6	+2.1	99.0	75	51	98	5.1×10^{-9}	P	
200	3-1	2+35	2+25	8	25.6	94.6	94.7	24.6	+1.0	99.9					P	
201	3-1	2+20	3+45	8	25.6	94.1	94.7	24.6	+1.0	99.3	91	65	98	4.6×10^{-9}	P	
202	3-1	2+00	4+05	8	27.8	91.9	94.7	24.6	+3.2	97.0					P	
290	3-20	4+80	2+60	8	27.5	93.3	94.7	24.6	+2.9	98.5				2.3×10^{-9}	P	
291	3-20	6+00	3+20	8	28.4	92.6	94.7	24.6	+3.8	97.8					P	
292	3-20	3+70	3+25	8	26.0	94.3	94.7	24.6	+1.4	99.5				2.2×10^{-9}	P	
417	4-21	9+40	3+15	8	29.7	87.2	88.4	29.1	+0.6	98.7					P	
418	4-21	8+35	3+00	8	30.3	88.1	88.4	29.1	+1.2	99.7	91	75	99	4.4×10^{-9}	P	
419	4-21	6+85	3+25	8	29.7	88.5	88.4	29.1	+0.6	100+					P	
420	4-21	8+50	3+80	8	28.7	92.1	94.7	24.6	+4.1	97.2	95	67	98	2.2×10^{-9}	P	
421	4-21	9+80	4+25	8	29.1	90.6	94.7	24.6	+4.5	95.6					P	
501	5-13	10+40	3+10	8	26.0	95.1	94.7	24.6	+1.4	100+					P	
504	5-20	11+10	3+25	8	28.5	92.4	94.7	24.6	+3.9	97.5	94	65	98	4.3×10^{-9}	P	
505	5-20	9+90	4+70	8	28.6	93.5	94.7	24.6	+4.0	98.7	93	66	98	4.4×10^{-9}	P	

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location		Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
		E	N													
313	3-22			9	27.5	92.7	94.7	24.6	+2.9	97.9					P	
314	3-22			9	26.6	91.3	94.7	24.6	+2.0	96.4					P	
468	4-29	8+85	3+20	9	27.4	90.7	94.7	24.6	+2.8	95.7					P	
469	4-29	6+90	3+35	9	28.1	91.3	94.7	24.6	+3.5	96.4					P	
506	5-20	10+00	3+05	9	30.1	89.0	88.4	29.1	+1.0	100+	105	76	98	2.2×10^{8}	P	
507	5-20	10+80	3+40	9	28.1	91.3	94.7	24.6	+3.5	96.4					P	
508	5-21	9+90	3+40	10	27.9	90.8	94.7	24.6	+3.3	95.8	112	85	99	2.2×10^{8}	P	
509	5-21	11+05	3+25	10	26.0	90.5	94.7	24.6	+1.4	95.5					P	
510	5-23	9+90	3+30	11	30.2	87.3	88.4	29.1	+1.1	98.7	98	70	98	$2.1 + 10^{8}$	P	

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
1	1-22	4+75	1+20	A	28.1	91.8	94.7	24.6	+3.5	96.9					P	
2	1-22	3+60	1+40	A	28.2	91.3	94.7	24.6	+3.6	96.4	92	67	97	4.5X10-9	P	
11	1-27	4+60	1+40	B	25.0	95.5	94.7	24.6	+0.4	100+					P	
12	1-27	3+40	1+10	B	27.5	93.3	94.7	24.6	+2.9	98.5	86	61	98		P	
323	3-24	12+35	3+80	A	26.4	92.8	94.7	24.6	+1.8	98.0				2.2X10-9	P	
324	3-24	12+50	2+45	A	27.1	91.4	94.7	24.6	+2.5	96.5					P	
325	3-24	12+40	3+60	B	24.8	95.0	94.7	24.6	+0.2	100+	94	64	98	2.3X10-9	P	
326	3-24	12+75	2+65	B	26.5	93.5	94.7	24.6	+1.9	98.7					P	
327	3-26	12+80	3+00	C	25.6	94.3	94.7	24.6	+0.9	99.5					P	
328	3-26	12+10	3+80	C	27.3	90.2	94.7	24.6	+2.7	95.2					P	
329	3-26	10+40	1+40	A	27.7	92.2	94.7	24.6	+3.1	97.3	90	64	97	4.4X10-9	P	
330	3-26	10+45	2+70	A	2.49	93.9	94.7	24.6	+0.3	99.1					P	

MONSANTO LANDFILL
CLOSURE CAP
SUMMARY OF FIELD & LABORATORY TEST DATA

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		E	N													
3	1-25	0+70	4+35	IC	28.9	92.6	96.4	24.2	+4.7	96.0					P	
4	1-25	0+25	3+50	IC	28.1	91.6	96.4	24.2	+3.9	95.0					P	
5	1-25	1+45	3+10	IC	26.8	93.1	96.4	24.2	+2.6	96.5					P	
6	1-25	1+60	4+80	IC	27.0	91.7	96.4	24.2	+2.8	95.7					P	
7	1-25	2+20	4+60	IC	24.2	98.2	96.4	24.2	+.00	100+					P	
8	1-25	2+50	3+75	IC	24.4	94.8	96.4	24.2	+0.2	98.3					P	
9	1-25	0+55	1+40	IC	25.2	92.3	96.4	24.2	+1.0	95.7					P	
10	1-25	1+35	2+65	IC	24.5	95.5	96.4	24.2	+0.3	99.0					P	
13	1-27	2+70	2+50	IC	25.9	93.4	96.4	24.2	+1.7	96.9					P	
14	1-27	2+40	1+10	IC	24.9	91.6	96.4	24.2	+0.7	95.0					P	
15	1-27	1+65	1+60	IC	24.3	93.5	96.4	24.2	+0.1	97.0					P	
16	1-27	0+45	1+35	IC	25.4	93.8	96.4	24.2	+1.2	97.3					P	
92	2-19	3+25	4+90	IC	25.8	93.7	96.4	24.2	+1.6	97.2					P	
93	2-19	3+55	3+75	IC	26.3	93.6	96.4	24.2	+2.1	97.1					P	
94	2-19	3+10	2+35	IC	24.4	97.2	96.4	24.2	+0.2	100+					P	
95	2-20	4+65	2+25	IC	24.9	95.8	96.4	24.2	+0.7	99.3					P	
96	2-20	4+75	3+65	IC	28.5	91.9	96.4	24.2	+4.3	95.3					P	
97	2-20	4+25	4+80	IC	27.6	91.9	96.4	24.2	+3.4	95.3					P	
98	2-20	5+50	1+30	IC	27.9	93.0	96.4	24.2	+3.7	96.4					P	
99	2-20	6+75	1+65	IC	24.5	96.4	96.4	24.2	+0.3	100					P	
107	2-21	5+45	2+10	IC	24.6	97.1	96.4	24.2	+0.4	100+					P	
108	2-21	6+20	2+45	IC	26.4	93.1	96.4	24.2	+2.2	96.5					P	
109	2-21	5+65	3+50	IC	25.6	92.5	96.4	24.2	+1.4	96.0					P	
110	2-21	5+35	4+80	IC	26.1	93.2	96.4	24.2	+1.9	96.7					P	

MONSANTO LANDFILL
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SUMMARY OF FIELD & LABORATORY TEST DATA

Sample Test Number	Date 1994	Grid Location E	Grid Location N	Lift No.	Moisture Content %	Dry Density pcf	Maximum Dry Density pcf	Optimum Moisture Content %	% Moisture Above Optimum	% Compaction	Liquid Limit %	Plasticity Index %	% Passing No. 200 Sieve	Hydraulic Conductivity k cm/sec	Pass/ Fail	Remarks
111	2-21	6+70	4+60	IC	27.5	92.6	96.4	24.2	+3.3	96.1					P	
112	2-21	6+80	3+45	IC	24.9	92.4	96.4	24.2	+0.7	95.8					P	
228	3-11	7+70	4+40	IC	27.1	94.0	96.4	24.2	+2.9	97.5					P	
229	3-11	7+40	3+10	IC	28.3	92.7	96.4	24.2	+4.1	96.1					P	
230	3-11	8+50	3+50	IC	27.3	93.8	96.4	24.2	+3.1	97.3					P	
231	3-11	9+15	3+10	IC	26.9	93.7	96.4	24.2	+2.7	97.2					P	
232	3-11	9+45	4+05	IC	27.2	93.3	96.4	24.2	+3.0	96.8					P	
233	3-11	8+50	4+90	IC	27.1	92.8	96.4	24.2	+2.9	96.2					P	
234	3-12	7+75	2+45	IC	26.5	93.4	96.4	24.2	+2.3	96.9					P	
235	3-12	8+60	2+60	IC	24.7	95.6	96.4	24.2	+0.5	99.2					P	
236	3-12	8+30	1+40	IC	28.2	92.6	96.4	24.2	+4.0	96.0					P	
237	3-12	7+30	1+30	IC	29.0	91.7	96.4	24.2	+4.8	95.1					P	
238	3-12	9+50	1+05	IC	26.9	93.5	96.4	24.2	+2.7	97.0					P	
239	3-12	9+80	2+15	IC	28.1	92.9	96.4	24.2	+3.9	96.3					P	
315	3-23	10+65	4+55	IC	27.7	93.9	96.4	24.2	+3.5	97.4					P	
316	3-23	10+40	3+60	IC	25.6	95.4	96.4	24.2	+1.4	98.9					P	
317	3-23	11+55	4+50	IC	26.7	93.9	96.4	24.2	+2.5	97.4					P	
318	3-23	12+50	4+80	IC	28.6	92.9	96.4	24.2	+4.4	96.3					P	
319	3-23	11+80	3+55	IC	26.5	94.5	96.4	24.2	+2.3	98.0					P	
320	3-24	11+40	2+60	IC	27.6	91.6	96.4	24.2	+3.4	95.0					P	
321	3-24	11+55	1+55	IC	25.7	93.2	96.4	24.2	+1.5	96.6					P	
322	3-24	12+40	1+50	IC	26.2	92.5	96.4	24.2	+2.0	95.9						

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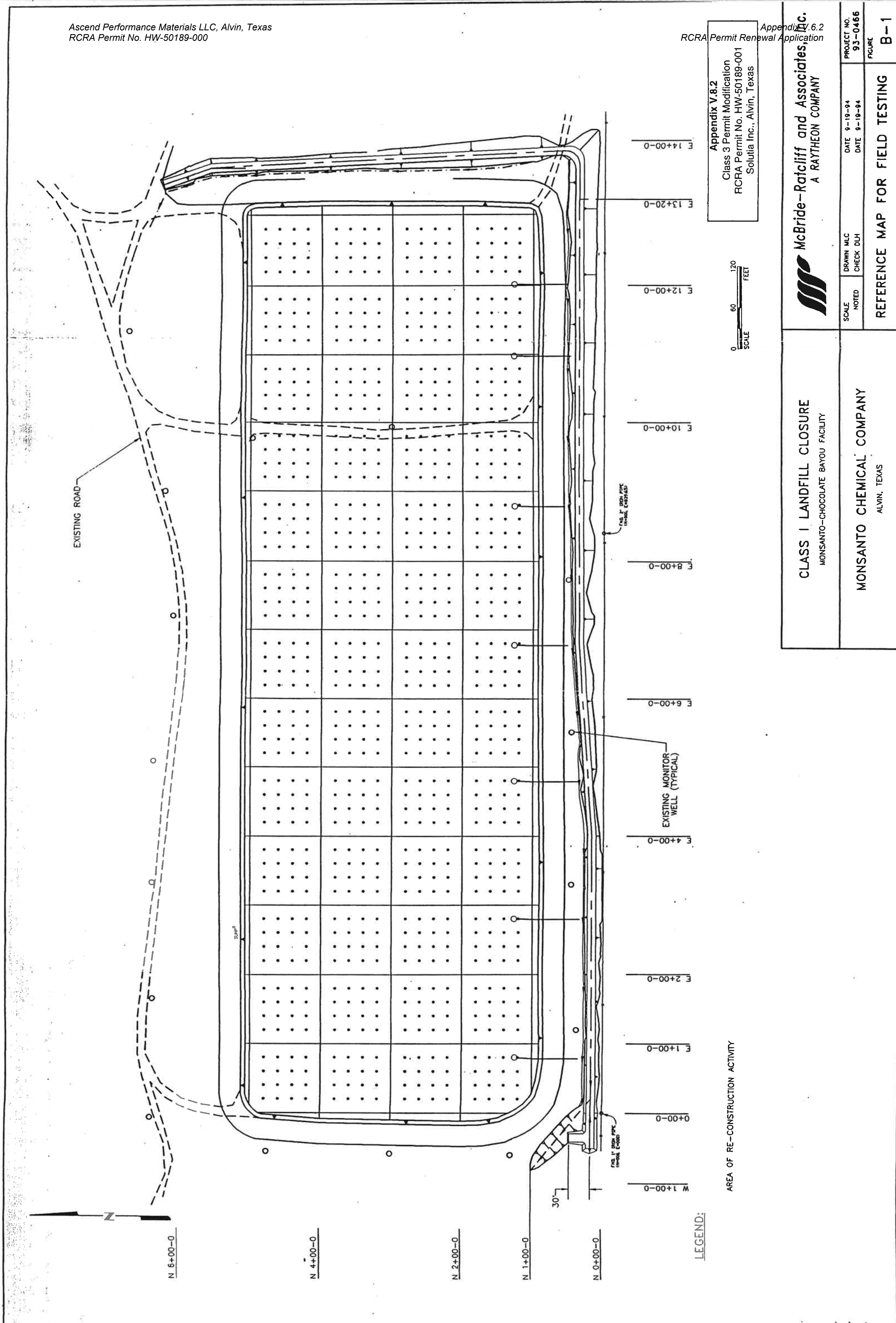
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas



APPENDIX C

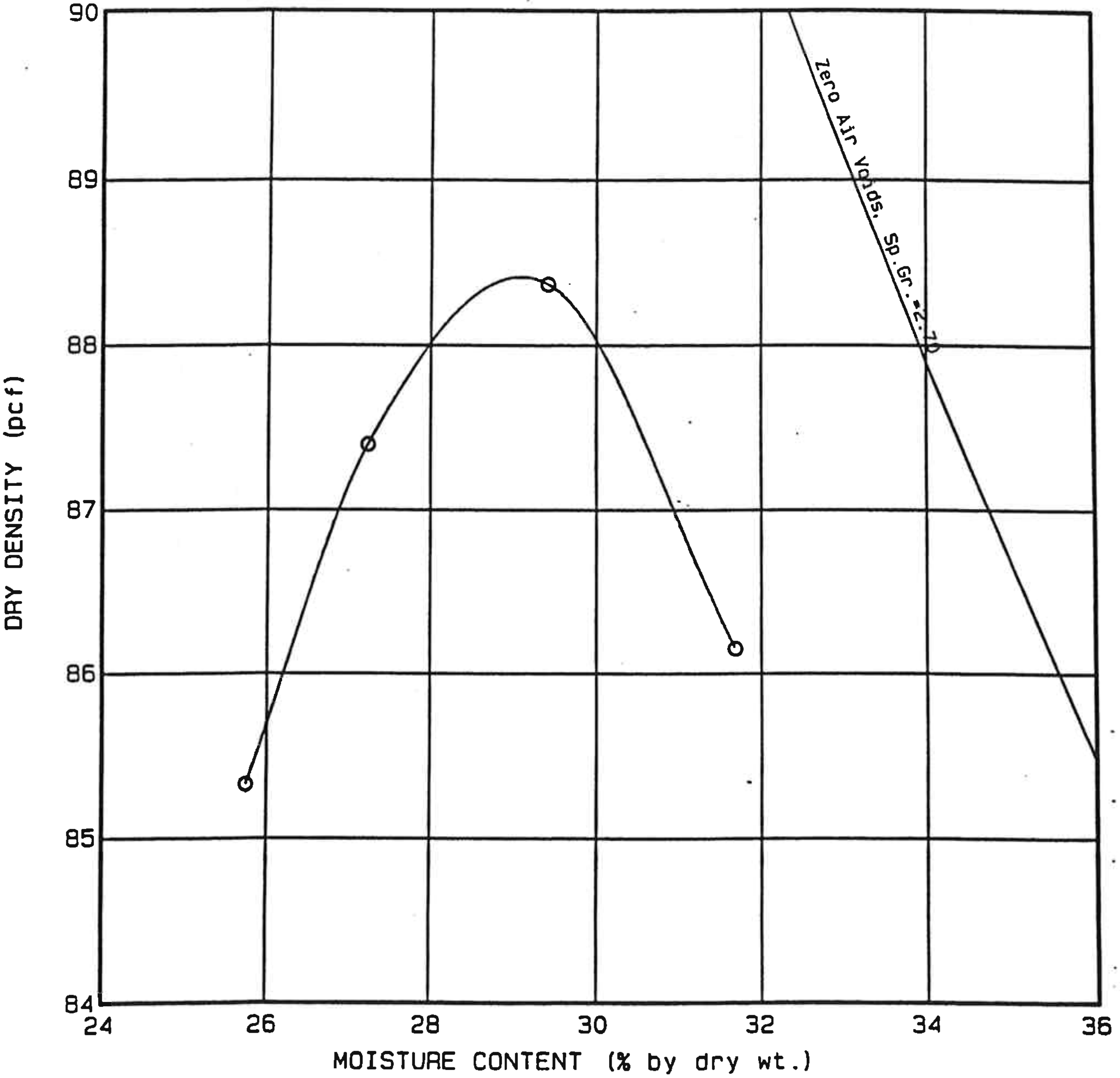
LABORATORY DATA

MOISTURE - DENSITY RELATION

Project: Landfill Closure CQA
Project No.: 93-0466

Client: Monsanto Chemical
Report No.:

Contractor:
Date: 01-31-94



Test No.: 1
Test Method: ASTM D698 Method A

Source: Hazardous Cell, NW Corner

Material Description: Gray & Tan Clay

Maximum Dry Density (pcf): 88.4
Optimum Moisture Content (%): 29.1

Atterberg Limits: LL: 77 PL: 26 PI: 51
Minus #200 Sieve (%): 96

Appendix V.8.2
Class 3 Permit Modification
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MOISTURE - DENSITY RELATION

Project: Landfill Closure CQA

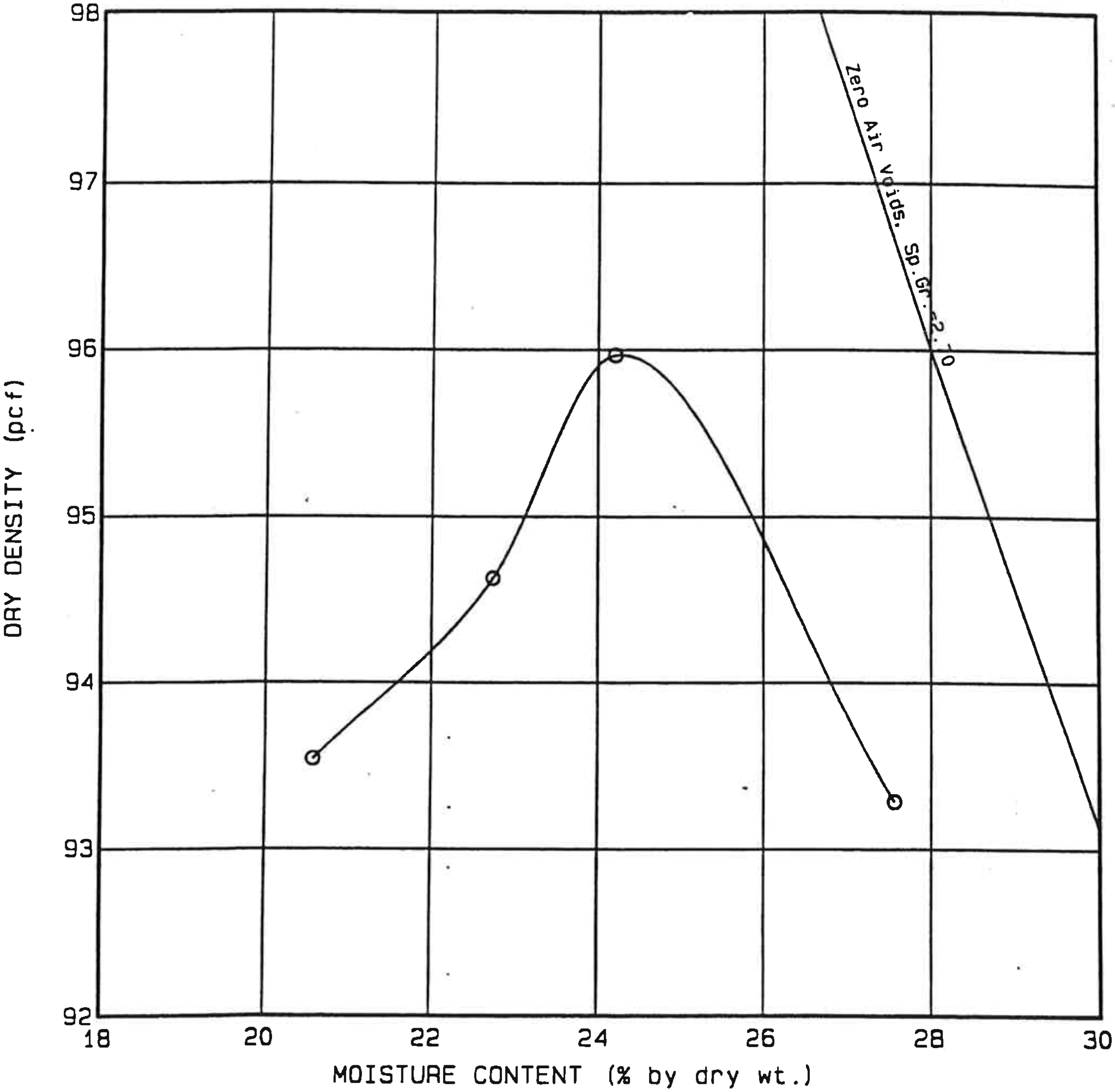
Project No.: 93-0466

Client: Monsanto Chemical

Report No.:

Contractor:

Date: 02-11-94



Test No.: 1

Test Method: ASTM D698 Method A

Source: Borrow Pit

Material Description: Reddish Tan Clay

Maximum Dry Density (pcf): 96.0

Optimum Moisture Content (%): 24.3

Atterberg Limits: LL: 75 PL: 22 PI: 53

Minus #200 Sieve (%):

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Class 3 Permit Modification
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Solutia Inc., Alvin, Texas

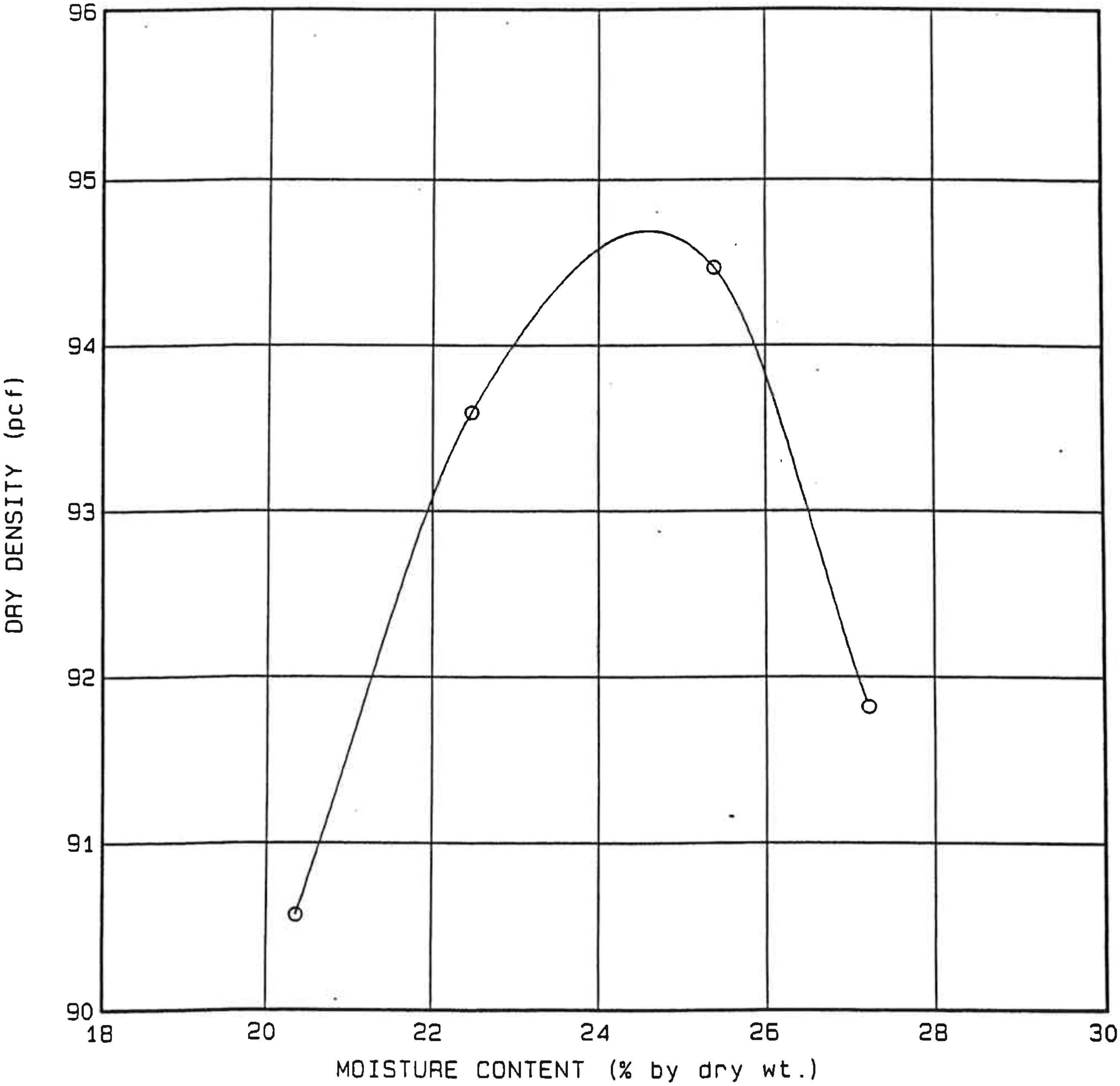
McBride-Ratcliff & Associates

MOISTURE - DENSITY RELATION

Project: Landfill Closure CQA
Project No.: 93-0466

Client: Monsanto Chemical
Report No.:

Contractor:
Date: 01-05-94



Test No.: 1
Test Method: ASTM D698 Method A

Source: Onsite

Material Description: Tan & Gray Clay

Maximum Dry Density (pcf): 94.7
Atterberg Limits: LL: 82 PL: 23 PI: 59

Optimum Moisture Content (%): 24.6
Minus #200 Sieve (%): 95

McBride-Ratcliff & Associates

MOISTURE - DENSITY RELATION

Project: Landfill Closure CQA

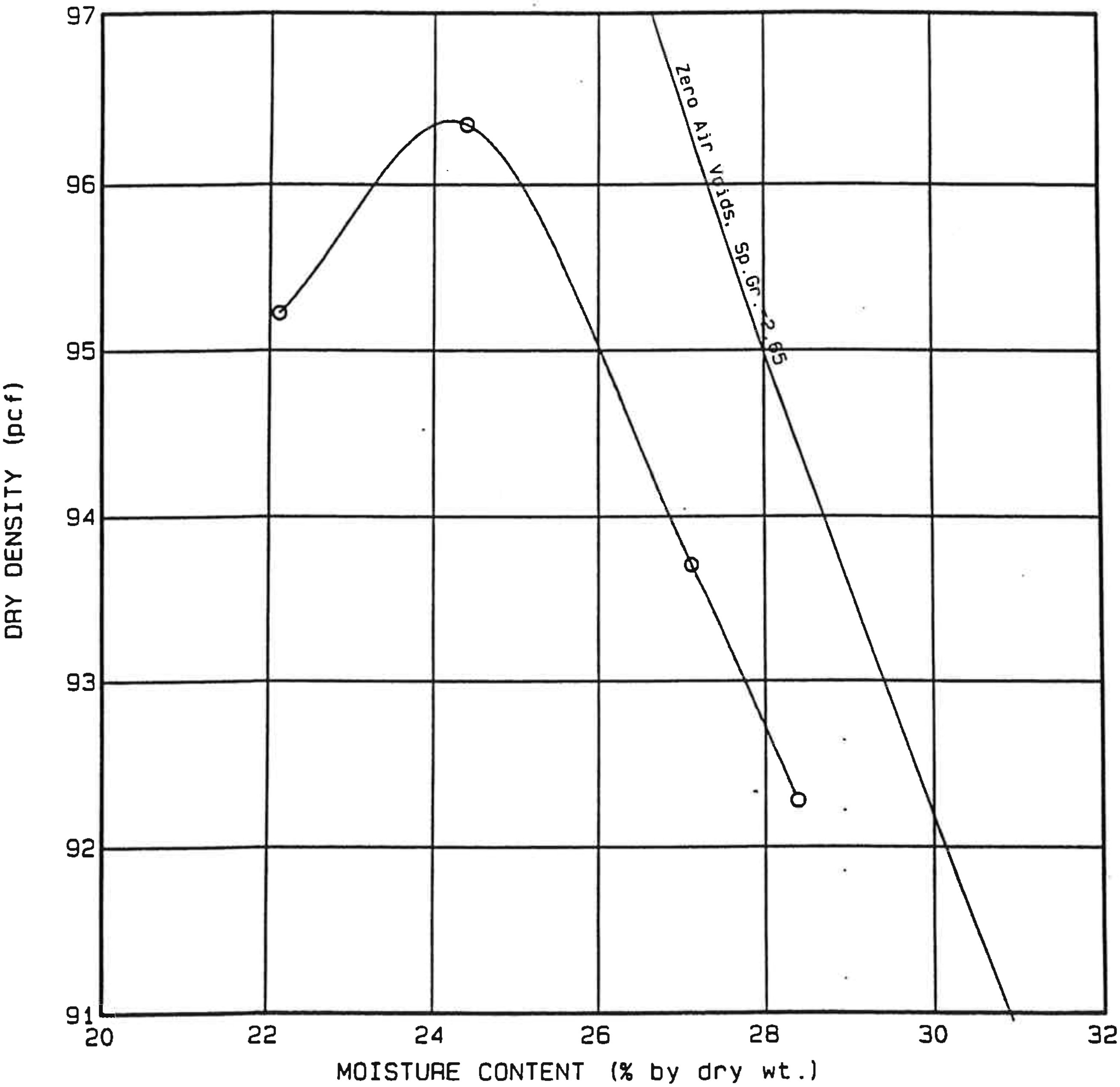
Project No.: 93-0466

Client: Monsanto Chemical Co.

Report No.:

Contractor:

Date: 01-09-94



Test No.: 1

Test Method: ASTM D698 Method A

Source: Interim Cap

Material Description: Tan & Gray Clay

Maximum Dry Density (pcf): 96.4

Optimum Moisture Content (%): 24.2

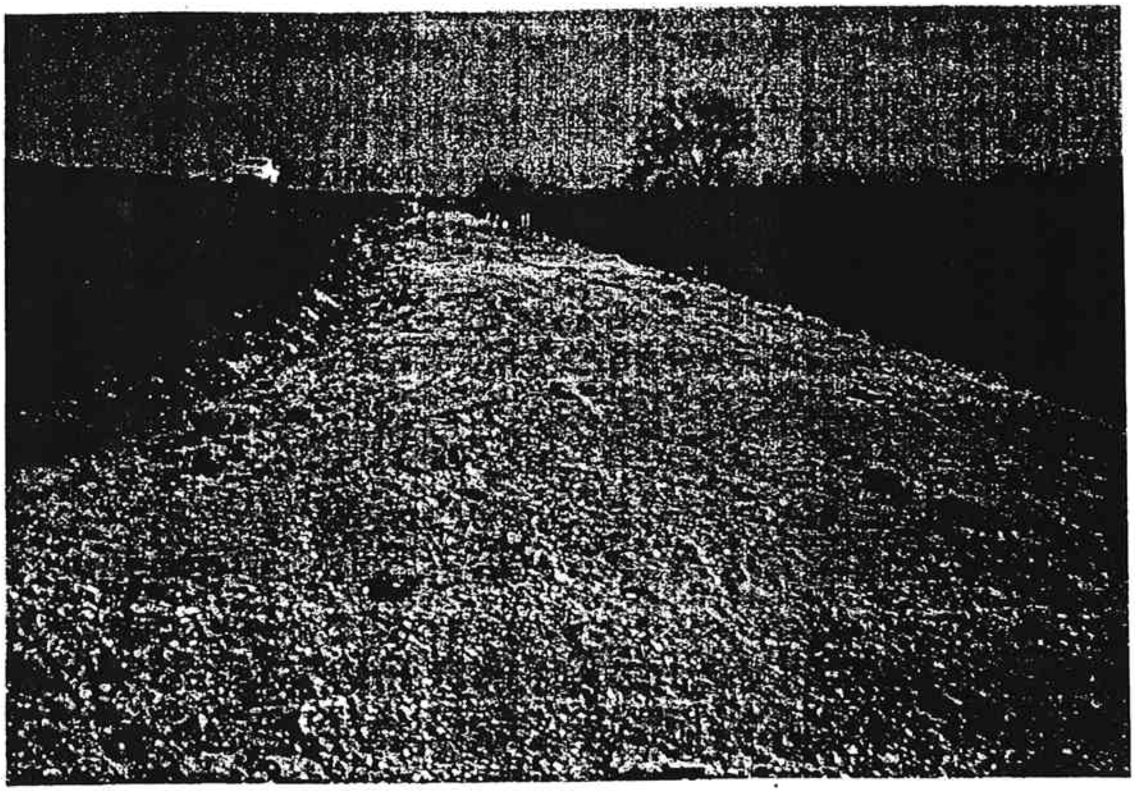
Atterberg Limits: LL: 71 PL: 24 PI: 47

Minus #200 Sieve (%): 95

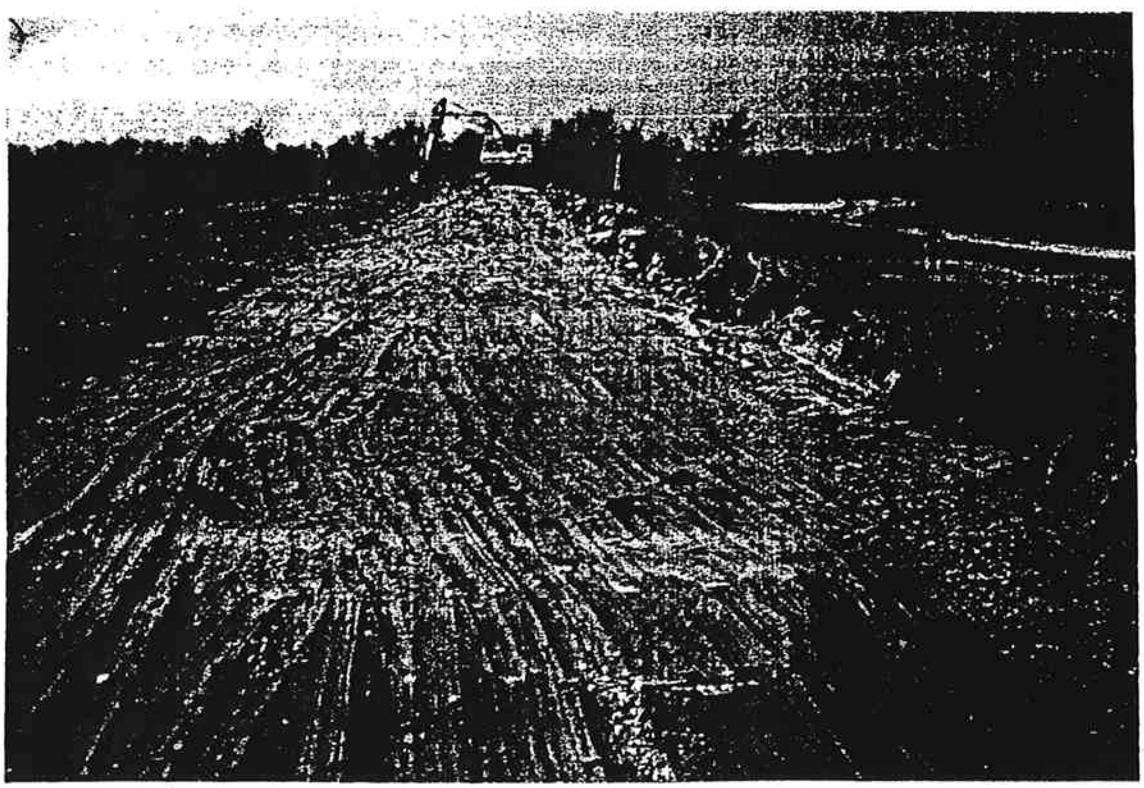
McBride-Ratcliff & Associates

APPENDIX D

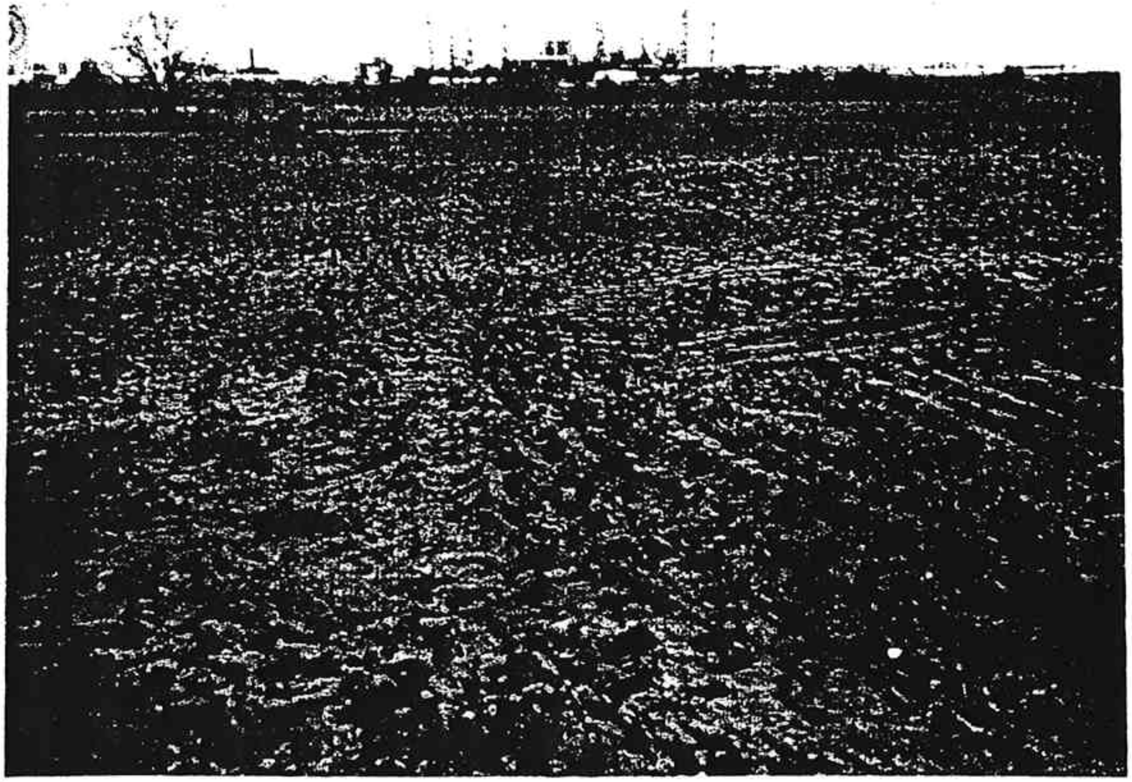
CONSTRUCTION PHOTOGRAPHS



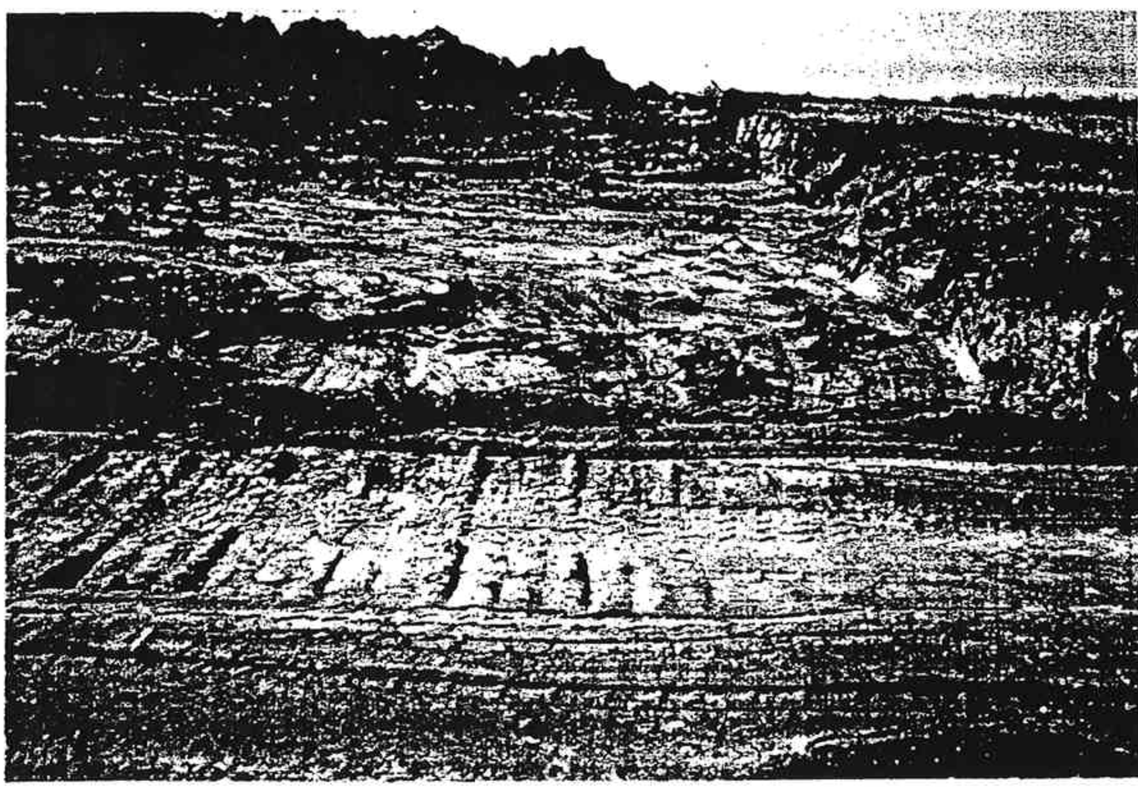
1. Looking east from E0+00, N0+00. Limestone road along south of landfill prior to relocating to the south.



2. Looking west from E5+00, N5+00. Removing access road on north levee, exposing the clay to tie in the cap. Dumptruck is on ramp on northwest corner.



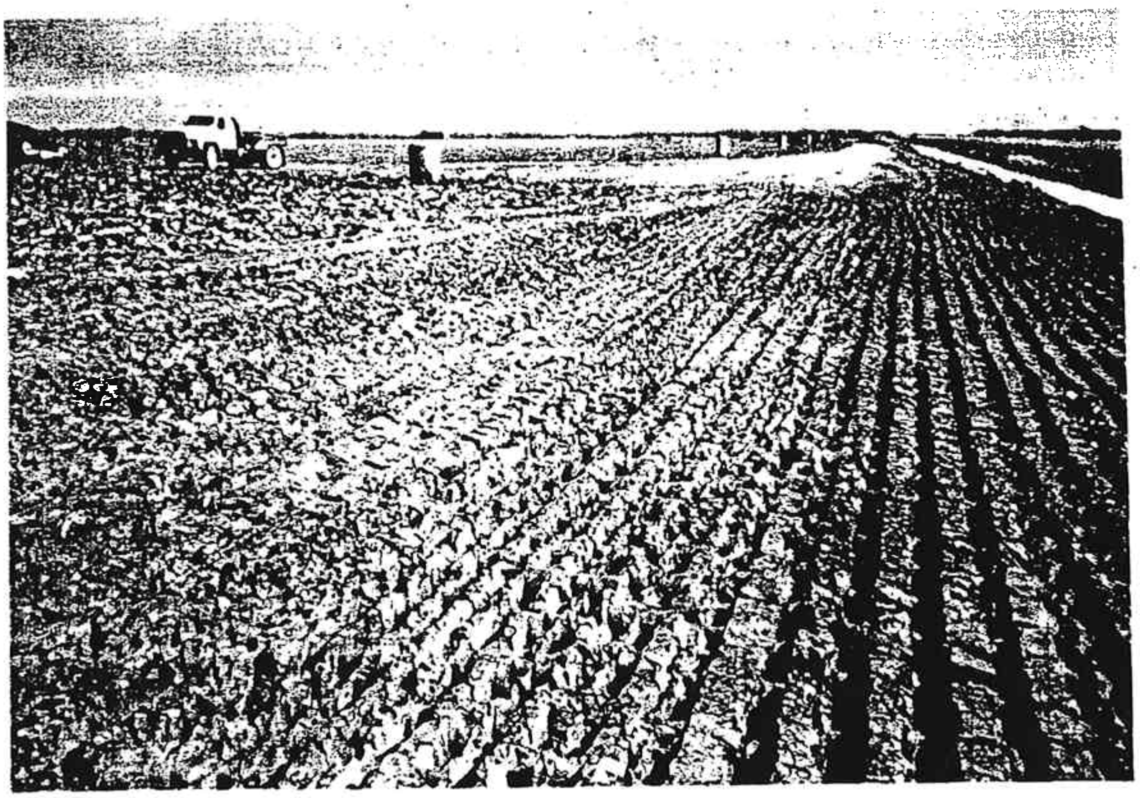
3. Looking south from E5 + 00, N5 + 00. Preparation of top of interim cover prior to receiving 1st lift of final cover.



4. Looking west from E13 + 00, N3 + 90. Removal of 18" of interim cover. reference to Figure A-1.

5. Tractor pulling weighted disc to scarify surface where truck traffic had been.

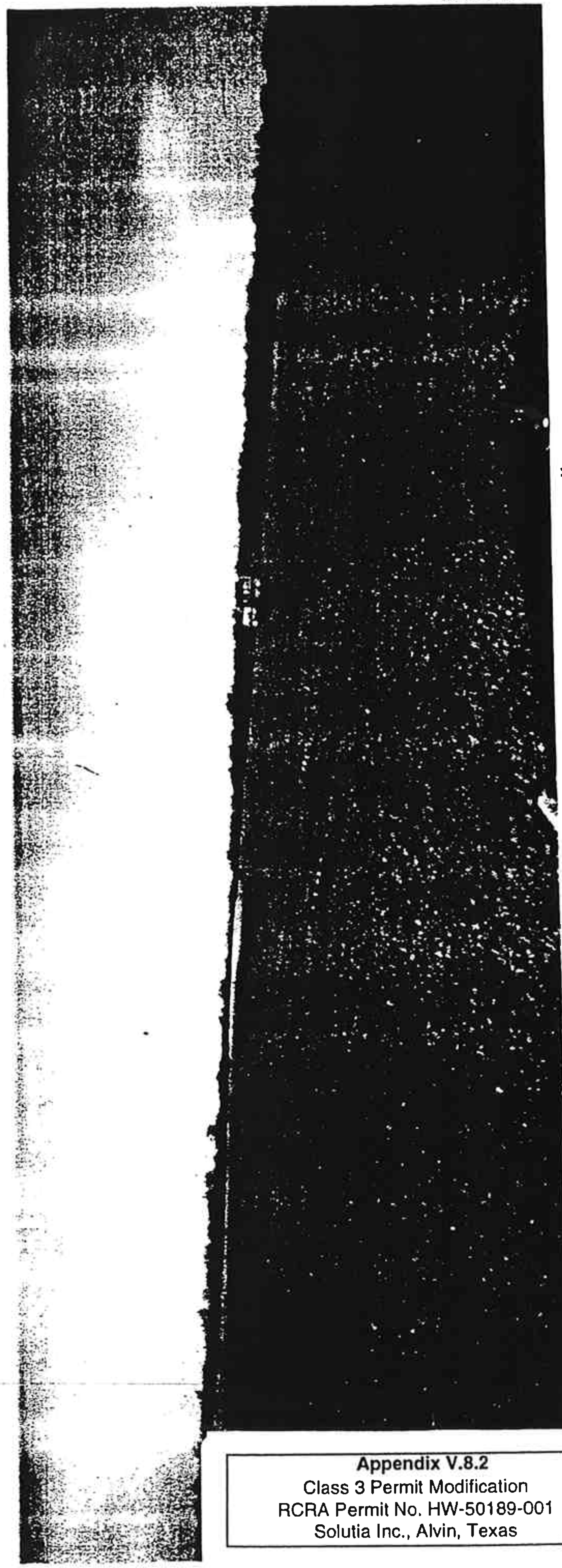
6. Caterpillar 815 Compactor on left, application of water prior to spreading material.



7. Looking east from E1+00, N0+80. Risers for leachate recovery along grid line N1+20.

8. Application of topsoil on west and of cap. Topsoil was placed as soon as survey verified adequacy of clay in each section.

9. In the borrow pit, backhoe on left is loading clay, backhoe on right is loading topsoil.

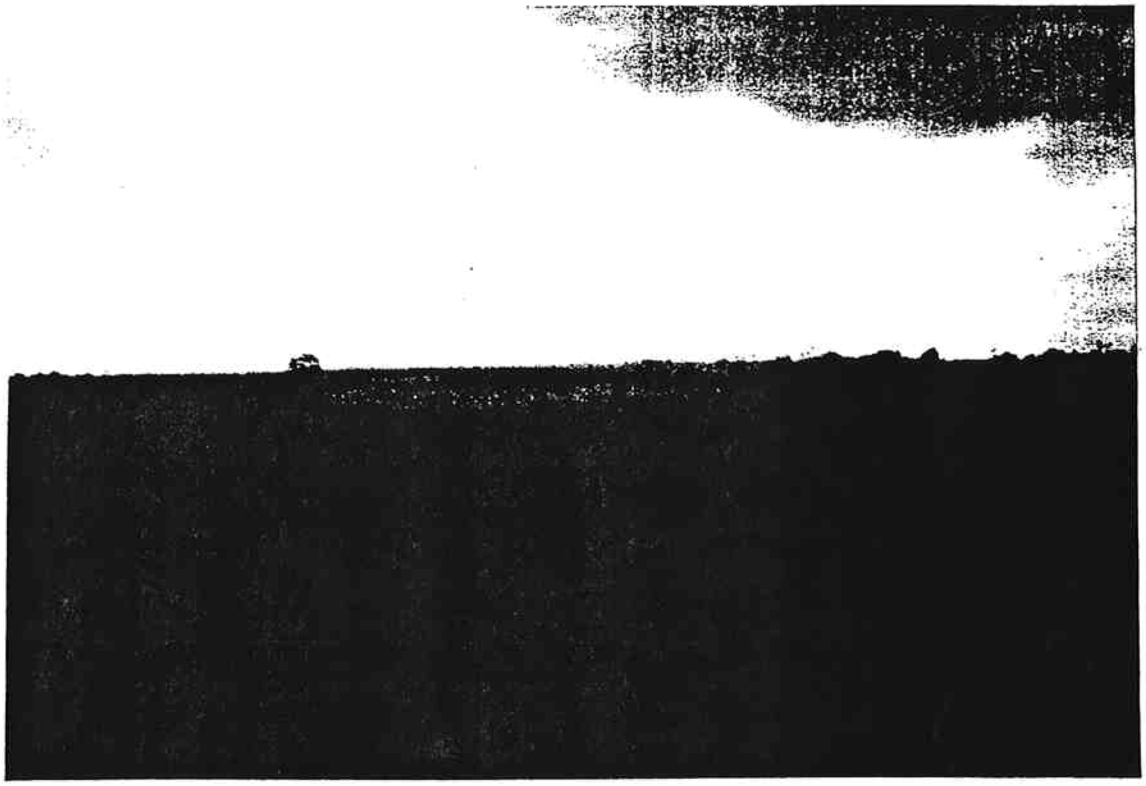


10. Panorama showing uniformity of surface prior to placement of top soil.

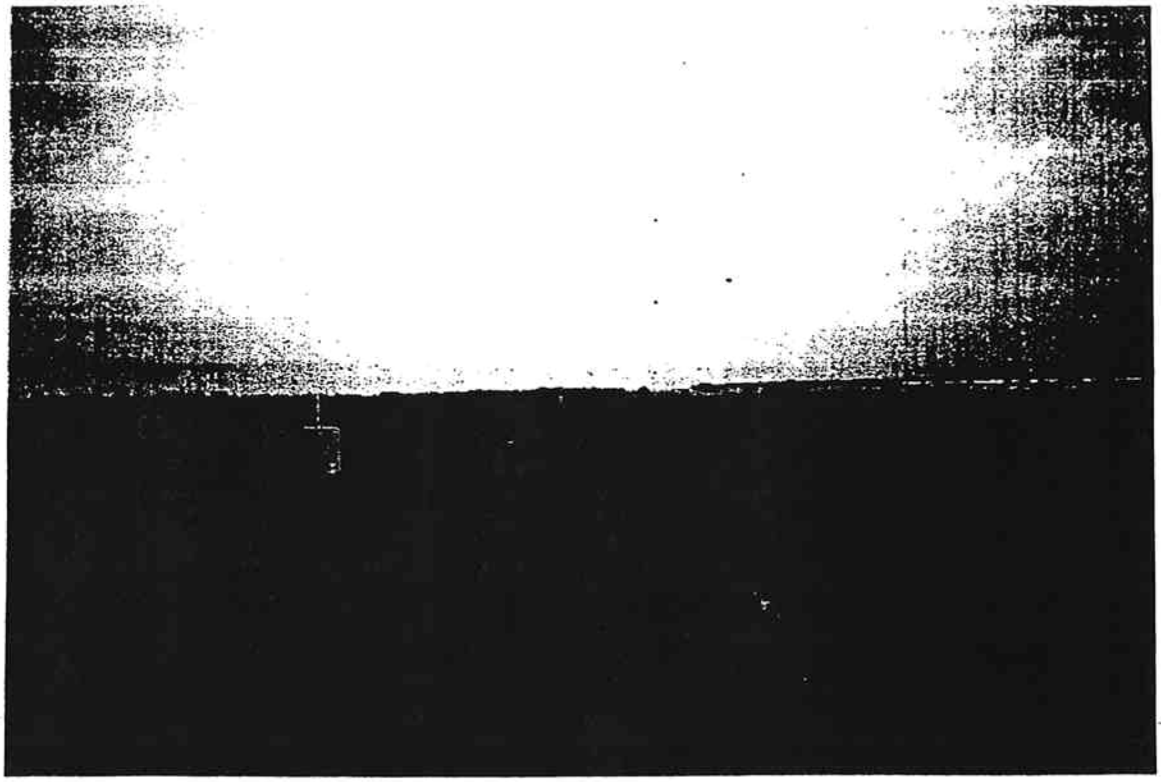
Appendix V.8.2
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas

11. Looking west from E7+00, N4+00. Grade stakes on topsoil prior to hydromulching.

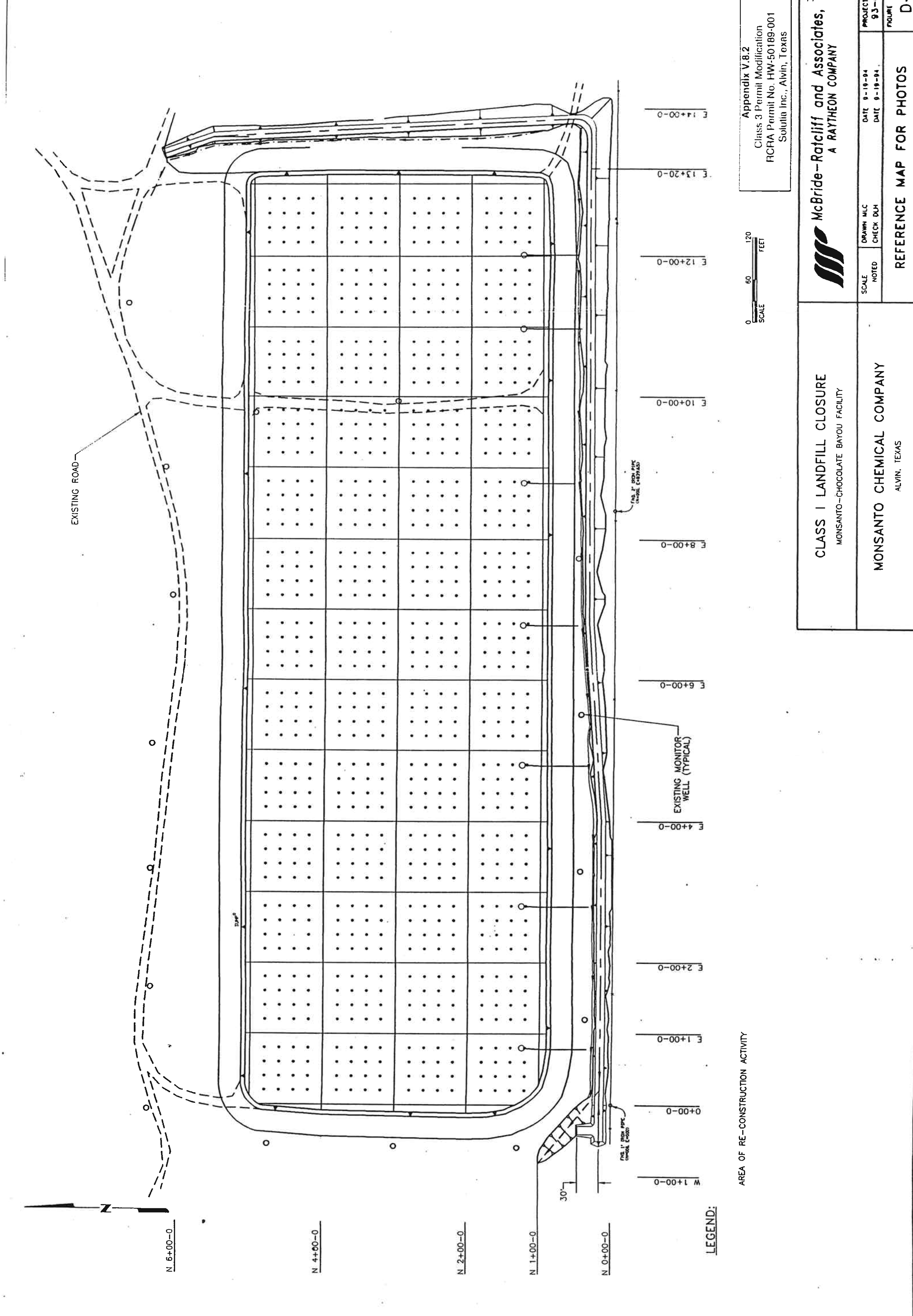
12. Looking east from 1+50, N0+00. Compare to Photo #1. Note drainage swale, leachate recovery connector (see Figure 8, Detail F), monitor well on north side of road (previously on south).



13. Looking west from E13+00, N3+90. Compare to Photo #4.



14. Looking east from E1+50, N0+80. Risers are capped (see Figure 8, Section A-A). Compare to Photo #7.


Appendix V.8.2
Class 3 Permit Modification
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas
McBride-Ratcliff and Associates, Inc.
A RAYTHEON COMPANY
CLASS I LANDFILL CLOSURE
MONSANTO-CHOCOLATE BAYOU FACILITY
MONSANTO CHEMICAL COMPANY
ALVIN, TEXAS
SCALE NOTED
DRAWN MLC
CHECK DLH
DATE 9-19-94
DATE 9-19-94
PROJECT NO 93-0466
FIGURE D-1
REFERENCE MAP FOR PHOTOS
SCALE
0
60
120
FEET
EXISTING ROAD
EXISTING MONITOR WELL (TYPICAL)
E 14+00-0
E 13+20-0
E 12+00-0
E 10+00-0
E 8+00-0
E 6+00-0
E 4+00-0
E 2+00-0
E 1+00-0
0+00-0
W 1+00-0
N 6+00-0
N 4+00-0
N 2+00-0
N 1+00-0
N 0+00-0
30'
N
LEGEND:
AREA OF RE-CONSTRUCTION ACTIVITY

GSI Job No. 6932

Hazardous Waste Permit Renewal Application
Ascend Performance Materials Texas Inc., Alvin, Texas

Hazardous Waste Permit No. 50189

Part B, Section V: Appendix V.G.2 - Engineering Report for Active Landfill

Note: There were no changes to the Engineering Report for the Active Landfill, originally issued 31 December 2009 and updated on 6 February 2012. Therefore, the 6 February 2012 Engineering Report and supporting documentation are submitted as is.

GSI Job No. 3742

ATTACHMENT V.7
ENGINEERING REPORT FOR
ACTIVE LANDFILL (PERMIT UNIT 02)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

GSI Job No. 3742

ATTACHMENT V.7
ENGINEERING REPORT FOR ACTIVE LANDFILL (PERMIT UNIT 02)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

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Ascend Performance Materials LLC, Alvin, Texas

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GSI ENVIRONMENTAL

CERTIFICATION OF ENGINEERING REPORT FOR ACTIVE LANDFILL (PERMIT UNIT 02)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

I, Elaine A. Higgins, a registered professional engineer in the State of Texas, certify that the Engineering Report in the RCRA Permit Renewal Application issued 31 December 2009 and revised 6 February 2012 for the Active Landfill (Permit Unit 02) on the Ascend Chocolate Bayou Plant in Alvin, Texas, has been prepared in accordance with the requirements of 40 CFR 264.300 - .317 and 30 TAC 335.173 - .176.

STATE OF TEXAS
ELAINE A. HIGGINS
85482
LICENSED
PROFESSIONAL ENGINEER

Elaine A. Higgins 6 February 2012

Elaine A. Higgins, P.E.
State of Texas
Registration No. 85482

1.0 DESCRIPTION OF ACTIVE LANDFILL

The Active Landfill (Permit Unit 02) has been designed, constructed, and operated in accordance with Minimum Technological Requirements (MTR) per 30 TAC 335.173 - .176; and 40 CFR 264.300 - .317. This section provides RCRA Part B permit application information for the unit as required by 40 CFR 270.21.

The Active Landfill is located in the southeast portion of the Ascend property (see Attachment C.1). Landfill cells are constructed, filled, and completed in a sequential manner employing the moving cell method of development. During waste placement, rainfall runoff and run-on are prevented by perimeter dikes and drainage and a temporary roof structure over the active cell. A Groundwater Detection Monitoring Program (GWDMP) has been conducted at this landfill on a semi-annual basis since 1992. Landfill specifications are summarized on Tables V.G.1, V.G.3, and V.G.4.

2.0 HAZARDOUS WASTES MANAGED

2.1 Types of Wastes Managed

Wastes managed in the Active Landfill are shown on Table V.G.1. During the period of 1991 to the present, the Active Landfill has been used for disposal of the following: i) organic and inorganic solids such as soils, spent filter cartridges, and spent carbon; and ii) organic and inorganic sludges from industrial and waste treatment processes. In this document, Section IV: Waste Analysis Plan provides additional details concerning the wastes generated at Ascend Chocolate Bayou and provides a waste flow diagram for each of the permitted units (see also Attachment E).

In accordance with 30 TAC 335.175, bulk or non-containerized liquid hazardous waste or hazardous waste containing free liquids is not received for disposal at the Active Landfill. Materials disposed in this unit must evidence the absence of free liquids as demonstrated by Method 9095: Paint Filter Liquids Test (EPA, 1995).

Containers which may be placed in the Active Landfill include those referenced by 30 TAC 335.175(e), as follows: i) very small containers, such as ampoules; or ii) containers designed to hold free liquids for use other than storage such as a battery or capacitor. Unless very small, such as an ample, containers are crushed, shredded or similarly reduced in volume to the maximum extent practical prior to burial per 30 TAC 335.176.

2.2 Ignitable and/or Reactive Wastes

All wastes disposed in the Active Landfill are treated prior to disposal to meet applicable requirements specified in the Land Disposal Restrictions (LDRs) referenced in 40 CFR Part 268, and, therefore, no longer meet the definition of ignitable or reactive. See Attachment IV.1 Waste Analysis Plan for additional information concerning ignitable and reactive waste management.

2.3 Incompatible Wastes

In order to prevent a potential adverse reaction or release, unit operating procedures require completion of a compatibility determination prior to disposing a waste or other material in the Active Landfill. Material compatibility is assessed using the procedures specified in the Waste Analysis Plan (see Attachment IV.1 Waste Analysis Plan). Incompatible wastes are not placed in the same landfill cell and only one cell is open at any time.

2.4 Land Disposal Restrictions

In order to ensure that only those wastes meeting LDRs per 40 CFR Part 268 are disposed in the Active Landfill, Ascend makes an LDR determination using the procedures specified in the Attachment IV.1 Waste Analysis Plan. Only wastes meeting the LDR treatment requirements specified in Attachment IV.1 Waste Analysis Plan are disposed in the Active Landfill.

3.0 LANDFILL SPECIFICATIONS

The general layout of the Active Landfill encompasses six cells is shown on Figure V.7.1. Major components of each cell are as follows: i) a double liner, ii) leachate collection and leak detection systems, and iii) a protective surface cover installed at the time of cell completion. Specifications for the Active Landfill liners and leachate collection systems are summarized on Tables V.G.3 and V.G.4. Figures V.7.2 and V.7.3 depict a plan-view sequence of construction for the layers comprising the liner, leachate collection system, and leak detection system. Cross sections of the liner and cover are shown on Figures V.7.4, V.7.5, and V.7.6. Relevant construction details are provided on Figures V.7.7 and V.7.8.

Additional details regarding the construction sequence for each landfill cell are provided below.

- *Project Startup:* Specifications are prepared, contractors selected, and field crews mobilized for construction of the landfill cell.

- *Construction of Perimeter Dikes and Clay Liner:* The cell is excavated and perimeter dikes constructed in accordance with the elevations shown on Figure V.7.4. Perimeter dikes are constructed of compacted clay having exterior slopes of no greater than 3 horizontal to 1 vertical (i.e., 3 to 1) and interior slopes of no greater than 2.5 to 1. Then a minimum 3-ft thick clay liner is installed within the perimeter dike. Appendix V.7.2 provides information regarding the dike slope stability analysis for the Active Landfill.

- *Installation of Leak Detection System:* Next, the leak detection system for the Active Landfill is constructed in accordance with provisions of 30 TAC 335.173(c). Elevations for the leak detection system are shown on Figure V.7.4 (Note that the leak detection system is referred to as the secondary leachate detection system on the attached drawings). Components of the leak detection system include, from deep to shallow, the following: i) an 80-mil thick high density polyethylene (HDPE) liner,

ii) protective geotextile, iii) sand drain layer equipped with drainage pipes, and iv) protective geotextile (see Figure V.7.8). The liner is compatible with the chemical properties of the waste materials and has sufficient physical strength and thickness to prevent failure during installation and operation. Material specifications and compatibility test results are provided in Appendix V.7.3.

- *Installation of Leachate Collection System:* The leachate collection system for each cell of the Active Landfill is constructed atop the leak detection system per 30 TAC 335.173(c). Components of the leachate collection system include, from deep to shallow, the following: i) a 100-mil thick HDPE liner, ii) protective geotextile, iii) sand drain layer equipped with drainage pipes, and iv) protective geotextile (see Figure V.7.8). The liner has been selected to be compatible with the chemical properties of the waste materials and has sufficient physical strength and thickness to prevent failure during installation and operation (see Appendix V.7.3).

- *Construction of Final Cover:* A final cover is installed on each landfill cell after placement of the waste. A final cover specification, applicable to all landfill cells, has been developed in accordance with 30 TAC 335.174(a). Elements of the cover system starting at the surface of the waste and progressing upward will be i) a compacted clay cap, ii) a synthetic membrane liner, iii) a drainage layer, and iv) a protective topsoil cover (see Figure V.7.4).

4.0 CONSTRUCTION QUALITY ASSURANCE PROGRAM

A Construction Quality Assurance (CQA) program has been developed in accordance with the requirements of 40 CFR 264.19 and will be implemented during construction and completion of landfill cells. The CQA program addresses physical components of landfill construction, such as liners, leachate collection systems, and final covers; key personnel and roles during construction; and testing methods and frequencies (see Appendix V.7.1).

5.0 LANDFILL OPERATING PROCEDURES

5.1 Site Development Plan

Individual waste disposal cells are constructed, filled, and closed in a sequential manner in order to accommodate waste generation rates. Projected waste disposal rates are expected to result in approximately 8 additional years of service for the Active Landfill; however, variability in waste production could result in a longer or shorter time period

Cells I, II, III, and IV have been completed, and Cell V is currently receiving waste. Certification reports were submitted to the TNRCC upon construction and completion of each cell (McBride, 1991a; 1992; 1996; Fugro, 1995). The remaining cells will be developed as needed to handle wastes generated by Ascend.

Each cell is approximately 250 ft wide and 130 ft long. The maximum depth below grade is 10 ft, and each cell has perimeter dikes that extend a nominal height of 8 ft above natural grade. Based upon geologic logs recorded during installation of monitoring wells for the unit (McBride, 1991b), the minimum distance between the base of the compacted clay liner and the shallow saturated unit is 20 to 30 ft.

Wastes may be placed in the landfill in bulk or containerized form. However, when beginning placement in a newly constructed landfill cell, the initial 2-ft thick layer is comprised of clean soil or bulk (i.e., non-containerized) waste placed using a tracked vehicle. Rubber-tired and roller-type compaction equipment are only used after the initial layer has been placed.

Bulk wastes are placed in lifts having a maximum thickness of 1.5 ft which are subsequently compacted to minimize later settlement. In order to allow for installation of the landfill cover system, the maximum height of the waste within each cell is no higher than 3 ft below the crest of the perimeter dike. The final surface of the waste is sloped at 2% to 5% so that the final elevation of the waste at the perimeter dike is less than the elevation of the perimeter dike.

5.2 Suppression of Emissions

In accordance with 30 TAC 335.173(j), potential dust-producing materials disposed in the landfill are covered as soon as practicable after placement within the active cell to prevent wind dispersal of particulates, production of odors, or emissions of vapors.

5.3 Control of Run-On/Run-Off

Accumulation of direct rainfall within the open landfill cells is prevented by means of a temporary roof structure. Rainfall from the temporary roof is diverted from the landfill area by a system of surface drainage channels sized to handle the volume of water expected from a 24-hr 100-yr storm event (see Figure V.7.1). In addition, perimeter dikes prevent run-on of stormwater drainage from adjoining areas.

In accordance with requirements of 30 TAC 335.204(a)(1), this landfill is designed, constructed, operated, and maintained to prevent physical transport of any hazardous waste by a 100-yr flood event. In order to prevent inflow from a 100-yr flood event, perimeter dikes have been constructed around each active landfill cell. The predicted 100-yr flood elevation is 15 ft MSL in the vicinity of this unit, and the landfill perimeter dikes are completed to a nominal elevation of 20.5 ft MSL. Therefore, the dikes are a minimum of 5 ft higher than expected water levels during a 100-yr flood event.

5.4 Monitoring and Inspection of Leachate Collection and Leak Detection Systems

Per the requirements of 40 CFR 264.303, Ascend conducts weekly inspections of the leachate collection and leak detection sump systems (see Table III.D and Figure V.7.8). The liquid levels in the leachate collection and leak detection sumps are recorded on a weekly basis. The fluid operating level is maintained below a level that would exert 1 ft of hydrostatic head on the liner. Accumulated fluids are removed by a vacuum truck for disposal in the permitted on-site injection well or other approved waste disposal or treatment method.

5.5 Recordkeeping

Information to be maintained in the plant records regarding the Active Landfill includes the following: i) the location and horizontal and vertical dimensions of each cell with respect to permanently surveyed benchmarks and ii) the contents of each cell and approximate location of each hazardous waste type within each cell.

6.0 ACTION LEAKAGE RATE

Fluid production within the leak detection system is monitored and compared to a the Action Leakage Rate (ALR) as defined in 40 CFR 264.302. The estimated ALR for each cell of the Active Landfill is 300 gallons per day as shown in the calculations on Table V.3.6. If the ALR is exceeded, a Response Action Plan (RAP) prepared in accordance with 40 CFR 264.304 will be implemented. A summary of response activities is provided on Table V.7.5.

ATTACHMENT V.7
ENGINEERING REPORT FOR
ACTIVE LANDFILL (PERMIT UNIT 02)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

TABLES

GSI ENVIRONMENTAL

TABLE V.7.1
COVER SYSTEM: ACTIVE LANDFILL

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

Clay Cover	Top Liner	Drainage Layer	Protective Cover
Compacted clay meeting the following specifications: • % Passing No. 200 Sieve: ≥30% • Plasticity Index: ≥15% • Liquid Limit: ≥30% • Hydraulic conductivity: ≤1E-07 cm/sec • Thickness: 3 ft	HDPE	Granular soils meeting the following specifications: • Hydraulic conductivity: ≥1E-02 cm/sec • Thickness: 1 ft	Topsoil meeting the following specifications: • Conducive to vegetative growth • Thickness: 1.5 ft

Notes:
1. See Figure V.7.1 for a plan view of the Active Landfill (Permit Unit 02).
2. Properties of compacted clay will be measured by the following methods: % passing no. 200 sieve by ASTM D1140; plasticity index and liquid limit by ASTM D4318; hydraulic conductivity of clay by ASTM D5084; and hydraulic conductivity of granular materials by ASTM D5084.
3. HDPE = High Density Polyethylene.

TABLE V.7.2
RESPONSE ACTION PLAN FOR ALR EXCEEDANCES: ACTIVE LANDFILL

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

Work Item Description	Schedule for Submittal to TCEQ	40 CFR 264.304 Reference
1. ***Initial Notification:*** Provide written notice if ALR is exceeded for one or more landfill cells.	• Within 7 days of determining that the ALR has been exceeded	(b)(1)
2. ***Preliminary Assessment:*** Prepare a summary of i) available information regarding the possible source, location, size, and cause of the leak; i) an estimate the volume of liquids released; and iii) short-term actions implemented to minimize potential adverse impacts of leak.	• Within 14 days of determining that the ALR has been exceeded	(b)(2)
3. ***Remedial Action Evaluation:*** Prepare a report evaluating the potential leak and appropriate remedial actions. To the extent practicable, determine the location, size, and cause of the leak; and assess the potential for a release to the environment. Develop a plan for modifying waste management activities, if necessary, and implementing any other mitigating actions to stop the leak.	• Within 30 days of Initial Notification	(b)(3), (b)(4), (b)(5), (c)(1), and (c)(2)
4. ***Status Reports:*** During the time the ALR is exceeded for one or more cells, summarize remedial actions completed and future activities planned to reduce the leakage rate to below the ALR.	• Monthly after submittal of first Remedial Action Evaluation	(b)(6)

Notes:
1. See Figure V.7.1 for a plan view of the Active Landfill (Permit Unit 02).
2. In accordance with operating procedures for the Active Landfill, the volume of leachate collected in the leak detection sump (i.e., secondary sump) will be measured on a regular basis per 40 CFR 264.302.
3. Per 40 CFR 264.304, this Response Action Plan will be implemented if the flow rate of leachate into the leak detection sump exceeds the ALR.
4. The estimated ALR for each cell of the Active Landfill is 300 gallons per day (see Table V.7.3).
5. ALR = Action Leakage Rate.

TABLE V.7.3
CALCULATION OF ACTION LEAKAGE RATE FOR ACTIVE LANDFILL

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

I. PURPOSE:

Calculate Action Leakage Rate (ALR) for each cell of Active Landfill (Permit Unit 02) per guidelines of 40 CFR 264.302. Each cell is equipped with one sump for collection of leachate. To identify potential release from landfill, compare volume of leachate to ALR on a weekly basis. If the ALR is exceeded, then implement the Response Action Plan (RAP) outlined on Table V.7.2.

II. DESIGN EQUATION:

$Q = K \alpha h B / SF$

III. DEFINITION OF VARIABLES AND VALUES:

Parameter	Variable	Rationale	Value
1. Drainage Layer Hydraulic Conductivity	K	Minimum value per 40 CFR 264.301(c)(3)(ii).	1E-02 cm/sec
2. Drainage Layer Hydraulic Gradient	α	Design slope of base of leak detection system, see Figure V.3.4	2% (i.e., 0.02 ft/ft)
3. Drainage Layer Thickness	h	Minimum value per 40 CFR 264.301(c)(3)(ii)	1 ft
4. Width of Leak Detection System Perpendicular to Flow	B	Design length of leachate collection pipe, see Figure V.5.4.	140 ft
5. Safety Factor	SF	Sufficient to allow for uncertainties in design; construction, and operation; other sources of fluids to leak detection system; and decreases in system flow capacity over time.	2

IV. RESULTS:

Q = 1E-02 cm/sec * 0.02 ft/ft * 1 ft * 140 ft * 2835 ft-sec/day-cm * 7.48 gal/ft^3 / 2
Q = 300 gal/day

Action Leakage Rate = 300 gal/day for each cell of Active Landfill (Permit Unit 02)

Note: The leak detection system for the Active Landfill (Permit Unit 02) is shown in plan and cross-sectional view on Figures V.7.3 and V.7.8, respectively.

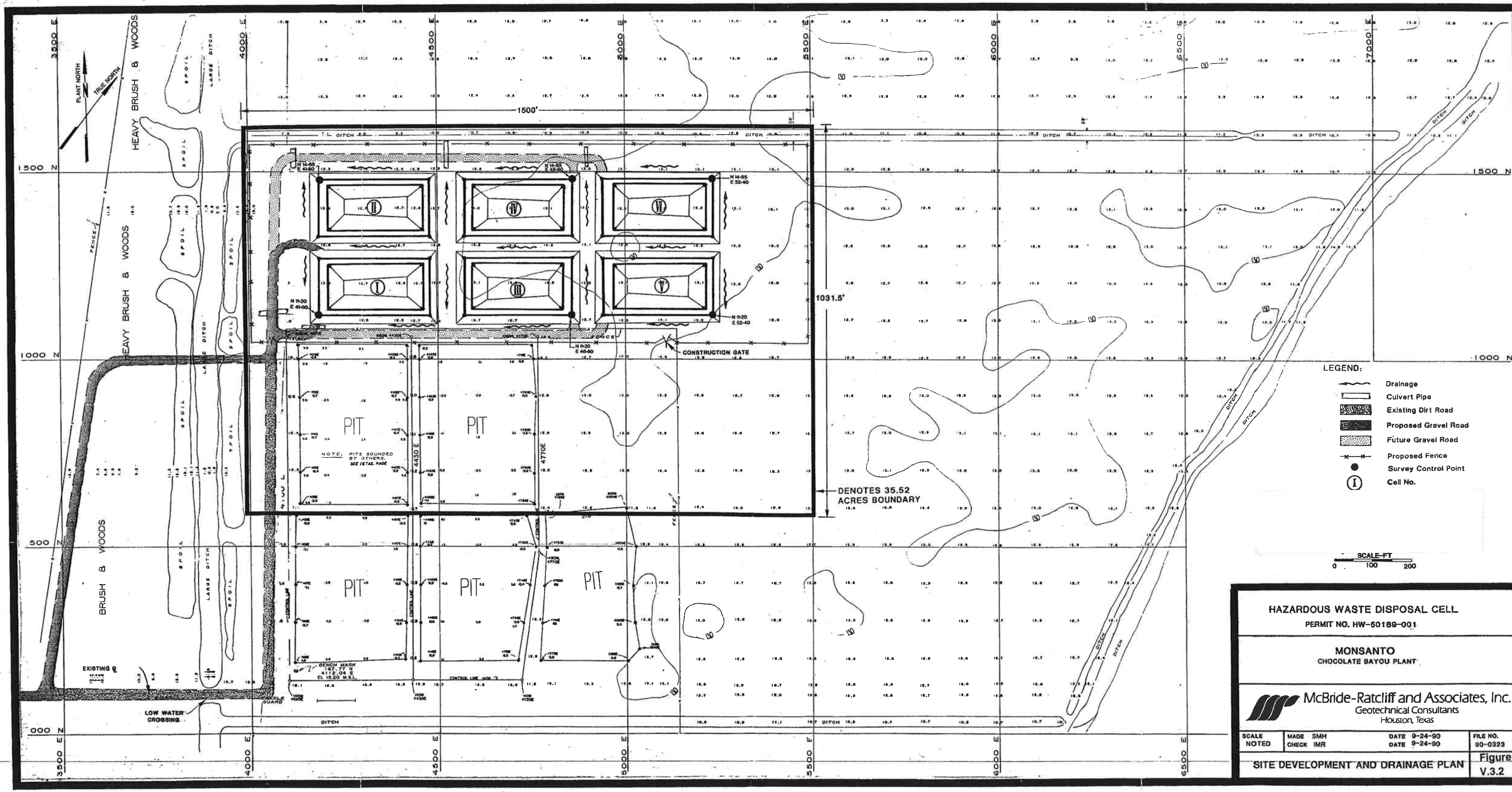
GSI Job No. G-3379
Issued: 31 December 2009

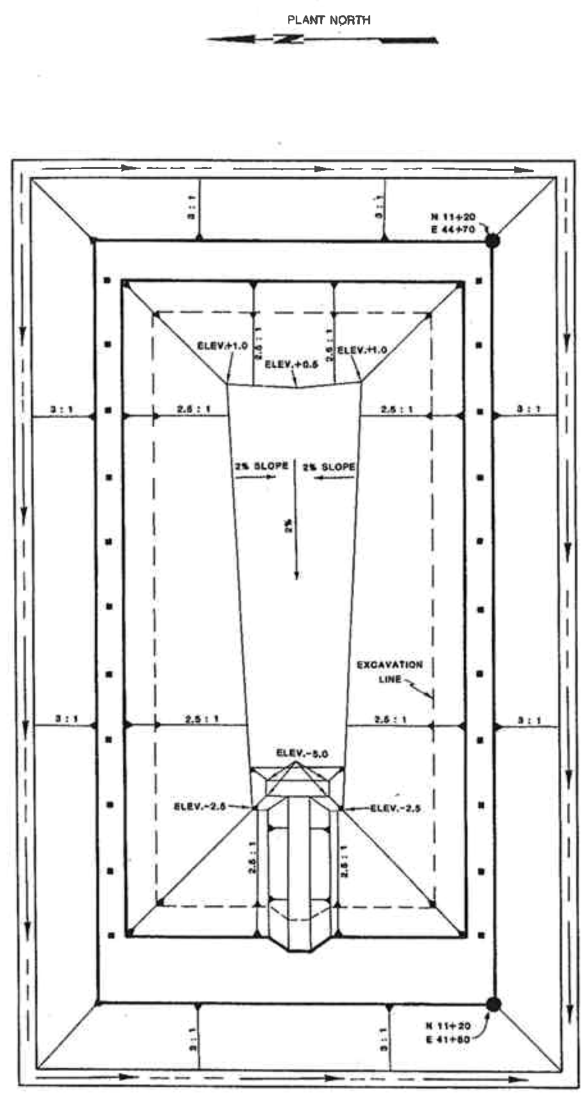
ATTACHMENT V.7
ENGINEERING REPORT FOR
ACTIVE LANDFILL (PERMIT UNIT 02)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

FIGURES


PLANT NORTH
TRUE NORTH
HEAVY BRUSH & WOODS
BRUSH & WOODS
SPOIL
LARGE DITCH
FENCE
1500'
1031.5'
DITCH
PIT
NOTE: PITS SOUNDED BY OTHERS. SEE DETAIL PAGE
CONSTRUCTION GATE
DENOTES 35.52 ACRES BOUNDARY
CONTROL LINE
BENCH MARK
LOW WATER CROSSING
EXISTING ℄
LEGEND:
Drainage
Culvert Pipe
Existing Dirt Road
Proposed Gravel Road
Future Gravel Road
Proposed Fence
Survey Control Point
Cell No.
SCALE-FT
0 100 200
1500 N
1000 N
500 N
000 N
3500 E
4000 E
4500 E
5000 E
5500 E
6000 E
6500 E
7000 E
HAZARDOUS WASTE DISPOSAL CELL
PERMIT NO. HW-50189-001
MONSANTO
CHOCOLATE BAYOU PLANT
McBride-Ratcliff and Associates, Inc.
Geotechnical Consultants
Houston, Texas
SCALE NOTED
MADE SMH
CHECK IMR
DATE 9-24-90
DATE 9-24-90
FILE NO. 90-0323
SITE DEVELOPMENT AND DRAINAGE PLAN
Figure V.3.2

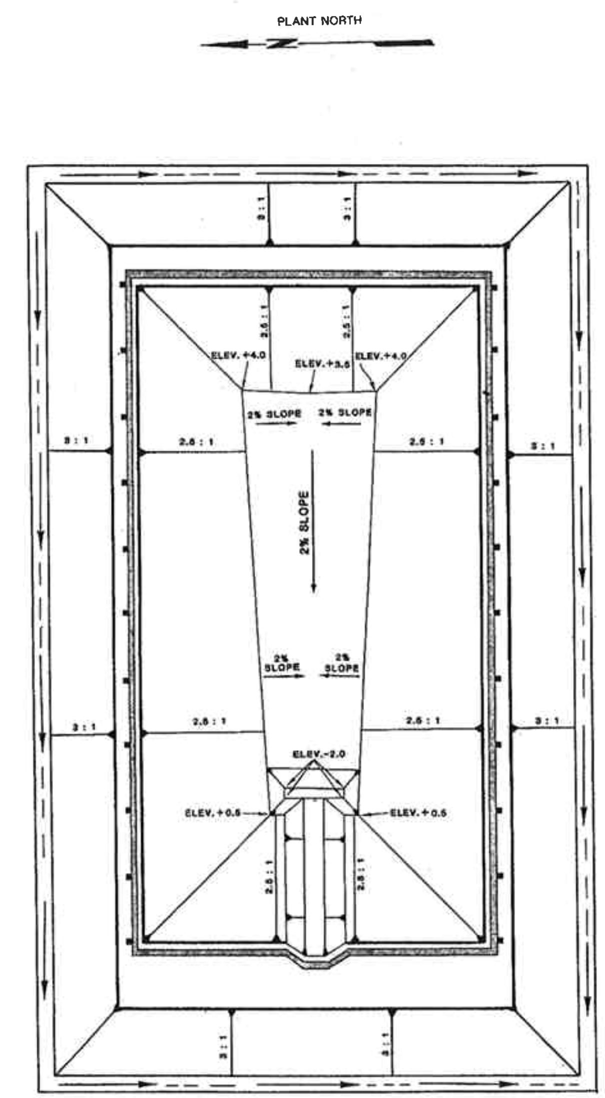


NOTES:

1. OVEREXCAVATED MATERIALS SHALL BE REPLACED IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS IN SECTION 02223 OF CONSTRUCTION SPECIFICATIONS.

2. SOFT SOILS MAY BE ENCOUNTERED AT BOTTOM OF EXCAVATION DUE TO SEEPAGE.

BASE OF EXCAVATION



NOTES:

1. CLAY LINER SHALL BE CONTINUOUS THROUGHOUT THE CELL BOTTOM AND SIDE SLOPES.

2. CONTRACTOR SHALL SUBMIT GEOMEMBRANE LAYOUT DRAWINGS TO THE ENGINEER FOR APPROVAL PRIOR TO FIELD INSTALLATION.

TOP OF COMPACTED CLAY LINER

LEGEND:

- ℄ DRAINAGE DITCH
- LIMIT OF EXCAVATION
- ANCHOR TRENCH
- SURVEY CONTROL POINT
- CONCRETE PIER

SCALE-FT
0 30 60

HAZARDOUS WASTE DISPOSAL CELL
PERMIT NO. HW-50189-001

MONSANTO
CHOCOLATE BAYOU PLANT

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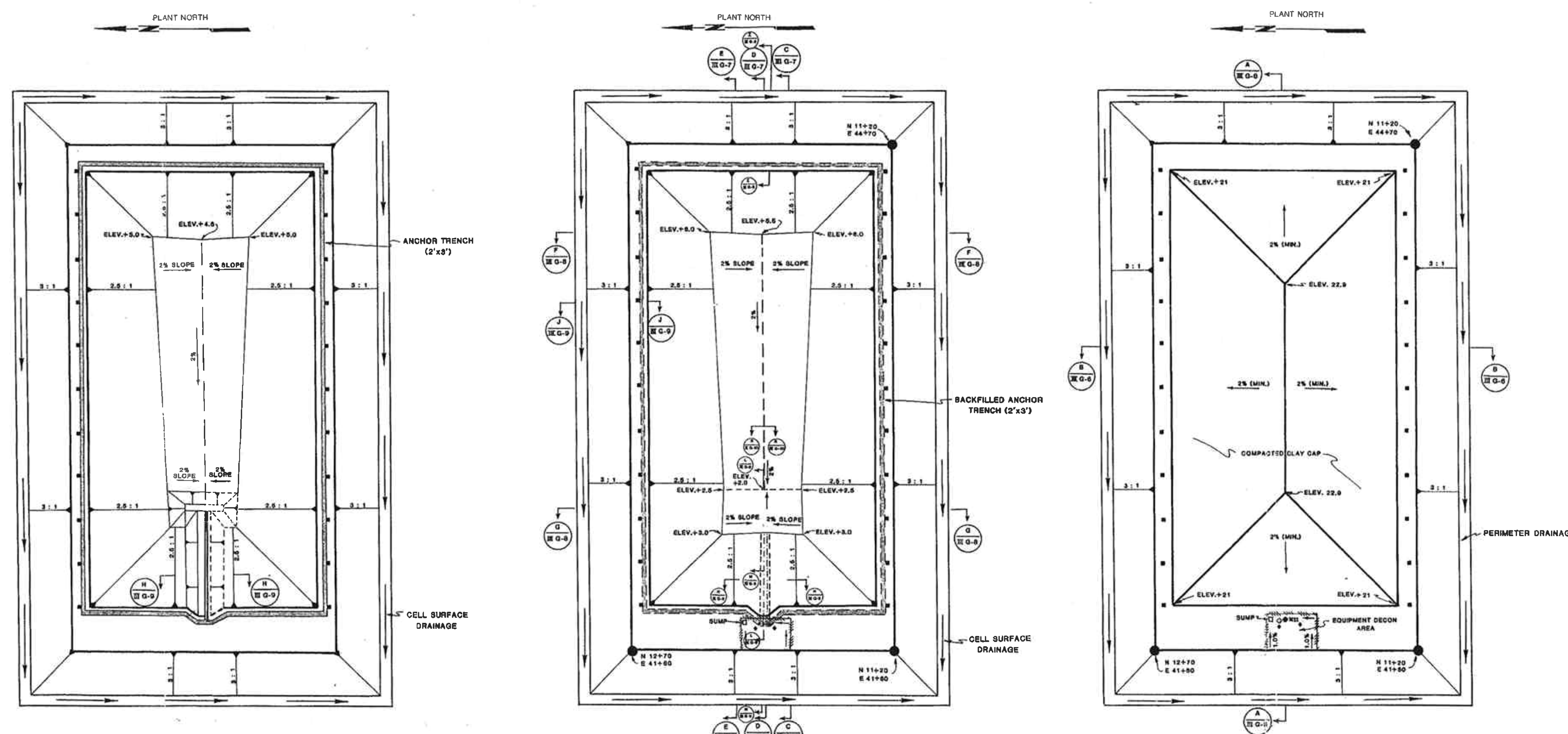
Geotechnical Consultants
Houston, Texas

SCALE NOTED	MADE SMH	DATE 9-24-90	FILE NO. 90-0323
	CHECK ADC/IMR	DATE 9-24-90	
PLAN VIEW - CELL EXCAVATION & CLAY LINER			Figure V.3.3



TOP OF SECONDARY
LEACHATE DETECTION SYSTEM

TOP OF PRIMARY
LEACHATE COLLECTION SYSTEM

TOP OF COMPACTED
CLAY CAP AT CLOSURE

LEGEND:

- SECONDARY COLLECTION SYSTEM RISER LOCATION
- PRIMARY COLLECTION SYSTEM RISER LOCATION
- PROTECTION POSTS
- CONCRETE BERM
- SURVEY CONTROL POINT
- CONCRETE PIERS
- CELL SURFACE DRAINAGE
- CROSS SECTION H-H ATTACHMENT G-10

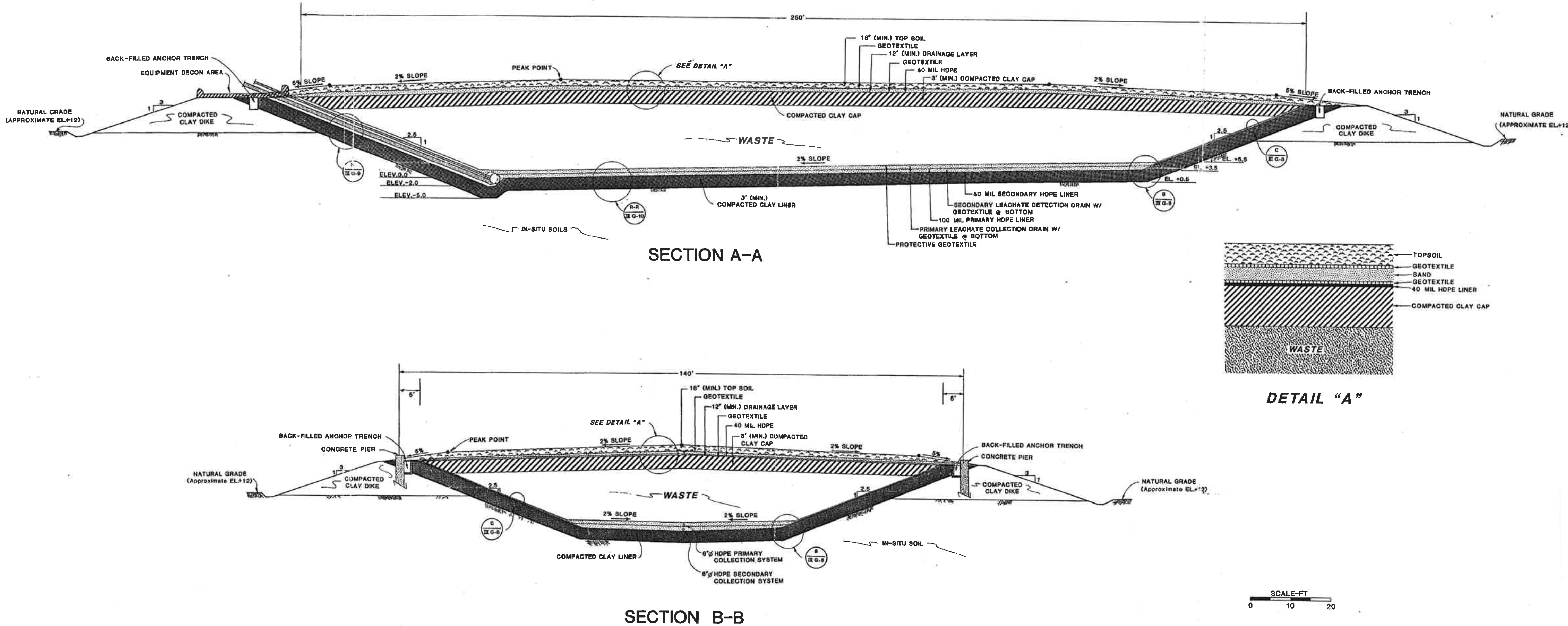
NOTES:

1. GRAVEL & SAND SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR "GRAVEL" AND "SAND" IN SECTION 02263 OF CONSTRUCTION SPECIFICATIONS.

2. LEACHATE COLLECTION AND DETECTION RISERS SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS IN SECTION 02050 OF CONSTRUCTION SPECIFICATIONS.

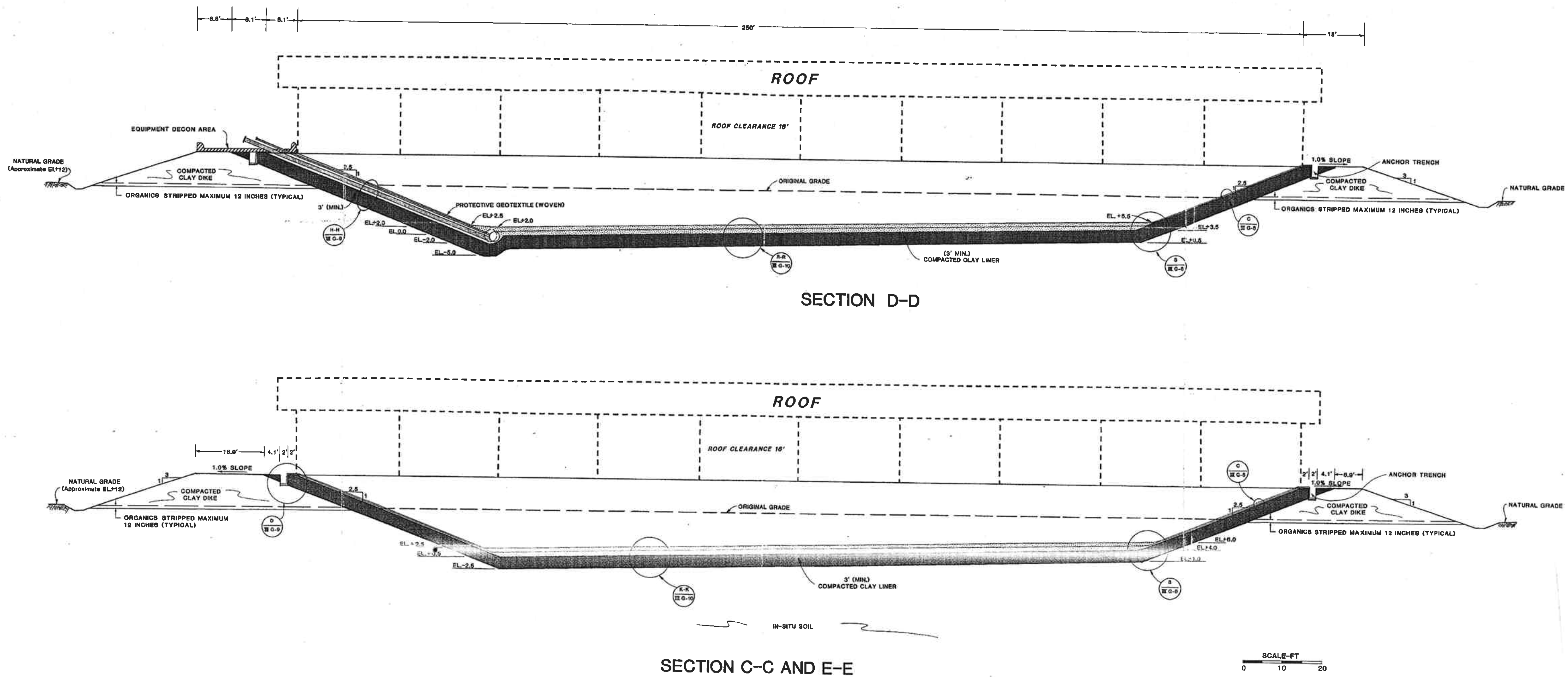
SCALE-FT
0 30 60

HAZARDOUS WASTE DISPOSAL CELL PERMIT NO. HW-50189-001	McBride-Ratcliff and Associates, Inc. Geotechnical Consultants Houston, Texas			
MONSANTO CHOCOLATE BAYOU PLANT	SCALE NOTED	MADE SMH CHECK ADC/IMR	DATE 9-24-90 DATE 9-24-90	FILE NO. 90-0323
	PLAN VIEW - LEACHATE DETECTION & COLLECTION SYSTEM			Figure V.3.4

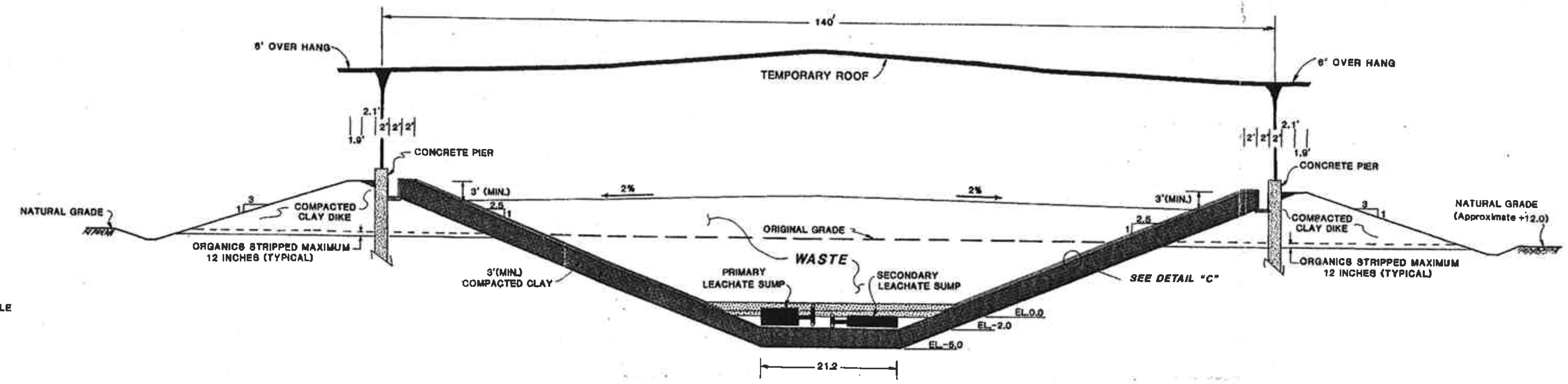


NOTE: COMPACTED CLAY CAP CONSTRUCTION NOT PART OF THIS CONTRACT.

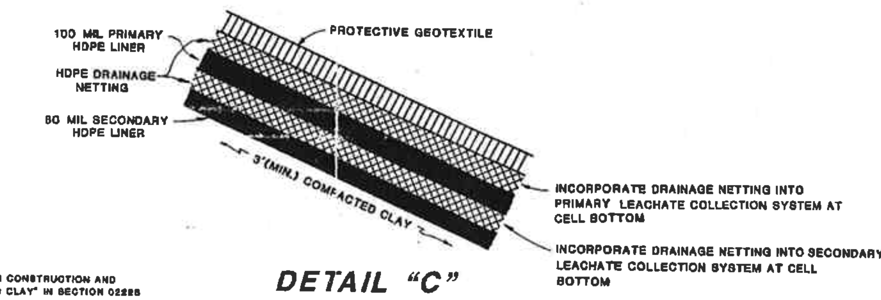
HAZARDOUS WASTE DISPOSAL CELL PERMIT NO. HW-50189-001	McBride-Ratcliff and Associates, Inc. Geotechnical Consultants Houston, Texas
MONSANTO CHOCOLATE BAYOU PLANT	SCALE NOTED · MADE SMH/LLD · DATE 9-24-90 · CHECK ADC/IMR · DATE 9-24-90 · FILE NO. 90-0323 CELL CROSS-SECTION W/ FINAL COVER · Figure V.3.5



HAZARDOUS WASTE DISPOSAL CELL PERMIT NO. HW-50189-001	McBride-Ratcliff and Associates, Inc. Geotechnical Consultants Houston, Texas
MONSANTO CHOCOLATE BAYOU PLANT	SCALE NOTED; MADE SMH/DLQ DATE 9-25-90; CHECK ADC/IMR DATE 9-25-90; FILE NO. 90-0323 CELL CROSS-SECTIONS — Figure V.3.6



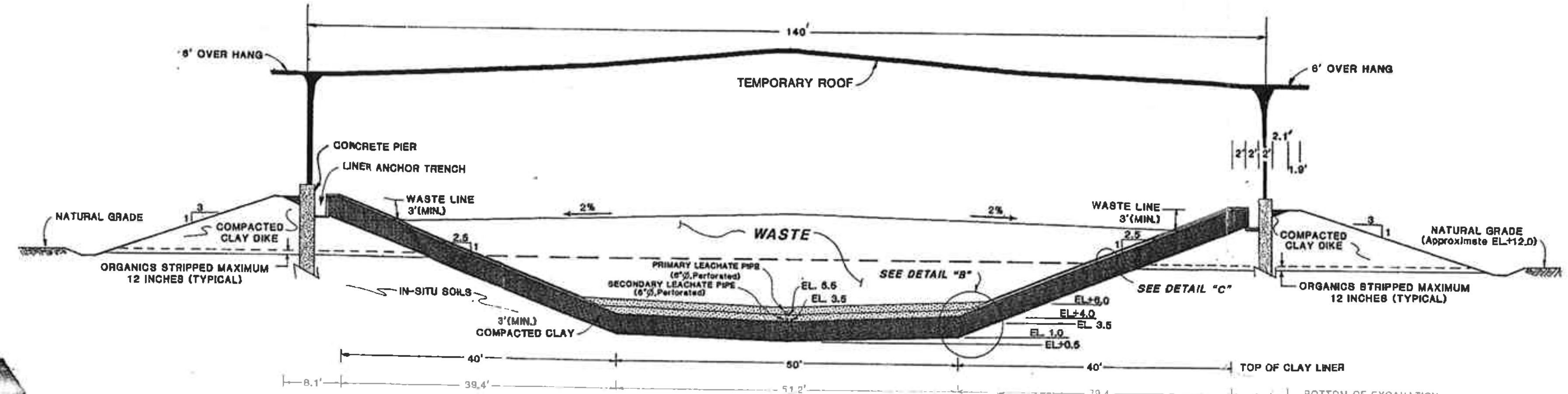
SECTION G-G



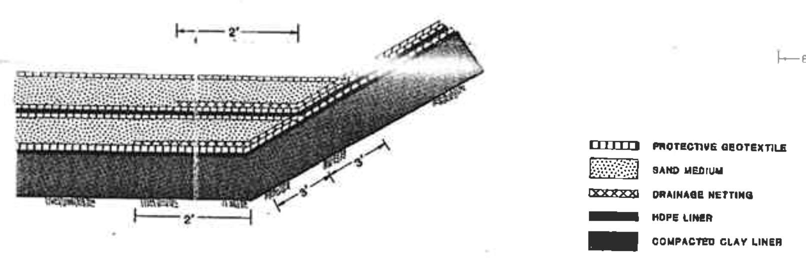
DETAIL "C"

NOTES:

1. CLAY LINER SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR "COMPACTED CLAY" IN SECTION 02225 OF CONSTRUCTION SPECIFICATIONS.
2. GRAVEL SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR "GRAVEL" IN SECTION 02226 OF CONSTRUCTION SPECIFICATIONS.
3. GEOTEXTILE FABRIC SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS IN SECTION 02020 OF CONSTRUCTION SPECIFICATIONS.
4. HDPE LINER SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR "GEOMEMBRANES" IN SECTION 02010 OF CONSTRUCTION SPECIFICATIONS.
5. GEOTEXTILE FABRIC THICKNESS NOT TO SCALE.
6. SYNTHETIC DRAINAGE NET SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR "GEONETS" IN SECTION 02050 OF CONSTRUCTION SPECIFICATIONS.



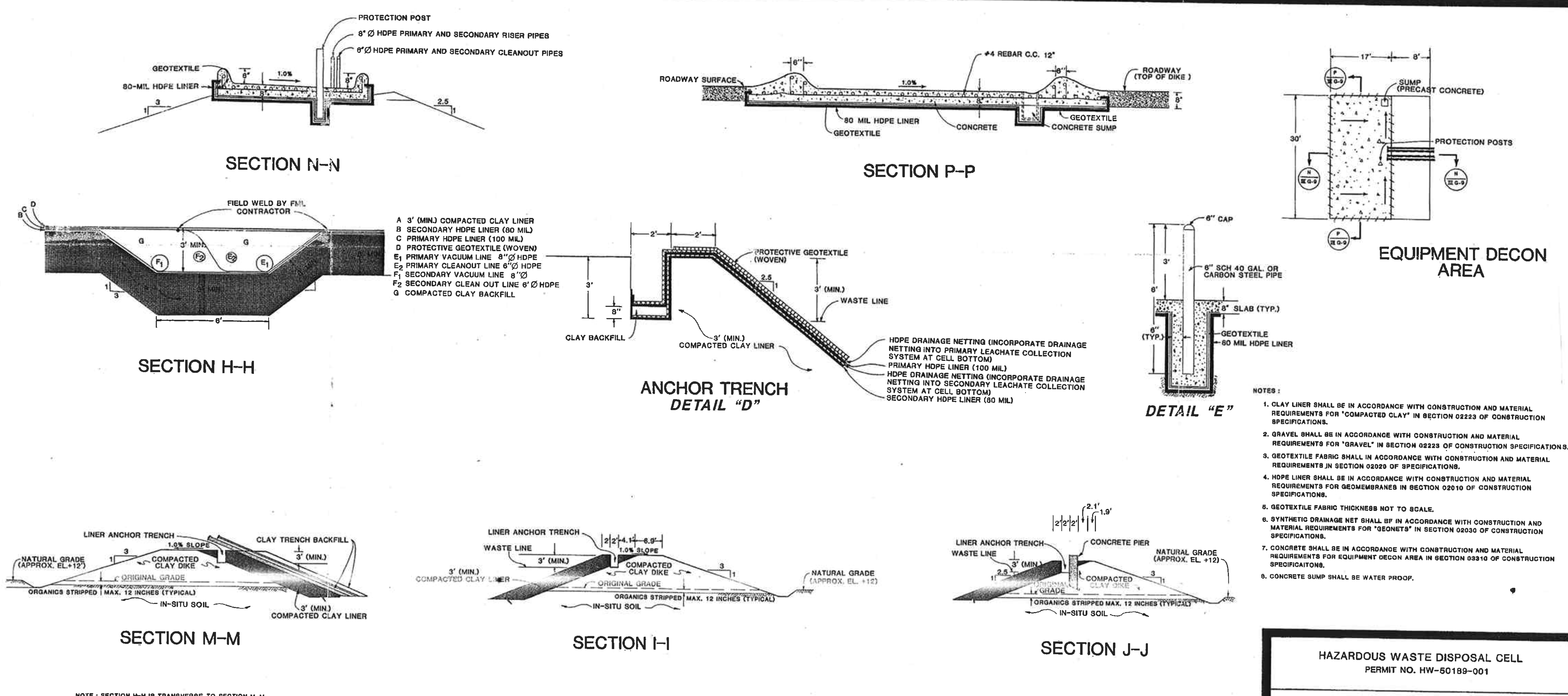
SECTION F-F



SCALE-FT
0 10 20

DETAIL "B"

HAZARDOUS WASTE DISPOSAL CELL PERMIT NO. HW-50189-001	McBride-Ratcliff and Associates, Inc. Geotechnical Consultants Houston, Texas
MONSANTO CHOCOLATE BAYOU PLANT	SCALE NOTED · MADE SMH DATE 9-24-90 · CHECK ADC/IMR DATE 9-24-90 · FILE NO. 90-0323
	CELL CROSS-SECTIONS · Figure V.3.7



NOTES :

1. CLAY LINER SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR "COMPACTED CLAY" IN SECTION 02223 OF CONSTRUCTION SPECIFICATIONS.
2. GRAVEL SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR "GRAVEL" IN SECTION 02223 OF CONSTRUCTION SPECIFICATIONS.
3. GEOTEXTILE FABRIC SHALL IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS IN SECTION 02020 OF SPECIFICATIONS.
4. HDPE LINER SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR GEOMEMBRANES IN SECTION 02010 OF CONSTRUCTION SPECIFICATIONS.
5. GEOTEXTILE FABRIC THICKNESS NOT TO SCALE.
6. SYNTHETIC DRAINAGE NET SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR "GEONETS" IN SECTION 02030 OF CONSTRUCTION SPECIFICATIONS.
7. CONCRETE SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR EQUIPMENT DECON AREA IN SECTION 03310 OF CONSTRUCTION SPECIFICAITONS.
8. CONCRETE SUMP SHALL BE WATER PROOF.

HAZARDOUS WASTE DISPOSAL CELL
PERMIT NO. HW-50189-001

MONSANTO
CHOCOLATE BAYOU PLANT

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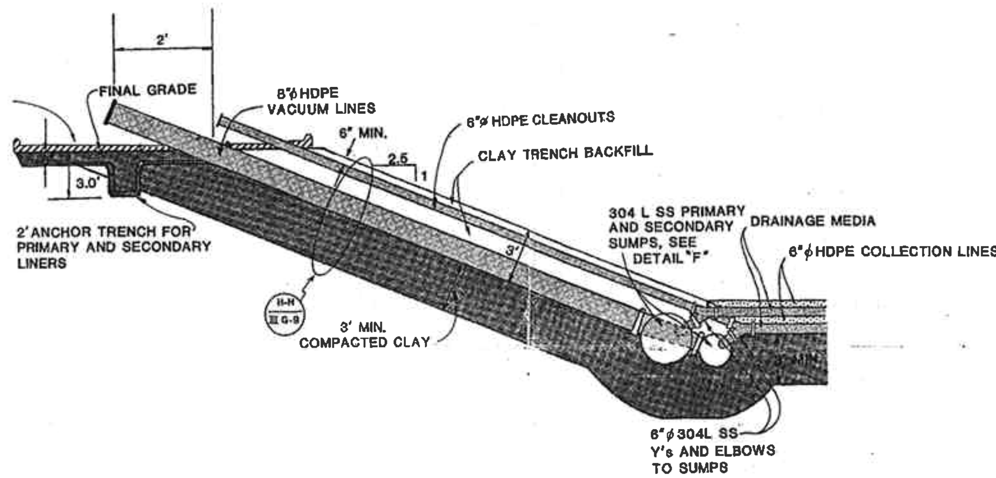
Houston, Texas

SCALE	MADE	LLD	DATE	9-24-90	FILE NO.
NONE	CHECK	ADC/IMR	DATE	9-24-90	90-0323

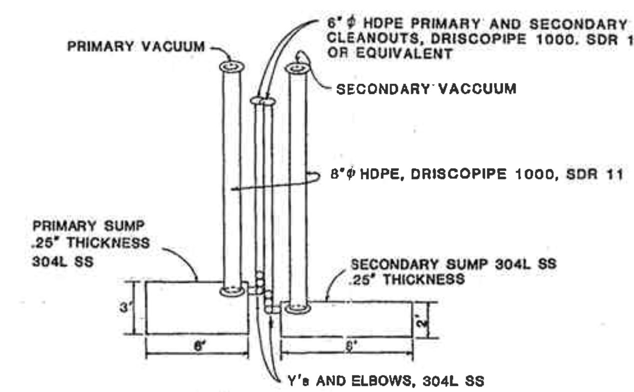
CELL CONSTRUCTION DETAILS — Figure V.3.8

NOTES:

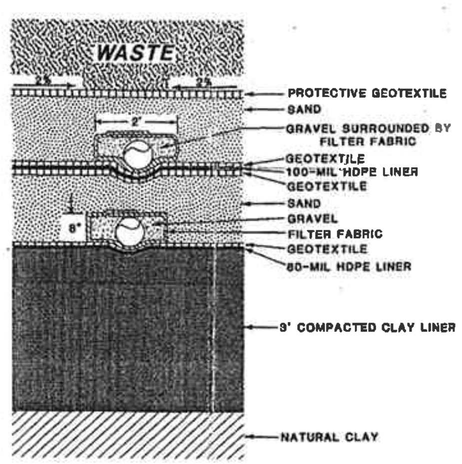
1. CLAY LINER SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR "COMPACTED CLAY" IN SECTION 02223 OF CONSTRUCTION SPECIFICATIONS.
2. GRAVEL SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR "GRAVEL" IN SECTION 02228 OF CONSTRUCTION SPECIFICATIONS.
3. SAND SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR "SAND" IN SECTION 02229 OF CONSTRUCTION SPECIFICATIONS.
4. GEOTEXTILE FABRIC SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS IN SECTION 02020 OF CONSTRUCTION SPECIFICATIONS.
5. HDPE LINER SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR "GEOMEMBRANES" IN SECTION 02010 OF CONSTRUCTION SPECIFICATIONS.
6. GEOTEXTILE FABRIC THICKNESS NOT TO SCALE.
7. SYNTHETIC DRAINAGE NET SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS FOR "GEONETS" IN SECTION 02030 OF CONSTRUCTION SPECIFICATIONS.
8. HDPE RISER PIPE SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND MATERIAL REQUIREMENTS IN SECTION 02050 OF CONSTRUCTION SPECIFICATIONS.
9. OWNER SHALL PROVIDE AND INSTALL LIQUID LEVEL DETECTION EQUIPMENT IN EACH SUMP FOR MONITORING PURPOSES.



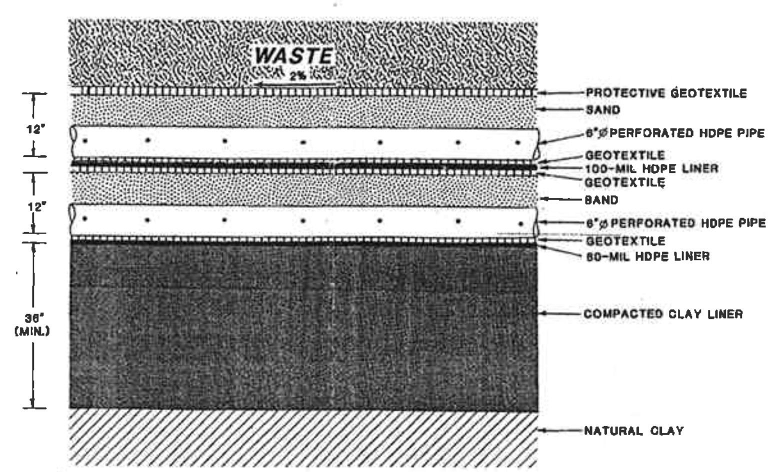
SECTION L–L



DETAIL "F"



SECTION K–K



SECTION R–R

HAZARDOUS WASTE DISPOSAL CELL
PERMIT NO. HW-50189-001

MONSANTO
CHOCOLATE BAYOU PLANT

McBride-Ratcliff and Associates, Inc.
Geotechnical Consultants
Houston, Texas

SCALE	MADE SMH/DLQ CHECK ADC/IMR	DATE 9-24-90 DATE 9-24-90	FILE NO. 90-0323
LEACHATE COLLECTION AND DETECTION SYSTEM DETAILS			Figure V.3.9

ATTACHMENT V.7
ENGINEERING REPORT FOR
ACTIVE LANDFILL (PERMIT UNIT 02)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDICES

ATTACHMENT V.7
ENGINEERING REPORT FOR
ACTIVE LANDFILL (PERMIT UNIT 02)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.7.1

ATTACHMENT III.G-12

CONSTRUCTION QUALITY ASSURANCE PLAN

1. Soil Liner and Perimeter Dike

Representative preliminary samples will be collected from approved onsite material sources prior to the placement of the dike and soil liners.

The minimum soil laboratory testing parameters for the materials considered for liner construction will be as follows:

a. Sieve Analysis - 40 and 200 mesh (ASTM D 422 and ASTM D 1140)

b. Atterberg Limits - ASTM D 4318

c. Permeability - (1) Constant Head, ASTM D 2434
(2) Appendix VII of the Corps of Engineers Manual EM - 1110-2-1906, 30 Nov. 1970, Laboratory Soils Testing. or ASTM D5084

d. Moisture-Density Compaction - Tests will be performed under ASTM D 698 test procedures. Once the maximum density has been determined, a sample will be compacted at 95% of the maximum compacted dry density, and a permeability test performed on the test sample. The maximum permeability for the three foot thick clay liner is 1×10^{-7} cm/sec. Upon achieving the specified coefficient of permeability or less, the density value of the compacted sample and its optimum moisture content will be considered the minimum acceptable for field density checks of that particular compacted liner. All compacted soil liner and dike material will be tested and evaluated in accordance with the following testing procedures:

(1.) Field Density - A minimum of one test per 5,000 square feet of surface area lining per 6 inch compacted lift or every 500 cubic yards of compacted dike material. (Nuclear Density Gauge Method ASTM D 2922).

(2.) Sieve Analysis - A minimum of one test per each ten field density tests (40 and 200 mesh (ASTM D-422)).

(3.) Atterberg Limits - A minimum of one test per ten field density tests (ASTM D 4318).

(4.) Coefficient of Permeability - A minimum of two undisturbed samples of clay liner will be tested for laboratory coefficient of permeability for each five (5) density tests. These tests will be performed in accordance with test method 1.c.(2) detailed above.

(5.) Thickness Verification - A minimum of one test per 5,000 square feet of surface area. Thickness verification will be performed by surveying methods to establish ground elevation prior to the initiation of liner placement and periodically thereafter.

Prior to the placement of any waste material into a disposal cell, a construction certification report for the disposal cell will be submitted to the Texas Water Commission by an engineer registered in the State of Texas.

2. <u>Soil Drainage and Collection Layers</u>

Representative, preliminary samples will be collected from material sources prior to the placement of the proposed drainage and filter layers. Whenever the source of the gravel or sand changes, samples of the new materials will be tested before being used. If multiple sources are to be used, then each source will be tested separately and the test data used for quality control planning during layer construction.

All soil drainage and collection layer material will be tested and evaluated in accordance with the following testing requirements:

a. Sieve Analysis - A minimum rate of one test per 5,000 square feet (40 and 200 mesh (ASTM D 422 and ASTM D 1140).

b. Hydraulic Conductivity - Performed on samples compacted so as to conservatively estimate the hydraulic conductivity of the layer after consolidation due to landfill activities and overlying materials. Two representative samples from the drainage layer material and from the collection layer material per cell (width) will be tested by ASTM D 2434 (constant head).

c. Thickness Determination - A minimum rate of one determination for every 5,000 square feet of layer installed by the method described for the clay liner.

3. Geotextile, Geomembrane, and HDPE

This document contains specifications relating to: (i) installation; (ii) inspection; and (iii) acceptance of installation and long-term monitoring, of the 80 and 100 mil thick High Density Polyethylene (HDPE) geomembranes to be installed at the Monsanto hazardous waste landfill site at Chocolate Bayou, Texas.

These specifications have recognized the need to verify that the installed HDPE geomembrane provides containment of hazardous waste. This recognition resulted in requirements for thorough quality control during geomembrane installation, and systematic documentation of that installation. Further, the recognition of the parties involved in geomembrane installation and the need for these parties to agree on individual responsibilities has been highlighted.

Parties who may be involved with geomembrane installation include: Designer, Earthwork Constructor, Geomembrane Installer, Geomembrane Manufacturer, Inspector, Monitor, Owner, Regulatory Authority, and Specifier. These terms are defined in the Appendix. Each of these parties may be involved in geomembrane installation. Responsibilities defined for one party may be assumed by another party (ie, the Geomembrane Manufacturer may also be the Geomembrane Installer).

a. Installation of Geomembrane

(1) Definition of Responsibilities

All parties involved with geomembrane installation shall attend a meeting held prior to installation of any geomembrane. The purpose of this meeting is to: (i) define the responsibilities of each party; (ii) establish lines of authority and lines of communication; (iii) establish site specific quality control and monitoring procedures; and (iv) define the method of acceptance of the completed liner. The meeting shall be documented and minutes transmitted to all parties.

(2) Surface Preparation

The upper 0.1 m (4 in.) of the supporting soil shall not contain stones, roots, sticks, sharp objects or debris larger than 22 mm (1 in.). The surface to be lined shall be rolled with a smooth drum steel or pneumatic roller so as to be free of irregularities, loose earth, and abrupt changes in grade. The surface preparation shall be done by the Earthwork Constructor. The Geomembrane Installer shall certify in writing that the surface on which the geomembrane is to be installed is acceptable. Thereafter, the Geomembrane Installer shall provide the necessary equipment and personnel to maintain an acceptable soil surface during geomembrane installation.

Special care must be taken to maintain the prepared supporting soil surface. The surface will be maintained at or slightly above optimum moisture content and be free of desiccation cracks prior to placement of the overlaying geomembrane liner. Verification testing and modifications to moisture content will be performed for the compacted clay liner during soil compaction activities at least every seven (7) days until placement of the overlying components of the liner system. Final soil moisture content determinations will be performed for the clay liner within 24 hours of placement of the overlying components of the liner system. The FML will be placed directly above and in direct contact with the compacted clay liner. At a minimum, soil moisture content will be measured at six (6) inch depths at a minimum rate of one test per 5,000 square feet of soil liner.

(3) Handling of Geomembranes

(a) Packaging - Geomembrane rolls shall be packaged and labeled prior to shipment to the site. The label shall indicate the Geomembrane Manufacturer, type of geomembrane, thickness, and roll number.

(b) Transportation - When transported to the site, geomembrane rolls shall be handled by appropriate means so that no damage is caused. Transportation shall be the responsibility of the Geomembrane Manufacturer.

(c) On-site Storage - Once on-site, storage of the geomembrane is the responsibility of the Geomembrane Installer. The geomembrane shall be protected from direct sunlight and heat to prevent degradation of the geomembrane material and adhesion of individual whorls of a roll. Adequate measures shall be taken to keep geomembrane materials away from possible deteriorating sources.

(d) On-site Handling - On-site handling of the geomembrane is the responsibility of the Geomembrane Installer. Appropriate handling equipment shall be used when moving rolled geomembranes from one place to another. Instructions for moving the geomembranes shall be given by the Geomembrane Installer to the workers and shall be approved by the Monitor.

(e) Panel Placement - Each roll shall be redesignated with a panel number. A panel is the unit area of in-place membrane which is to be seamed (ie, one roll may be cut into several panels). The geomembrane shall be positioned on the site as shown in the layout drawings. Instructions on wrapping containing the geomembrane materials shall be followed to assure the panels are unrolled in the proper direction for seaming. Only the parcels which are to be anchored or seamed together in one day shall be unrolled. Care shall be exercised to not damage the geomembrane during this operation. All workers shall wear shoes which will not damage the geomembrane. Pulling geomembrane panels shall be minimized to reduce permanent tension. The following precautions should be taken to minimize the risk of damage by wind during panel placement:

- No more than one panel should be unrolled prior to seaming (unless authorized by the Monitor);
- Work shall be oriented according to the direction of prevailing winds if possible, unless otherwise specified;
- Adequate loading on geomembrane panels to prevent uplift by wind shall be provided by sand bags, tires or any other means which will not damage the geomembrane. Along the edges, loading shall be continuous, to avoid possible wind flow under the panels.

Any panels, which, in the judgement of the Monitor, become seriously damaged (torn or twisted permanently), shall be replaced. Less serious damage should be repaired.

Geomembrane placement shall not proceed at an ambient temperature below 5°C (41°F) or above 35°C (95°F), unless otherwise specified.

Geomembrane placement shall not be done when raining nor in an area of ponded water.

The geomembrane roll shall be installed so that there will be neither tension nor wrinkles at the average expected temperature of the final use condition.

(4) Considerations of Site Geometry - Layout Drawings - The Geomembrane Installer shall produce layout drawings of the proposed geomembrane placement pattern and seams prior to geomembrane placement. The layout drawings shall indicate the panel configuration, panel number, and location of seams and shall tie into the site coordinate system in such a way that all test locations can be identified and relocated.

(5) Field Seaming

(a) Requirements of Personnel - All personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests.

At least one seamer shall have experience seaming at least one hundred thousand m^2 (1 million sq. ft.) of HDPE geomembranes using the same type of seaming method. This master seamer shall provide direct supervision over apprentice seamers.

Apprentice seamers shall be qualified by attending training sessions taught by the master seamer and performing at least two successful seaming tests under similar weather conditions using the seaming method used for actual field operation (production seaming).

(b) Overlapping - Adjacent panels of the primary geomembrane liner and of the cap geomembrane shall be overlapped a minimum of 75 mm (3 in.) Wherever in contact with geomembranes, geotextiles shall be spot seamed at their edges of the geomembrane at a minimum of 1 m (3 ft.) intervals.

(c) Preparation - Prior to seaming, the seam area shall be clean and free of moisture, dust, dirt, debris of any kind, and foreign material. The seam overlaps shall be abraded according to the Geomembrane Manufacturer's instructions when required.

(d) Seaming Equipment - Each seaming unit must include thermometers giving the temperature of the extradite in the machine and at the nozzle.

(e) Weather Conditions for Seaming - Weather conditions required for seaming are as follows: (i) no weld shall be done below 1°C (34°F); (ii) between 1°C (34°F) and 10°C (50°F), seaming is possible if the geomembrane is preheated by either sun or hot air device, and if there is not excessive cooling results from wind (as determined by the Monitor); and (iii) above 10°C (50°F), no preheating is required. In all cases, the geomembrane shall be dry.

b. Installation of the Leachate Collection System Materials

(1) Granular Drain Materials - Granular drain materials used as a leachate collection system shall be placed by the Geomembrane Installer or Earthwork Constructor at the direct supervision of the Geomembrane Installer in a manner so as not to damage the geomembrane.

Placement of the leachate collection granular drain materials shall commence after the appropriate leachate collection sump structures have been installed, and installation of the protective geotextile has been advanced far enough to prevent any leachate collection granular drain materials from being in direct contact with the geomembrane.

The full design thickness of the leachate collection granular drain materials shall be maintained when spreading the material. Leachate collection granular drain material shall be maintained when spreading. the material. Leachate collection granular drain material shall be placed using tracked vehicles no larger than a D-6 dozer. The tracked vehicles shall spread the leachate collection granular drain material in such a manner that the tracks will be supported by a minimum of 1 ft of the granular drain material at all times. Tracked vehicles shall not be allowed to turn by locking-up of one track. Waste shall be similarly placed and tracked vehicles shall be supported by a minimum of 1 ft of waste thickness above the top of the leachate collection granular drain material and geotextile filter. Rubber-tired vehicles may be used to spread waste after a minimum uniform depth of 2 ft has been achieved above the top of leachate collection granular drain layer.

The layer of the leachate collection granular drain material shall be compacted using the tracked bull-dozer. The Monitor shall obtain direct layer thickness measurements to verify conformance with design drawing requirements.

(2) Geotextiles - Geotextiles shall be overlapped 0.1 m (4 in.) unless otherwise specified. The overlaps shall be continuously sewn so as to avoid infiltration of leachate collection granular drain materials or

waste through the overlaps when spreading these materials. In general, overlaps shall be oriented parallel to the lines of maximum slope.

During placement of the protective geotextile, care should be taken not to entrap leachate collection granular drain materials between the protective geotextile and the geomembrane.

Construction equipment shall not be allowed to roll on the geotextiles.

c. Inspection and Quality Control

(1) Materials. Documents, pertaining to both the raw materials used to manufacture the geomembrane and the geomembrane rolls, and indicating that the geomembrane rolls delivered to the site have successfully passed the quality control tests, shall be required from the Geomembrane Manufacturer. These shall be supplied to the Monitor by the Geomembrane Manufacturer prior to installation.

These documents shall be reviewed by the Monitor to verify that a certificate has been received for all rolls.

(2) Transportation, Handling, and Placement

Upon arrival at the site, the Geomembrane Installer and Monitor shall inspect all materials for defects in the manufacturing process and for damage during transportation. Materials judged by the Monitor to be severely damaged shall be rejected and removed from the site. Minor damages and other defects shall be repaired.

The Monitor shall inspect each panel, after placement and prior to seaming, for damage caused by placement operation or by wind. Damaged panels or portions of damaged panels which have been rejected, as judged by the Monitor, shall be marked and their removal from the work area recorded.

The Monitor shall also verify that the weather conditions (air temperature, non-excessive wind, and lack of precipitation) are acceptable for panel placement.

(3) Field Seaming Operations - The Monitor shall verify that:

- The seaming personnel have the qualifications required.

- The overlaps meet the requirements.
- The seaming area is clean.
- Seaming equipment is available on the site and meet the requirements.
- Weather conditions for seaming are acceptable.
- Seaming procedures are followed.
- The panels are properly positioned to minimize wrinkling and wrinkled areas are properly repaired.
- All cap-strips required are placed.
- Equipment for testing seams is available on-site.

(4) Test Seams - Test seams shall be made and tested during installation to verify that seaming conditions are adequate. Test seams shall be made at least two times each day at the beginning of the morning and the beginning of the afternoon) and at other times specified by the monitor, for each piece of seaming equipment used that day. Also, each seamer shall perform at least one test seam each day. Test seaming shall be performed under the same conditions as production seams. The test seam shall be at least 0.6 m (2 ft) long.

The Monitor shall observe all test seams. A sample from each test seam shall be retained and labeled with the date, ambient temperature, number of seaming unit, seamer, and pass or fail description. One half of the sample shall be given to the Geomembrane Installer for subsequent laboratory testing and the other half retained by the Monitor.

(5) Non-Destructive Seam Testing - All field seams shall be non-destructively tested over their full length. Each seam shall be numbered or otherwise designated. The location, date, test unit, name of tester, and outcome of all non-destructive testing shall be recorded by the Monitor.

The Monitor shall observe all testing. Testing shall be done as the seaming work progresses, not at the completion of all field seaming. All defects found during testing shall be numbered and marked immediately after detection. All defects found shall be repaired, retested, and remarked to indicate completion of the repair and acceptability.

(6) Identification of Defects

All seams and non-seam areas of the geomembrane shall be inspected for identification of defects, holes, blisters, undispersed raw materials and any sign of contamination by foreign matter.

The surface of the geomembrane shall be clean at the times of inspection. Brooming and/or washing of the geomembrane surface shall be required if the amount of surface dust or mud inhibits inspection.

(7) Documentation

(a) Materials - The documents pertaining to raw materials and manufactured geomembrane rolls required shall be provided by the Geomembrane Manufacturer to the Monitor prior to installation. The Monitor shall review the test results, included in these documents, for completeness and for compliance with the required minimum properties for both the raw materials, and manufactured geomembrane rolls. Materials and rolls which are in non-compliance with the minimum required properties shall be rejected.

(b) Surface Preparation Certificate- The Geomembrane Installer shall provide the certification of acceptance of surface preparation to the Monitor prior to any geomembrane installation. Thereafter the Geomembrane Installer shall provide the Monitor written acceptance daily for the surface to be covered by geomembrane in that days operations.

(c) Daily Field Installation Reports - The Geomembrane Installer shall provide the Monitor with daily reports of: (i) the total amount and location of geomembrane placed; (ii) total amount and location of seams completed and seamer and unit used; (iii) changes in layout drawings; (iv) results of test seams; (v) location and results of non-destructive testing; (vi) location and results of repairs and; (vii) location of destructive test samples.

The Monitor shall record daily all activities of the geomembrane installation, which shall include but not be limited to:

- receipt of the written daily acceptance of surface preparation from the Geomembrane Installer;
- observations of all geomembrane placement activities and record of defects caused during transportation and handling;

- observations of test seams, including seaming unit member, names of seamers, weather conditions and results;
- observations of both run-on diversion dike and toe dike construction including compaction;
- observations of field seaming operations, including weather conditions, cleaning, overlaps, rate of seaming, names of seamers and units used;
- observations of seams around appurtenances, and connections to appurtenances;
- observations of non-destructive seam testing, including testing location, location of defects and testing unit used;
- observations of repairs and retesting, including locations, name of repairer and seaming equipment or product used.

d. Acceptance of Installation of Long Term Geomembrane Monitoring

The geomembrane liner shall be accepted by the Monitor when: (i) the installation is finished; (ii) all documentation of installation is completed; and (iii) verification of the adequacy of all field seams and repairs, and associated testing is complete.

A passing test seam shall be an indicator of the adequacy of the seaming unit and seamer working under prevailing site conditions, but not necessarily an indicator of seam adequacy. A passing non-destructive test of seams and repairs shall be taken to indicate the adequacy of field seams and repairs. If the laboratory tests of the field test seams fail, they shall be taken as an indicator of the possible inadequacy of the entire seamed length corresponding to the test seam. Destructive test portions shall then be taken by the Geomembrane Installer at locations suggested by the Monitor and the same laboratory tests required of test seams shall be performed. Passing tests shall be taken as an indicator of adequate seams. Failing tests shall be an indicator of nonadequate seams and all seams represented by the destructive test location shall be repaired with a cap-strip. Any cap-strip shall be non-destructively tested and repaired, as required, until adequacy of the seams is achieved.

4. Final Cover

a. Compacted Clay Cap - clay rich soils used for the final cover shall meet all specifications and undergo all quality control tests listed for the soil liner under Section 1 of this attachment with the exception that one hydraulic conductivity test will be conducted for each completed two lifts.

b. Geotextile and Geomembrane - A protective geotextile and a 40 mil HDPE flexible membrane liner will cover the compacted clay cap. Geotextile and geomembrane shall meet all specifications and undergo all quality control tests listed in Section 3 of this attachment.

c. Drainage Layer - A nominal 12 in. thick layer of free draining granular material will be placed over the synthetic liner. These materials shall meet quality control tests and specifications listed in Section 2 of this attachment.

d. Topsoil - The topsoil layer shall be checked for thickness at a minimum of one test per 5000 square feet of surface area. Thickness verification will be performed by surveying techniques.

APPENDIX

Definition of Terms

Designer	-	The organization or person who generated the design drawings and plans of the geomembrane system including the supporting soil.
Earthwork Contractor	-	The organization which is responsible for the preparation of the surface on which the geomembrane is to be installed; also the party responsible for placing the granular materials over the installed geomembrane.
Geomembrane Installer	-	The organization responsible for field unrolling, placing, seaming and other site aspects of the geomembrane construction.
Geomembrane Manufacturing	-	The organization responsible for production of geomembrane rolls from raw materials.
Inspector	-	A person who observed the geomembrane construction but is not responsible for the monitoring, testing or documentation.
Monitor	-	The organization or person independent of the Geomembrane Manufacturer, and Installer that is responsible for observing and documenting most activities and testing and approving certain other activities relating to geomembrane placement.
Owner	-	The organization or person that owns the hazardous waste disposal facility.
Regulatory Authority	-	The organization responsible for issuing a permit for the completed waste disposal facility.

Specifier - The organization or person who generated the specifications for the geomembrane construction.

ATTACHMENT V.7
ENGINEERING REPORT FOR
ACTIVE LANDFILL (PERMIT UNIT 02)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.7.2

Appendix V.7.2 Dike Slope Stability Analysis For Active Landfill

ATTACHMENT III.G-14

PROPOSAL HAZARDOUS WASTE LANDFILL

CALCULATIONS AND DISCUSSIONS

1. Dike Slope Stability Analysis

The sliding stability of the landfill slope was evaluated using circular arc analyses. A critical slope profile with slope declivity of 1(V):2.5(H), as shown in Figure 1, was selected for sliding stability analyses.

Soil Parameters. Stability analyses were conducted for long-term stress conditions. The long-term conditions represent the case where induced pore pressures within the cohesive soils have dissipated and drained shear strength parameters are in effect. We used a drained shear strength, c, of 75 psf and angle of interval friction, Ø, of 22° for the compacted clays. The respective c and Ø used for the natural clays are 200 psf and 20°. The groundwater level was set at the slope toe elevation with a water lag of 11 ft, which is at the interface of the compacted clays and natural clays, assumed for the analyses.

Results. The result of our stability analyses are shown on Figure 1. A minimum factor of safety of 1.68 was found for the selected slope geometry. Standards for acceptable safety factors for slopes in landfill sites are generally at least 1.5. The computed safety factor of 1.68 is above the commonly applied standard.

2. Hydrostatic and Hydrodynamic Analyses

The landfill is located within the 100 yr. floodplain as designated by the Federal Emergency Management Agency. The floodplain for the 24 hr. 100 yr. storm is Elevation 15.0 msl. The elevation of the perimeter dikes is at least Elevation 20.0 msl. The area is designated in a zone which implies that the area is not subject to the velocity effects of flooding. Dissipation of the flood waters will be rapid and will not have time to saturate the dikes or cause a "rapid drawdown" failure.

3. Dike Piping and Scouring

a. Dike Piping - In order for piping to occur, a sufficient head will have to be maintained against the soil to overcome the cohesiveness of the soil. In order to maintain this head, failure of the leachate collection system and the primary and secondary geomembranes would have to occur simultaneously. This is considered highly improbable.

b. Scouring - Minimal scour of the exterior slopes should occur since the slopes are constructed at 3:1 (3 horizontal/1 vertical).

4. Anchor Trench Design

A method for calculating anchor capacity for FML anchorage is presented in US EPA - CE RI 88-33, Seminars on Requirements for Hazardous Waste Landfill Design, Construction, and Closure. This reference considers soil/FML friction angle, soil friction angle, slope angle, embedment length (L), soil cover and anchor burial depth (d), and soil unit weight.

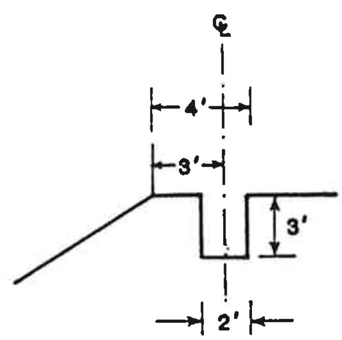
The only variables in considering the equivalency of the actual anchorage and the permit design is the embedment length (L) and the anchor burial depth (d). Combining the constants, the anchor capacity (T) is calculated as follows:

$$T=\frac{K_1(L)(60d^2+60d)}{K_2}$$

Where K_1 and K_2 are constants for the permit and proposed construction cases.

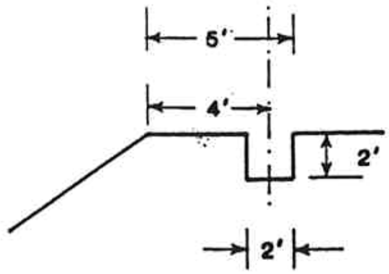
Proposed:

$$T=\frac{K_1(L)(60d^2+60d)}{K_2}$$



$$\frac{4(K_1)(60x3^2+60x3)}{K_2}=\frac{4(K_1)720}{K_2}=\frac{2,880K_1}{K_2}$$

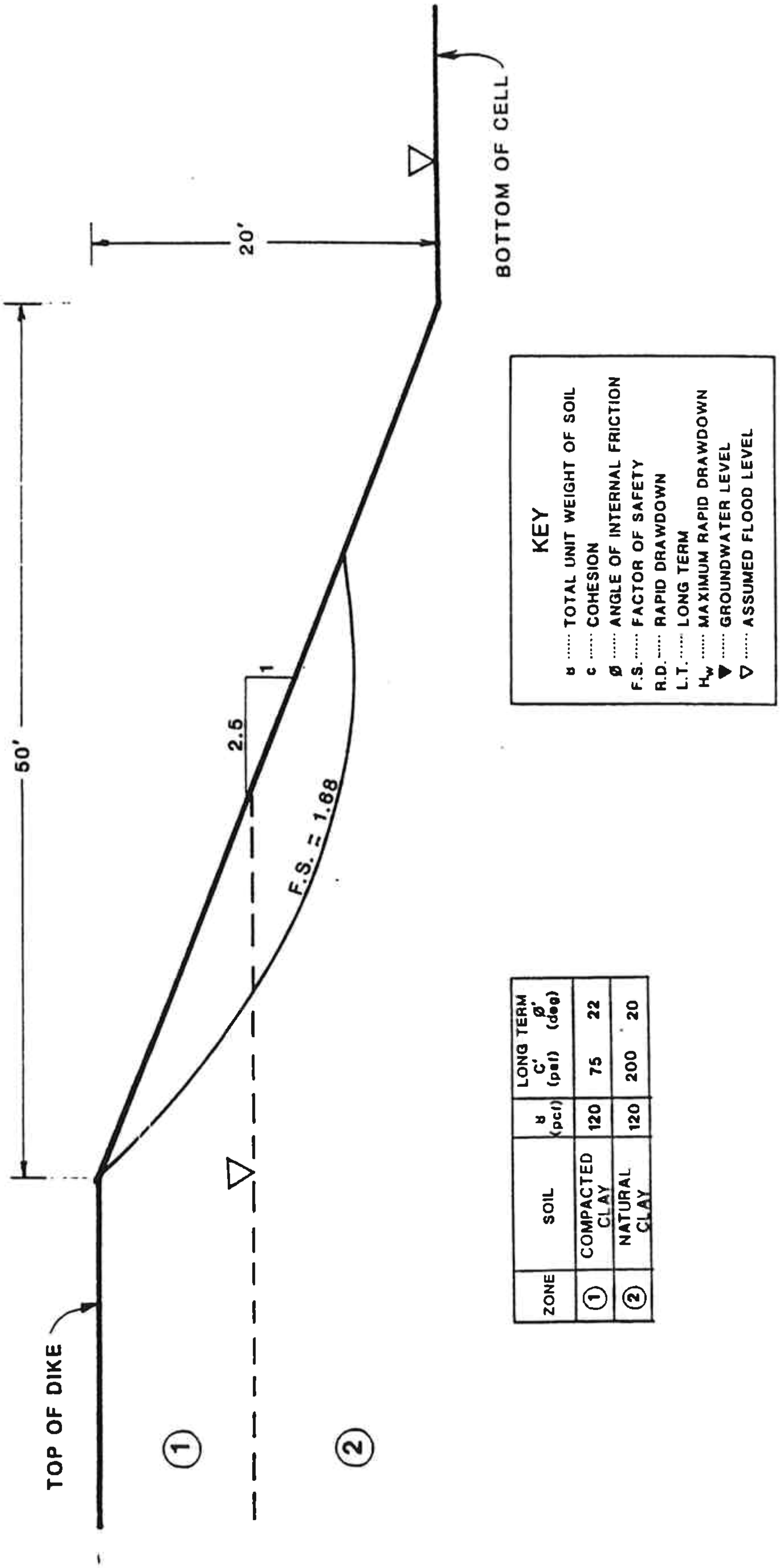
Permit:



$$\frac{5(K_1)(60x2^2+60x2)}{K_2}=\frac{5K_1(360)}{K_2}=\frac{1{,}880K_1}{K_2}$$

Based on the following comparison, the Proposed anchor trench capacities exceed the Permit capacities by the following factor:

$$\frac{\textit{Proposed}}{\textit{Permit}}\;\frac{2880\frac{K_1}{K_2}}{1800\frac{K_1}{K_2}}=1.6\quad \textit{Proposed Design Capacity}$$



ZONE	SOIL	γ (pcf)	LONG TERM C' (psf)	LONG TERM φ' (deg)
1	COMPACTED CLAY	120	75	22
2	NATURAL CLAY	120	200	20

SLOPE STABILITY ANAYSIS
BISHOP SIMPLIFIED METHOD

PROJECT NO. 90-0323
FIGURE 1
McBride-Ratcliff and Associates, Inc.

```
TSTAB slope stability analysis
Revision 2.82 - 01/06/86

TAGA Engineering Software Services
Berkeley, California USA

IBM PC & 8086/8088 MS-DOS Version by

Design Professionals Management Systems
Kirkland, Washington USA

copyright (c) 1983,84,85 TAGA
copyright (c) 1983,84,85 DPMS
```

```
90-0323 MONSANTO LANDFILL
```

```
ANALYSIS BY BISHOP'S SIMPLIFIED METHOD
```

```
INPUT DATA
```

```
CONTROL DATA,
      AUTOMATIC SEARCH FOR CRITICAL CIRCLE
      NUMBER OF DEPTH LIMITING TANGENTS                     2
      NUMBER OF VERTICAL SECTIONS                           4
      NUMBER OF SOIL LAYER BOUNDARIES                       3
      NUMBER OF POINTS DEFINING COHESION PROFILE            0
      NUMBER OF CURVES DEFINING COHESION ANISOTROPY         0
      NUMBER OF BOUNDARY LINE LOADS                         0
      NUMBER OF BOUNDARY PRESSURE LOADS                     0

      SEISMIC COEFFICIENT                      =        .000
      ATMOSPHERIC PRESSURE                     =    2116.000
      UNIT WEIGHT OF WATER                     =      62.400
      UNIT WEIGHT OF WATER IN TENSION CRACK    =      62.400

 SEARCH STARTS AT CENTER (   20.0,   90.0),WITH FINAL GRID OF   4.0

 ALL CIRCLES TANGENT TO DEPTH, 115.0, 120.0,
```

SOIL PROPERTIES

LAYER	DENSITY	COHESION	FRICTION ANGLE	DELTA PHI
1	120.00	75.00	22.00	.00
2	57.00	200.00	20.00	.00

1

****
RESULTS
****

****
DEPTH LIMITING TANGENT NO. 1 AT Y = 115.00
****

NUMBER	TANGENT	RADIUS	(X) CENTER	(Y) CENTER	F.S.
1	115.0	25.0	20.0	90.0	2.097
2	115.0	25.0	12.0	90.0	2.603
3	115.0	33.0	20.0	82.0	2.087
4	115.0	25.0	28.0	90.0	2.022
5	115.0	17.0	20.0	98.0	2.409
6	115.0	25.0	24.0	90.0	2.051
7	115.0	29.0	28.0	86.0	1.961
8	115.0	25.0	32.0	90.0	1.898
9	115.0	21.0	28.0	94.0	2.099
10	115.0	29.0	32.0	86.0	1.828
11	115.0	25.0	36.0	90.0	2.226
12	115.0	21.0	32.0	94.0	1.985
13	115.0	29.0	28.0	86.0	1.961
14	115.0	33.0	32.0	82.0	1.771
15	115.0	29.0	36.0	86.0	2.100
16	115.0	33.0	28.0	82.0	1.909
17	115.0	37.0	32.0	78.0	1.722
18	115.0	33.0	36.0	82.0	1.999
19	115.0	37.0	28.0	78.0	1.870
20	115.0	41.0	32.0	74.0	1.681
21	115.0	37.0	36.0	78.0	1.916
22	115.0	41.0	28.0	74.0	1.865
23	115.0	45.0	32.0	70.0	1.709
24	115.0	41.0	36.0	74.0	1.847
25	115.0	45.0	28.0	70.0	1.881
26	115.0	45.0	36.0	70.0	1.789
27	115.0	37.0	36.0	78.0	1.916
28	115.0	37.0	28.0	78.0	1.870

F.S. MINIMUM= 1.681 FOR THE CIRCLE OF CENTER (32.0, 74.0)

1

****
LOCATION OF CRITICAL CIRCLE

```
                                                                   1.9       1.
                                                                   1.9       1.

                                                 2.1               1.9       1.

                                                                   2.0       1.

                               2.6               2.1      2.1      2.0       1

                                                                   2.1       2

                                                 2.4

OOOOOOOOOOOOOOOO
              XXOOOO
              OOXXXXOOOO
                OOXXXXXXOOOO
                  OOXXXXXXXXOOOOO
                    OOXXXXXXXXXXXOOOO
                      OOXXXXXXXXXXXXXOOOO
                        OOXXXXXXXXXXXXXXXOOOO
                          OOXXXXXXXXXXXXXXXXXOOOOO
                            OOXXXXXXXXXXXXXXXXXXXXOOOO
                              OOOXXXXXXXXXXXXXXXXXXXXXOOOO
                                 OOXXXXXXXXXXXXXXXXXXXXXXXXOOOO
                                   OOOOOXXXXXXXXXXXXXXXXXXXXXXXOOOOO
                                        OOXXXXXXXXXXXXXXXXXXXXXXXXXXOOOO
                                          OOOOOXXXXXXXXXXXXXXXXXXXXXXXXXOOOO
                                               OOOOOXXXXXXXXXXXXXXXXXXXXXXXOO
                                                    OOOOOXXXXXXXXXXXXXXXXXXXX
                                                         OOOOOOOOXXXXXXXXXXX
                                                                 OOOOOOOOOOOO

1
*****************************************************
  DEPTH LIMITING TANGENT NO.  2  AT Y =    120.00
```

[illegible]	[illegible]	[illegible]	[illegible]	78.0	[illegible]
[illegible]	120.0	50.0	28.0	70.0	1.968
[illegible]	120.0	41.0	36.0	78.0	1.920
[illegible]	120.0	34.0	28.0	86.0	1.965
[illegible]	120.0	42.0	24.0	76.0	2.047
[illegible]	120.0	38.0	28.0	82.0	1.939
[illegible]	120.0	44.0	24.0	74.0	2.064
[illegible]	120.0	46.0	32.0	74.0	1.876
[illegible]	120.0	38.0	32.0	82.0	1.913
11	120.0	38.0	24.0	82.0	2.040
12	120.0	50.0	32.0	70.0	1.885
13	120.0	46.0	36.0	74.0	1.874
14	120.0	50.0	36.0	70.0	1.851
15	120.0	46.0	40.0	74.0	1.963
16	120.0	42.0	36.0	78.0	1.920
17	120.0	50.0	32.0	70.0	1.885
18	120.0	54.0	36.0	66.0	1.851
19	120.0	50.0	40.0	70.0	1.916
20	120.0	54.0	32.0	66.0	1.902
21	120.0	54.0	40.0	66.0	1.877
22	120.0	46.0	40.0	74.0	1.963
23	120.0	46.0	32.0	74.0	1.876

F.S. MINIMUM= 1.651 FOR THE CIRCLE OF CENTER (36.0, 70.0)

1

****

LOCATION OF CRITICAL CIRCLE

****

1.9 1.9 1.

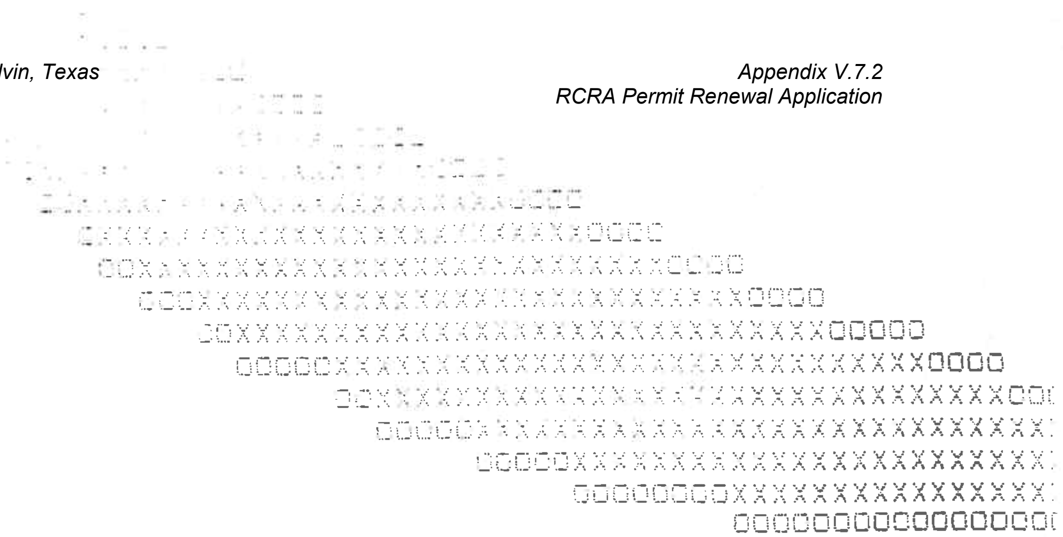
2.0 1.9 1*9 1.

2.1 1.9 1.9 2.

2.2 2.0 1.9

2.0 1.9 1.9

2.0



Execution complete, time = 5.78 seconds

ATTACHMENT V.7
ENGINEERING REPORT FOR
ACTIVE LANDFILL (PERMIT UNIT 02)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.7.3

Appendix V.7.3 Material Specifications For Active Landfill Leachate Collection and Leak Detection Layers

ATTACHMENT III.G-11

MATERIAL SPECIFICATIONS

The various materials proposed to be used in the landfill, as described above, have been selected based on the requirements of TAC 335.475 (a), the Federal Regulations and standard engineering practices for landfill design in Texas. Accordingly, the materials, their specifications, and rationale for selection are as follows:

1. Leachate Collection and Leak Detection Drainage Layers

The leachate collection and leak detection drainage layers will be comprised of siliceous aggregate which will be compatible with the expected leachate. The materials grain size will meet ASTM C33 aggregate specifications. These materials will meet the following gradation requirements and exhibit a minimum permeability of 1.0×10^{-3} cm/sec.

a. Gravel

Nominal Size (sieves with square openings)	Percent Passing
1 1/2"	95 - 100
3/8"	60 - 80
1/2"	30 - 60
1/4"	0 - 10
#4	less than 10

b. Sand

Standard Sieve	Percent Passing
No. 4	100
No. 6	95 - 10
No. 10	30 - 95
No. 20	20 - 80
No. 40	0 - 20
No. 60	0 - 5

2. High Density Polyethylene (HDPE) Liner

a. Selection

HDPE was selected for use in the liner of the proposed landfill for two reasons: 1) the low permeability of the material, and 2) high tensile strength.

These characteristics will prevent migration of wastes into the liner at any time during the active life of the landfill as required by 40 CFR 264.301 (a)(i)(1). Table 1 compares the general chemical resistance characteristics of HDPE and other liner materials to a broad range of chemical classes. Information presented in Table 1 is based on the test procedures adopted by Schlegel Corporation for estimating general chemical resistance. These test procedures are found in Table 2. As can be seen from Table 2, all liner materials tested had generally good resistance to the potential contaminants contained in the waste materials.

Most of the test data is based on theoretical chemistry compatibility comparisons provided by the manufacturer. Of the limited number of chemical compounds for which actual test data is available, the test procedure as described in Table 2 does not completely conform to USEPA Method 9090. A compatibility demonstration conforming to USEPA Method 9090 was carried out by Texas Research Institute. Results are presented in Tables 2A and 2B of Volume X.

In addition to chemical resistance characteristics defined in Table 2, polyethylene showed the smallest percentage of swell after one year of exposure of water and leachate of the nine liner materials tested. Other physical tests on leachate and water exposed liners confirm the superior characteristics of HDPE when compared to other liner materials (Matrecon, Inc., 1980; USEPA SW-870 pages 101 - 117). The initial selection of HDPE was based on manufacturer's data and previously published data (e.g., USEPA SW-870). The 80 and 100 mil HDPE were selected as being most suitable for use in this landfill. This thickness range was selected after consideration of the geotechnical requirements, flexibility needs and the need for protection against mechanical damage. Typical physical properties of an HDPE geomembrane liner include high tensile strength and resistance to tears and punctures. These properties make HDPE well suited for use in landfill situations where stresses are placed on synthetic membranes. Table 3 shows the expected physical characteristics of 80 and 100 mil HDPE synthetic membranes.

3. High Density Polyethylene (HDPE) Drain Pipe

Leachate collection pipe will be comprised of schedule 80 HDPE pipe. HDPE pipe is manufactured using the same raw materials as for HDPE geomembrane. The compatibility testing conducted for HDPE membranes will apply to HDPE pipe, and additional compatibility testing of the HDPE pipe will not be performed.

4. Geotextile

A geotextile will be placed on top of the geomembrane as protection for the geomembrane from potential damage resulting from puncture by the leachate collection granular drain material. Preliminary information indicates that adequate protection will be provided by a polypropylene needle punched non-woven geotextile with a minimum mass per unit area of 17.6 oz/yd^2.

5. Non-Woven Geotextile Drainage Layer

For specifications of grade 1155 see Table 4.

6. Synthetic Drainage Net

For specifications see Table 5. Tensar DN3, or approved equivalent material meeting these specifications will be used.

7. HDPE Liner

After the area to be lined with HDPE has been constructed to the proper dimensions, the area will be smoothed and the liner installed. The liner will be anchored in trenches as shown in Attachment III.G-7.

The field seams of the liner will be checked for pin hole leaks with a high pressure air lance, vacuum box or other approved method. Any leaks or damaged areas discovered will be repaired by solvent welding a patch over the area. A stock of HDPE material will be kept on-site to handle any repairs.

The detailed installation procedures for the liner will follow the manufacturer's specifications. Certification that the liner materials meet the manufacturer's specifications will be provided by the liner supplier based on random samples of materials taken during the manufacturing process.

All field testing of the field seams will be done in the presence of an engineer who will verify that the seams have been properly tested and that any leaks or damaged areas have been repaired. Prior to placing the overlying protective geotextile over the liner, the entire liner will be visually checked by this engineer to assure that no damaged areas are present.

8. Cap Drain

The cap drain granular material must have a coefficient of permeability no less than 1.0×10^{-3} cm per second and will meet the following grain size distribution specifications:

US Sieve Number	Percent Passing
No. 4	100
No. 6	95 - 100
No. 10	30 - 95
No. 20	20 - 80
No. 40	0 - 20
No. 60	0 - 5

TABLE 1

General Chemical Resistance Guidelines

X = Generally Good Resistance	Butyl Rubber		Chlorinated Polyethylene (CPE)		Chloro-sulfonated Polyethylene (CSPE)		Elasticized Polyolefin		Epichloro-hydrin Rubber		Ethylene Propylene Diene Monomer (EPDM)		Poly-chloroprene (Neoprene) (CR)		Polyethylene (PE)		Polyvinyl Chloride (PVC)	
	100 F	158 F	100 F	158 F	100 F	158 F	100 F	158 F	100 F	158 F	100 F	158 F	100 F	158 F	100 F	158 F	100 F	158 F
Aliphatic Hydrocarbons			X	X			X		X	X			X	X	X	X		
Aromatic Hydrocarbons							X		X	X			X	X	X	X		
Chlorinated Solvents	X	X					X		X	X	X		X		X	X		
Oxygenated Solvents	X	X					X		X		X	X	X	X	X	X		
Crude Petroleum Products			X	X			X		X	X			X	X	X	X		
Alcohols	X	X	X	X			X		X	X	X	X	X	X	X	X	X	X
Acids																		
Organic	X	X	X	X	X		X		X		X	X	X	X	X	X	X	X
Inorganic	X	X	X	X	X		X		X		X	X	X	X	X	X	X	X
Bases																		
Organic	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X
Inorganic	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X
Heavy Metals	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Salts	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Low Temperature Resistance °F	-40		-40		-40		-76		-76		-76		-40		-76		-20	
High Temperature Resistance °F	+220		+180		+180		+180		+220		+220		+220		+200		+180	

Note: Polyethylene (2nd column from right) includes high density polyethylene (HPDE).
Source: Schlegel Lining Technology, Inc., 1981 Technical Bulletin

TABLE 2

Test Procedure for Determining
Chemical Resistance of Flexible Membrane Liners
(Source: Schlegel Lining Technology Inc.)

I. Scope:

This test method is intended for use in determining the resistance of flexible membrane liners to changes in tensile properties due to chemical attack. Although this method does not duplicate environmental conditions perfectly, it does give an indication as to which liners are more suitable than others. The test is run at high temperatures in order to accelerate the detrimental effects, if any, of the chemical reagent in questions.

II. Test Specimen:

A. The test specimen shall be in compliance with the guidelines stated in ASTM D 638 for testing the tensile properties of materials.

B. The test reagent shall be a sample taken from the actual application, or a reagent of known composition prepared in the laboratory.

III. Apparatus and Method:

A. A conditioning room capable of maintaining standard laboratory atmosphere as per ASTM D 638.

B. The equipment necessary for determining the tensile properties of materials as per ASTM D 638.

C. A vessel of some type, capable of containing the test reagent and test specimen while being heated at 158°F.

D. A water bath, oven or hot plate capable of maintaining the test temperature of 158°F.

Table 2 (continued)

E. An analytical balance, accurate to .1 mg for determining weight changes.

IV. Procedures:

A. Twenty samples of the liner specimen are to be taken and conditioned to the laboratory atmosphere. After conditioning, ten of the samples are reserved as the control specimens and tested for tensile properties without being subjected to the chemical resistance test. The weight, dimensions and tensile properties are to be recorded. In liners where seams are present, whether they be chemical or heat welds, seam samples should be taken and tested as well as the liner in order to determine whether the seams are weaker or stronger than the liner itself.

B. The other half of the samples are subjected to chemical resistance testing as follows:

1. The test specimen is weighed and dimensions recorded.

2. The test specimen is totally immersed in the test reagent.

3. The specimen and reagent are heated to 158°F for a period of 28 days. Every 7 days the specimens are removed from the reagent, wiped clean and weighed to determine any weight change.

4. If the weight change has stabilized after 28 days, the test is concluded. If not, the tests continued until the weight change has stabilized.

5. Once the exposure to the chemical agent is concluded, the test specimen is removed, wiped clean and weighed. The specimen is then acclimated to the laboratory atmosphere for a period of not less than one hour.

6. After the test specimen has been conditioned it is submitted to the same tensile property testing as the ten control specimens. The tensile properties, change in weight and linear dimensions are recorded.

Table 2 (continued)

V. Calculation:

A. The tensile strength and elongation are calculated according to ASTM D 638.

B. The percent weight change (% W) is calculated as the difference of the initial weight (Wi) and the final weight (Wf) divided by the initial weight and multiplied by one hundred.

$$Wi - Wf = W$$

$$(W/Wi)\ (100) = \%\ W$$

C. The percent change in tensile properties are determined similar to the above. C denotes the control specimen, f denotes the test specimen.

$$Ec - Ef = E$$ For Elongation

$$(E/Ec)\ (100) = \%\ E$$

$$Tc - Tf = T$$ For Tensile Strength

$$(T/Tc)(100) = \%\ T$$

Note: The ten control specimens should be averaged to determine the best value for comparison.

VI. Report:

This report shall consist of a list of the individual values for % weight change, % change in elongation and % change in tensile strength as well as the average values. Any important observations should be included as well. The test specimen is determined to have passed in the test reagent if the following criteria are met:

A. The weight change is no greater than $\pm 3\%$,

B. The change in tensile and elongation properties is no greater than $\pm$ 10%, and

C. The liner seams are not significantly weaker than the liner sections.

TABLE 3

Material Property Specifications
High Density Polyethylene (HDPE)

Property	Test Method	40 mil HPDE	80 mil HDPE	100 mil HDPE
Thickness, mils minimum	ASTM D 1593	36	72	90
Density g/cc (minimum)	ASTM D 1505	0.94	0.94	0.94
Melt Index (g/10 min., maximum)	ASTM D 1238	0.4	0.4	0.4
Minimum Tensile properties (each direction)	ASTM D 638 Type IV at 2 ipm			
1. Tensile Strength at Yield (lb/in width)		100	200	250
2. Tensile Strength at Break (lb/in width)		165	330	400
3. Elongation at Yield (percent)		13	13	13
4. Elongation at Break (percent)		750	750	750
5. Modulus of Elasticity (lb/sq in)		90,000	90,000	90,000
Tear Resistance (lb, minimum)	ASTM D 1004 Die C	31	63	79
Low Temperature, °F	ASTM D 746	<-94	<-94	<-94
Dimensional Stability (each direction, percent change maximum)	ASTM D 1204 212°F, 15 min.	±1	±1	±1
Resistance to Soil Burial (percent change maximum in original value)	ASTM D 3083 using Type IV at 2 ipm			
1. Tensile Strength Yield		±10	±10	±10
2. Tensile Strength at Break		±10	±10	±10
3. Elongation at Yield		±10	±10	±10
4. Elongation at Break		±10	±10	±10
5. Modulus of Elasticity		±10	±10	±10
Environmental Stress Crack (minimum, hours)	ASTM D 1693	>2000	>2000	>2000
Puncture Resistance (lb)	* FTMS 101B Method 2031	180	340	420

* Federal Test Method Standards.
Source: Poly America

Trevira® Spunbonds are highly needled nonwoven engineering fabrics with excellent tensile properties, high filtration potential and outstanding permeability.

Trevira® Spunbond Type 11 products are 100% continuous filament polyester nonwoven needlepunched engineering fabrics. They deliver a combination of advantages unmatched by any other spunbonded geotextiles. They're resistant to freeze-thaw, soil chemicals and ultraviolet light exposure.

Trevira® Spunbonds are excellent where the requirement is (1) tensile reinforcement, (2) planar flow, (3) filtration, and (4) separation. For example, in roadways, railbeds, drainage systems, pondliners, retaining walls. And much more. Trevira® Spunbonds are extraordinary engineering fabrics.

TYPICAL PHYSICAL PROPERTIES OF TREVIRA® TYPE 11 PRODUCTS

Fabric Property	Unit	Test Method	1112	1114	1120	1125	1135	1145	1155
Fabric Weight	oz/yd²	ASTM D-3776	3.6	4.2	6.0	7.4	10.5	13.5	16.2
Thickness, t	mils	ASTM D-1777	60	65	90	110	150	175	210
Grab Strength (MD/CD)[1]	lbs	ASTM D-4632	110/90	135/110	205/175	270/225	390/330	500/425	625/560
Grab Elongation (MD/CD)	%	ASTM D-4632	70/85	70/85	75/85	75/85	75/85	90/95	90/95
Trapezoid Tear Strength (MD/CD)	lbs	ASTM D-4533	50/40	60/50	80/75	105/95	135/120	175/170	205/200
Puncture Resistance (5/16" hemispherical tip)	lbs	ASTM D-3787	50	60	90	115	155	175	240
Mullen Burst Strength	psi	ASTM D-3786	180	210	315	390	550	625	840
Water Flow Rate	gpm/ft²	ASTM D-4491	150	140	130	120	100	80	55
Permittivity, Ψ	sec⁻¹	ASTM D-4491	2.04	1.90	1.77	1.63	1.36	1.09	0.75
Permeability, k	cm/sec	k = Ψt	0.31	0.31	0.40	0.46	0.52	0.48	0.40
AOS	Sieve Size mm	CW-02215 Mod. to 10 Min.	70-100 .210-.149	70-100 .210-.149	70-100 .210-.149	70-120 .210-.125	70-120 .210-.125	100-140 .149-.105	100-170 .149-.088
Standard Roll Widths[2]	ft		12.5 and 15.0						
Standard Roll Length[2]	ft		400	400	300	300	300	300	300

[1] MD = Machine Direction, CD = Cross Machine Direction.
[2] Other width and length rolls are available upon request.

MINIMUM AVERAGE ROLL VALUES (WEAKEST PRINCIPAL DIRECTION) OF TREVIRA® TYPE 11 PRODUCTS

Fabric Property	Unit	Test Method	1112	1114	1120	1125	1135	1145	1155
Fabric Weight	oz/yd²	ASTM D-3776	3.4	4.0	5.7	7.1	10.0	13.0	16.0
Thickness, t	mils	ASTM D-1777	50	55	80	100	135	160	200
Grab Strength	lbs	ASTM D-4632	80	100	155	200	290	375	500
Grab Elongation	%	ASTM D-4632	60	60	65	60	65	80	80
Trapezoid Tear Strength	lbs	ASTM D-4533	30	40	60	75	100	140	170
Puncture Resistance (5/16" hemispherical tip)	lbs	ASTM D-3787	35	45	75	95	130	155	200
Mullen Burst Strength	psi	ASTM D-3786	160	190	285	360	500	575	765
Water Flow Rate[3]	gpm/ft²	ASTM D-4491							
Permittivity, Ψ[3]	sec⁻¹	ASTM D-4491							
Permeability, k[3]	cm/sec	k = Ψt							
AOS[4]	Sieve Size mm	CW-02215 Mod. to 10 Min.	70 .210	70 .210	70 .210	70 .210	70 .210	100 .149	100 .149

[3] Insufficient testing has been performed to statistically establish "minimum average values" at the time of this printing. Please contact your Trevira Distributor or Hoechst Fibers for additional information.
[4] AOS "minimum average roll value" is a measure of the *largest* opening size in the fabric.

TREVIRA

Hoechst Fibers Industries
A division of American Hoechst Corporation
P.O. Box 5887
Spartanburg, SC 29304-5887 U.S.A.
1 (800) 845-7597
1 (803) 579-5479
Telex: 530 799

Hoechst

TABLE 5

Tensar*

GEONETS DN1, DN2 & DN3

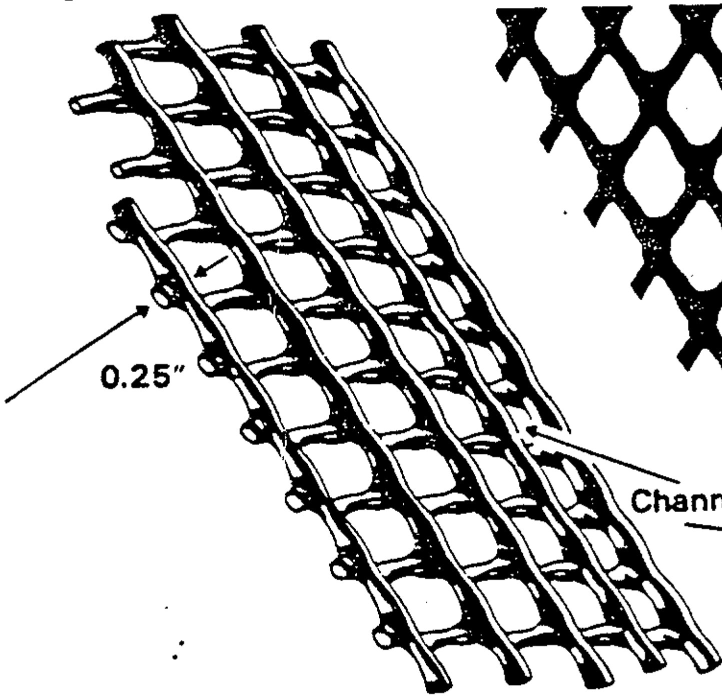
Applications

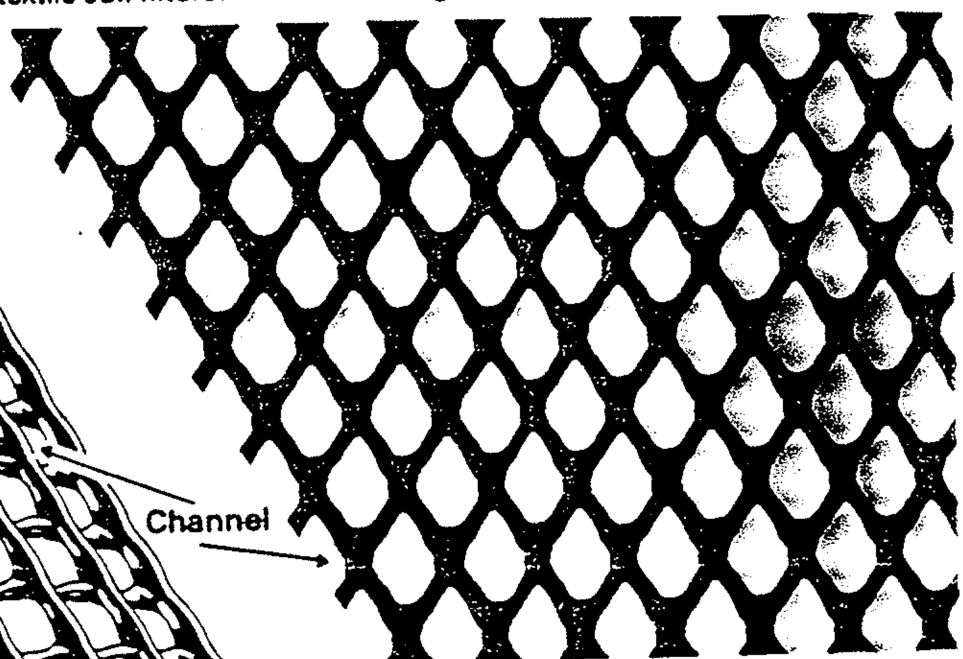
TENSAR geonets DN1, DN2, and DN3 are chemically and dimensionally stable mesh structures consisting of two sets of parallel strands. The intersecting strands form two overlaid sets of continuous deep channels which provide high flow capacity.

These geonets are used in a variety of drainage applications, often in conjunction with geo-membrane liners and geotextile soil filters.

Typical applications: leachate and gas collection and leakage detection for ponds and landfil cut-offs; French drains; landslide repair drainag drainage behind bridge abutments, basements and retaining walls.

Selection of a particular drainage net will depe upon required flow capacity and field condition: Detailed information on the flow characteristics of drainage nets is available on request.





Actual Siz

Structural Characteristics:

	DN1	DN2	DN3
Roll length (ft):	98.50	98.50	98.50
Roll width (ft):	5.35	6.33	5.35
Roll weight (lb):	85.00	91.00	75.00
Thickness (in):	0.25	0.20	0.15

Raw Material – Physical and Chemical Properties:

Color	:Black
Polymer	:Polyethylene
Polymer Density	:0.926 g/cm³
Melt Index	:0.2 g/10 min
Chemical Resistance	:Resistant to all naturally occurring alkaline and acidic soil conditions
Biological Resistance	:Resistant to attack by bacteria and fungi
Sunlight Resistance	:Stabilized for long periods of exposure to U.V.

TEN - D - 101 (5-

*Trademark

High Flow Capacity

Flow Test Results

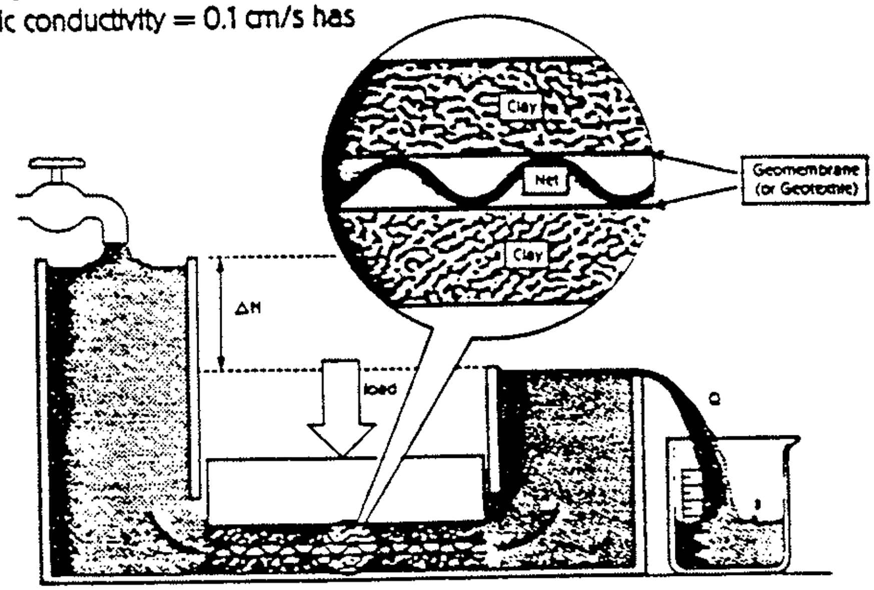
An extensive testing program has been conducted to evaluate the influence of the various parameters affecting transmissivity.* Test results show that in most practical cases, the transmissivities of TENSAR drainage nets are larger than:

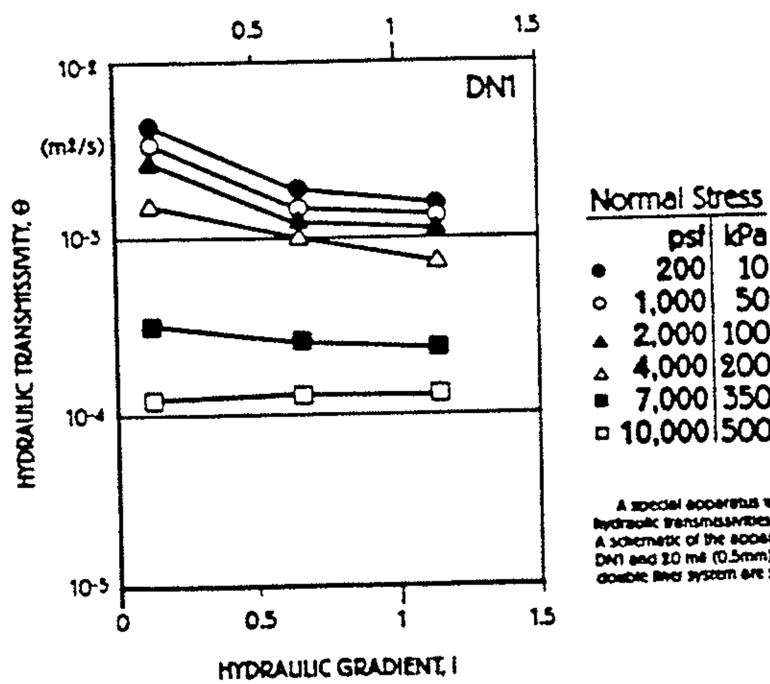
- DN1 – 5 gallons/minute/lineal foot of width/unit gradient ($1 \times 10^{-3} m^2/s$).
- DN2, DN3 – 2 gallons/minute/lineal foot of width/unit gradient ($4 \times 10^{-4} m^2/s$).

Compare the TENSAR drainage net transmissivities compared to those of other drainage materials:

- A one-foot thick layer of sand with a coefficient of permeability or hydraulic conductivity = 0.1 cm/s has a transmissivity of 1.5 gallons/minute/lineal foot of width/unit gradient ($3 \times 10^{-4} m^2/s$).
- A needlepunched, nonwoven geotextile with significant in-plane permeability has a hydraulic transmissivity under low compressive stress of 0.05 to 0.005 gallons/minute/per lineal foot of width/unit gradient (10^{-5} to $10^{-6} m^2/s$).

The TENSAR drainage net transmissivities can also be compared to the transmissivity of the drainage layer given in the U.S. Environmental Protection Agency Guidance Document for waste disposal facilities – 0.015 gallons/minute/lineal foot of width/unit gradient ($3 \times 10^{-6} m^2/s$).





A special apparatus was constructed to measure the hydraulic transmissivities of TENSAR drainage nets , A schematic of the apparatus and results of tests on a DN1 and 20 mil (0.5mm) unreinforced PVC geomembrane double liner system are shown above

*Reference 2

The TENSAR Approach. Designing with TENSAR Drainage Nets.

Drainage Capacity.

The drainage capacity of a net or other synthetic drainage layer is characterized by its transmissivity which is defined as the number of gallons of flow passing through a one foot wide section of drain in one minute per unit of gradient. The transmissivity depends on several interrelated parameters:

- Type of liquid (water, leachate, etc.) or gas (air, methane, etc.).
- Temperature of liquid or gas.
- Type of net – Three types of TENSAR drainage nets are available: DN1, DN2 and DN3.
- Number of net layers – Typically, one layer of net is sufficient. When required for certain flow conditions, nets can be stacked to achieve the necessary drainage capacity.
- Flow gradient – In most cases, flow in nets is not laminar. Consequently, the transmissivity of a net depends on the gradient.
- Compressibility – All synthetic drainage layers are compressible and their transmissivity decreases with increasing normal stress. However, the transmissivities of TENSAR drainage nets are not significantly affected over the range of typical design pressures. TENSAR DN3 can provide substantial flow capacity for pressures as great as 15,000 psf – (720 kPa).
- Strength – Collapse of stiff, brittle synthetic drainage layers caused by impact loadings and high overburden stresses greatly reduces flow and may puncture geomembrane liners. The structure of TENSAR drainage nets is designed to withstand impact loadings and extreme normal stresses without failure.
- Boundary Conditions – The transmissivity of a synthetic drainage layer depends on the type of geotextile and/or geomembrane adjacent to the drainage layer.

Filtration.

Drainage nets should not be placed in direct contact with soil or waste. The net openings must be protected from clogging by fine particles by using a geotextile filter. Selection of the type of geotextile should be made in accordance with geotextile filter criteria. These criteria show that no one geotextile filter is appropriate for all types of soil or waste. Therefore, prefabricated drainage layers incorporating an attached geotextile filter are limited in their range of applicability. The TENSAR approach permits the designer to independently select the geotextile filter best suited to a given situation.

The use of a geotextile which exhibits low compressibility, such as a woven monofilament or a heat-bonded nonwoven, should be used when filter criteria permit. If a thick geotextile, such as needlepunched nonwoven, is necessary, tests should be conducted to determine the transmissivity of the geotextile/drainage net system. Test results on a wide variety of TENSAR drainage net systems are available.*

Resistance to Chemical Attack.

The polyethylene family is generally regarded as having good to excellent resistance to attack by a wide variety of chemicals. High density polyethylene (HDPE) geomembranes, for example, resist attack by a wide range of chemicals encountered in waste disposal facilities. The actual resistance exhibited by a specific polyethylene material will depend on the type of polyethylene polymer (linear or branched), on the material formulation and on the material thickness. This resistance is best determined from laboratory chemical compatibility studies using samples of the material. The TENSAR Corporation is currently performing such studies and will provide information on request.

GSI Job No. 6932

Hazardous Waste Permit Renewal Application
Ascend Performance Materials Texas Inc., Alvin, Texas

Hazardous Waste Permit No. 50189

Part B, Section V: Appendix V.G.3 – Engineering Report for New Landfill

Note: There were no changes to the Engineering Report for the New Landfill, originally issued 31 December 2009 and updated on 6 February 2012. Therefore, the 6 February 2012 Engineering Report and supporting documentation are submitted as is.

GSI Job No. 3742

ATTACHMENT V.8
ENGINEERING REPORT FOR
NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

ATTACHMENT V.8
ENGINEERING REPORT FOR
NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

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GSI ENVIRONMENTAL

CERTIFICATION OF ENGINEERING REPORT FOR NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

I, Elaine A. Higgins, a registered professional engineer in the State of Texas, certify that the Engineering Report in the RCRA Permit Renewal Application issued 31 December 2009 and revised 6 February 2012 for the New Landfill (Permit Unit 16) on the Ascend Chocolate Bayou Plant in Alvin, Texas, has been prepared in accordance with the requirements of 40 CFR 264.300 - .317 and 30 TAC 335.173 - .176.

STATE OF TEXAS
ELAINE A. HIGGINS
85482
LICENSED
PROFESSIONAL ENGINEER

Elaine A. Higgins 6 February 2012

Elaine A. Higgins, P.E.
State of Texas
Registration No. 85482

1.0 DESCRIPTION OF NEW LANDFILL

The New Landfill (Permit Unit 16) has been designed and will be constructed and operated in accordance with Minimum Technological Requirements (MTR) per 30 TAC 335.173 - .176; and 40 CFR 264.300 - .317. This section provides RCRA Part B permit application information for the unit as required by 40 CFR 270.21.

The New Landfill will be located in the southeast portion of the Ascend property (see Attachment C.1). Landfill cells will be constructed, filled, and completed in a sequential manner employing the moving cell method of development. During waste placement, rainfall runoff and run-on will be prevented by perimeter dikes and drainage and a temporary roof structure over the active cell. A Groundwater Detection Monitoring Program (GWDMP) will be conducted at this landfill on a semi-annual basis as described in Section VI: Geology Report of this application. Landfill specifications are summarized on Tables V.G.1, V.G.3, and V.G.4.

2.0 HAZARDOUS WASTES MANAGED

2.1 Types of Wastes Managed

Wastes managed in the New Landfill are shown on Table V.G.1. The New Landfill will be used for disposal of the following: i) organic and inorganic solids such as soils, spent filter cartridges, and spent carbon; and ii) organic and inorganic sludges from industrial and waste treatment processes. In this document, Section IV: Waste Analysis Plan provides additional details concerning the wastes generated at Ascend Chocolate Bayou, and Attachment E provides a waste flow diagram for each of the permitted units.

In accordance with 30 TAC 335.175, bulk or non-containerized liquid hazardous waste or hazardous waste containing free liquids will not be received for disposal at the New Landfill. Materials disposed in this unit must evidence the absence of free liquids as demonstrated by Method 9095: Paint Filter Liquids Test (EPA, 1995).

Containers which may be placed in the New Landfill include those referenced by 30 TAC 335.175(e), as follows: i) very small containers, such as ampoules; or ii) containers designed to hold free liquids for use other than storage such as a battery or capacitor. Unless very small, such as an ample, containers are crushed, shredded or similarly reduced in volume to the maximum extent practical prior to burial per 30 TAC 335.176.

2.2 Ignitable and/or Reactive Wastes

All wastes disposed in the New Landfill will be treated prior to disposal to meet applicable requirements specified in the Land Disposal Restrictions (LDRs) referenced in 40 CFR Part 268, and, therefore, no longer meet the definition of ignitable or reactive.

2.3 Incompatible Wastes

In order to prevent a potential adverse reaction or release, unit operating procedures require completion of a compatibility determination prior to disposing a waste or other material in the New Landfill. Material compatibility is assessed using the procedures specified in Section IV: Waste Analysis Plan. Incompatible wastes will not be placed in the same landfill cell and only one cell will be open at any time.

2.4 Land Disposal Restrictions

In order to ensure that only those wastes meeting LDRs per 40 CFR Part 268 are disposed in the New Landfill, Ascend will make an LDR determination using the procedures specified in the Section IV: Waste Analysis Plan. Only wastes meeting the LDR treatment requirements will be disposed in the New Landfill.

3.0 LANDFILL SPECIFICATIONS

The general layout of the New Landfill encompasses six cells as shown on Figures V.8.1, V.8.2, and V.8.3. Sections through the landfill oriented south to north and west to east are depicted on Figure V.8.4. Major components of each cell are as follows: i) a double liner, ii) primary and secondary leachate collection systems, and iii) a protective surface cover installed at the time of cell completion. A plan-view sequence of construction for the layers comprising the liner, primary leachate collection system, and secondary leachate collection (i.e., leak detection) system is provided on Figures V.8.5 through V.8.9. Detailed cross-sections through a typical landfill cell are provided on Figures V.8.10 and V.8.11. Specifications for the New Landfill liners and leachate collection systems are summarized on Tables V.G.3 and V.G.4, and details are shown on Figures V.8.12, V.8.13, and V.8.14. Additional details regarding the construction sequence for each landfill cell are provided below.

- *Project Startup:* Specifications are prepared, contractors selected, and field crews mobilized for construction of the landfill cell.

- *Construction of Perimeter Dikes and Clay Liner:* The cell is excavated and perimeter dikes constructed in accordance with the elevations shown on Figure V.8.5. Perimeter dikes are constructed of compacted clay having exterior slopes of no greater than 4 horizontal to 1 vertical (i.e., 4H:1V) and interior slopes of no greater than 2.5H:1V to 3H:1V. Then a minimum 3-ft thick clay liner is installed within the perimeter dike (see Figure V.8.6). Settlement calculations are provided in Appendix V.8.4, and Appendix V.8.5 provides information regarding the dike slope stability analysis for the New Landfill.

- *Installation of Leak Detection System:* Next, the secondary leachate collection system for the New Landfill is constructed in accordance with provisions of 30 TAC 335.173(c). Components of the secondary leachate collection system include, from deep to shallow, the following: i) an 80-mil thick high density polyethylene (HDPE) geomembrane, ii) a double-sided drainage geocomposite, and iii) a geosynthetic clay liner (GCL; see Figure V.8.12). The liner is compatible with the chemical properties of the waste materials and has sufficient physical strength and thickness to prevent failure during installation and operation. Material specifications and compatibility test results are provided in Appendix V.8.3.

- *Installation of Leachate Collection System:* The primary leachate collection system for each cell of the New Landfill is constructed atop the secondary leachate collection system per 30 TAC 335.173(c). Components of the primary leachate collection system include, from deep to shallow, the following: i) an 80-mil thick HDPE geomembrane, ii) a nonwoven geotextile, iii) a 12-in thick sand drain layer equipped with drainage pipes, and iv) nonwoven geotextile (see Figure V.8.12). The sides of each cell include a double-sided drainage geocomposite connected to the sand drainage layer (see Figure V.8.12). The liner has been selected to be compatible with the chemical properties of the waste materials and has sufficient physical strength and thickness to prevent failure during installation and operation (see Appendix V.8.3). Leachate system calculations are provided in Appendix V.8.6.

- *Construction of Final Cover:* A final cover is installed on each landfill cell after placement of the waste (see Table V.8.1). A final cover specification, applicable to each landfill cell, has been developed in accordance with 30 TAC 335.174(a). Elements of the cover system starting at the surface of the waste and progressing upward will be i) a soil cover, ii) a 2-ft thick compacted clay cover, ii) 40-mil thick linear low density polyethylene (LLDPE) geomembrane, iii) a double-sided drainage composite, and iv) an 18-in thick protective topsoil cover (see Figure V.8.12). Additional details regarding installation of the cover system and closure of each cell are presented in Section VII: Closure Plans of this application.

4.0 CONSTRUCTION QUALITY ASSURANCE PROGRAM

A Construction Quality Assurance (CQA) program has been developed in accordance with the requirements of 40 CFR 264.19 and will be implemented during construction and completion of landfill cells. The CQA program addresses physical components of landfill construction, such as liners, leachate collection systems, and final covers; key personnel and roles during construction; and testing methods and frequencies (see Appendix V.8.1).

5.0 LANDFILL OPERATING PROCEDURES

5.1 Site Development Plan

Individual waste disposal cells will be constructed, filled, and closed in a sequential manner in order to accommodate waste generation rates. Past and projected waste disposal rates are expected to average 2,500 cubic yards per year over the life of the unit, resulting in an approximate 24-year life span for the New Landfill.

The configuration of the New Landfill is shown on Figure V.8.1. Each cell is designed to be 222 ft wide and 362 ft long. The maximum depth is approximately 17 ft below grade, and each cell has perimeter dikes that extend a nominal height of 9 ft above natural grade. As described in the Subsurface Geology Report for the New Landfill, geologic logs in the vicinity of the unit indicate that the minimum distance between the base of the compacted clay liner and the shallow saturated unit is 10 ft to greater than 30 ft (see Section VI: Geology Report, Attachment VI.3).

Wastes may be placed in the landfill in bulk or containerized form. However, when beginning placement in a newly constructed landfill cell, the initial 2-ft thick layer is comprised of clean soil or bulk (i.e., non-containerized) waste placed using a tracked vehicle. Rubber-tired and roller-type compaction equipment are only used after the initial layer has been placed.

Bulk wastes are placed in lifts having a maximum thickness of 1.5 ft which are subsequently compacted to minimize later settlement. In order to allow for installation of the landfill cover system, the maximum height of the waste within each cell is no higher than 3 ft below the crest of the perimeter dike. The final surface of the waste is sloped at 2% to 5% so that the final elevation of the waste at the perimeter dike is less than the elevation of the perimeter dike.

5.2 Suppression of Emissions

In accordance with 30 TAC 335.173(j), potential dust-producing materials disposed in the landfill will be covered as soon as practicable after placement within the active cell to prevent wind dispersal of particulates, production of odors, or emissions of vapors.

5.3 Control of Run-On/Run-Off

Accumulation of direct rainfall within the open landfill cells will be prevented by means of a temporary roof structure. Rainfall from the temporary roof is diverted from the landfill area by a system of surface drainage channels sized to handle the volume of water expected from a 24-hr 100-yr storm event (see Figure V.8.3). In addition, perimeter dikes prevent run-on of stormwater drainage from adjoining areas. Surface water drainage analyses are provided in Appendix V.8.7.

In accordance with requirements of 30 TAC 335.204(a)(1), the New Landfill has been designed and will be constructed, operated, and maintained to prevent physical transport of any hazardous waste by a 100-yr flood event. In order to prevent inflow from a 100-yr flood event, perimeter dikes have been constructed around each New Landfill cell. The predicted 100-yr flood elevation is 15 ft msl in the vicinity of this unit, and the landfill perimeter dikes are completed to a nominal elevation of 21 ft sl. Therefore, the dikes are a minimum of 5 ft higher than expected water levels during a 100-yr flood event.

5.4 Monitoring and Inspection of Leachate Collection and Leak Detection Systems

Per the requirements of 40 CFR 264.303, Ascend will conduct weekly inspections of the primary and secondary leachate collection sump systems (see Table III.D and Figure V.8.14). The liquid levels in the leachate collection and leak detection sumps will be recorded on a weekly basis. The fluid operating level is maintained below a level that would exert 1 ft of hydrostatic head on the liner. Accumulated fluids are removed by a vacuum truck for disposal in the permitted on-site injection well or other approved waste disposal or treatment method.

5.5 Recordkeeping

Information to be maintained in the plant records regarding the New Landfill includes the following: i) the location and horizontal and vertical dimensions of each cell with respect to permanently surveyed benchmarks and ii) the contents of each cell and approximate location of each hazardous waste type within each cell.

6.0 ACTION LEAKAGE RATE

Fluid production within the leak detection system is monitored and compared to a the Action Leakage Rate (ALR) as defined in 40 CFR 264.302. The estimated ALR for each cell of the New Landfill is 111 gallons per day per cell, as shown in the calculations in Attachment B of Appendix V.8.2. If the ALR is exceeded, a Response Action Plan (RAP) prepared in accordance with 40 CFR 264.304 will be implemented. A summary of response activities is provided on Table V.8.2.

ATTACHMENT V.8
ENGINEERING REPORT FOR
NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

TABLES

GSI ENVIRONMENTAL

TABLE V.8.1
COVER SYSTEM: NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

Clay Cover	Top Liner	Drainage Layer	Protective Cover
Compacted clay meeting the following specifications: • Particle – Size Analysis: ≤ 1 inch • % Passing No. 200 Sieve: ≥30% • Soil Classification: SC, CH, or CL • Plasticity Index: ≥15% • Liquid Limit: ≥30% • Hydraulic conductivity: ≤1E-07 cm/sec • Thickness: 2 ft	40 mil LLDPE	Geocomposite drainage layer having a transmissivity ≥ 1.1E-04 m^2/sec	Topsoil meeting the following specifications: • Conducive to vegetative growth • Thickness: 1.5 ft

Notes:
1. See Figure V.8.1 for a plan view of the New Landfill (Permit Unit 16).
2. Properties of the cover system will be measured by the following methods: particle – size analysis and % passing no. 200 sieve by ASTM D422; soil classification by ASTM D 2487, plasticity index and liquid limit by ASTM D4318; hydraulic conductivity of clay by ASTM D5084; and transmissivity of the drainage layer by ASTM D4716. See Appendix V.8.1, Construction Quality Assurance Plan, for a complete list of the required tests, testing frequency, methods and specifications.
3. LLDPE = Linear Low Density Polyethylene.

GSI ENVIRONMENTAL

TABLE V.8.2
RESPONSE ACTION PLAN FOR ALR EXCEEDANCES: NEW LANDFILL

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

Work Item Description	Schedule for Submittal to TCEQ	40 CFR 264.304 Reference
1. ***Initial Notification:*** Provide written notice if ALR is exceeded for one or more landfill cells.	• Within 7 days of determining that the ALR has been exceeded	(b)(1)
2. ***Preliminary Assessment:*** Prepare a summary of i) available information regarding the possible source, location, size, and cause of the leak; i) an estimate the volume of liquids released; and iii) short-term actions implemented to minimize potential adverse impacts of leak.	• Within 14 days of determining that the ALR has been exceeded	(b)(2)
3. ***Remedial Action Evaluation:*** Prepare a report evaluating the potential leak and appropriate remedial actions. To the extent practicable, determine the location, size, and cause of the leak; and assess the potential for a release to the environment. Develop a plan for modifying waste management activities, if necessary, and implementing any other mitigating actions to stop the leak.	• Within 30 days of Initial Notification	(b)(3), (b)(4), (b)(5), (c)(1), and (c)(2)
4. ***Status Reports:*** During the time the ALR is exceeded for one or more cells, summarize remedial actions completed and future activities planned to reduce the leakage rate to below the ALR.	• Monthly after submittal of first Remedial Action Evaluation	(b)(6)

Notes:
1. See Figure V.8.1 for a plan view of the New Landfill (Permit Unit 16).
2. In accordance with operating procedures for the New Landfill, the volume of leachate collected in the leak detection sump (i.e., secondary sump) will be measured on a regular basis per 40 CFR 264.302.
3. Per 40 CFR 264.304, this Response Action Plan will be implemented if the flow rate of leachate into the leak detection sump exceeds the ALR.
4. The estimated ALR for each cell of the New Landfill is 111 gallons per day (see Attachment B of Appendix V.8.2).
5. ALR = Action Leakage Rate.

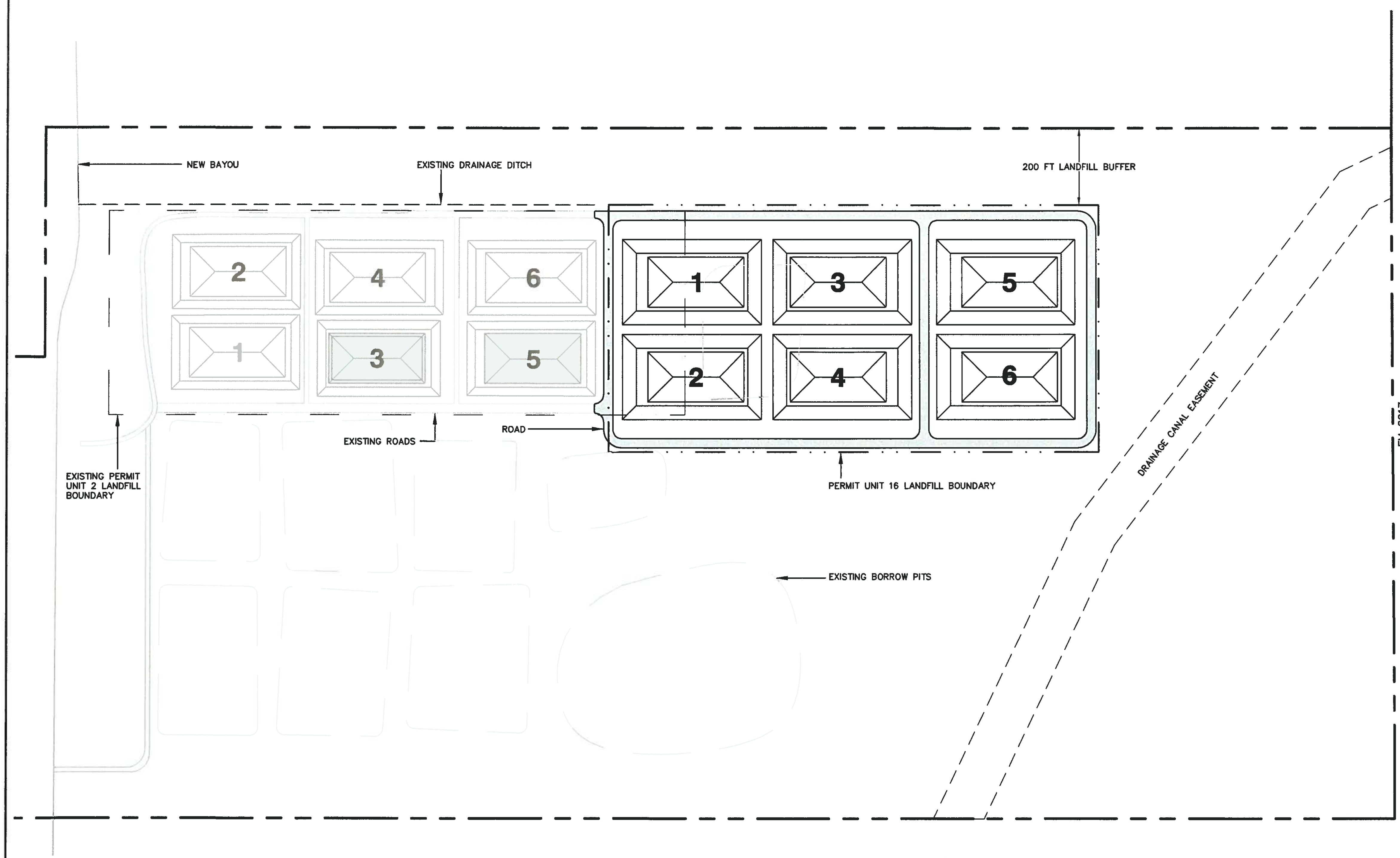
GSI Job No. G-3379
Issued: 31 December 2009

ATTACHMENT V.8
ENGINEERING REPORT FOR
NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

FIGURES



LEGEND

	ASCEND PROPERTY LINE
	PERMIT UNIT 16 LANDFILL BOUNDARY
	EXISTING PERMIT UNIT 2 LANDFILL BOUNDARY
	EXISTING ROADS
	EXISTING DRAINAGE DITCH
	ROADS
	EXISTING BORROW PITS
)(	CULVERT
6	CELL NUMBER

NOTES

1. LOCATION OF EXISTING BORROW PITS ARE BASED ON AERIAL PHOTOS AND ARE APPROXIMATE.
2. EXISTING EASTERN PERMIT UNIT 2 LANDFILL BOUNDARY HAS BEEN RELOCATED TO COINCIDE WITH WESTERN PERMIT UNIT 16 LANDFILL BOUNDARY AS PART OF THIS RCRA PERMIT RENEWAL APPLICATION (SEE FIGURE V.8.2).

150 0 150 300
scale feet

12/30/09

STATE OF TEXAS
PHILLIP REID MATTHEWS II
83554
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Golder Associates
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Tel: (281) 821-6868
Texas Registration Number: F-2578

ASCEND
PERFORMANCE MATERIALS

PROJECT: ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PERMIT UNIT 16
ALVIN, TX

TITLE: SITE AREA PLAN

DRAWN	TLE	REVIEWED	PRM
CHECKED	PCM	APPROVED	
DATE	DECEMBER 2009		
SCALE	AS SHOWN		
JOB NO.	083-94322		
DWG. NO.	083-94322-301		

FIGURE NUMBER
V.8.1

REV.	DATE	DESCRIPTION	DR. BY	APP. BY

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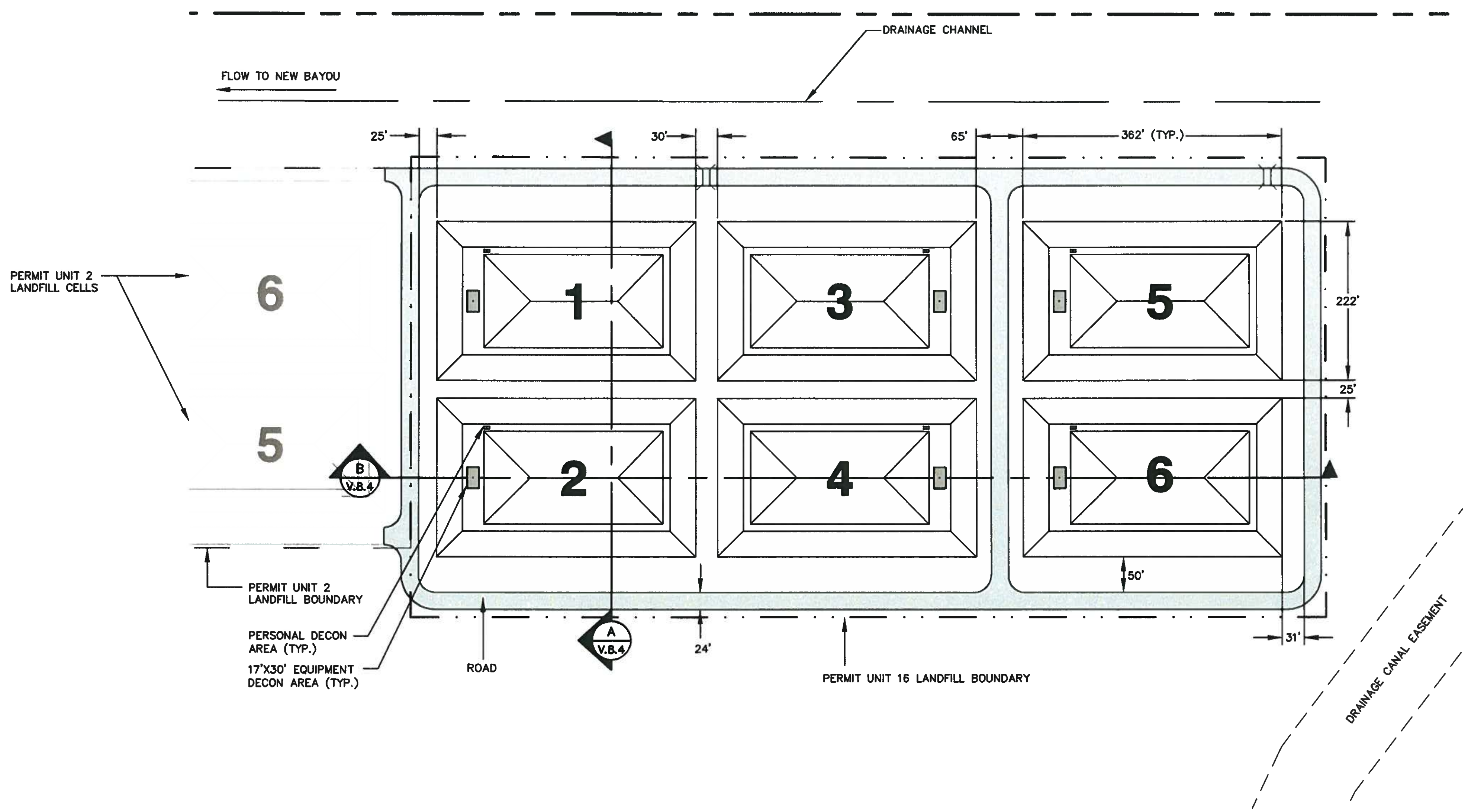

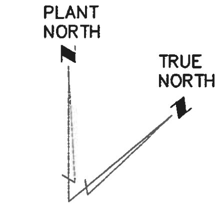

LEGEND

— — —	ASCEND PROPERTY LINE
— · · —	PERMIT UNIT 16 LANDFILL BOUNDARY
— —	EXISTING PERMIT UNIT 2 LANDFILL BOUNDARY (MODIFIED)
═══	ROADS
)(	CULVERT
▪	PERSONAL DECON AREA
▯	EQUIPMENT DECON AREA
6	CELL NUMBER AND CONSTRUCTION SEQUENCE

NOTES

1. CELLS 1–6 HAVE THE SAME DIMENSIONS AND GEOMETRY. THE ORIENTATION FOR CELLS 3 AND 4 HAS BEEN ROTATED 180 DEGREES FROM THE ORIENTATION OF CELLS 1, 2, 5, AND 6.

100 0 100 200
scale feet

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ASCEND PERFORMANCE MATERIALS

PROJECT
ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PERMIT UNIT 16
ALVIN, TX

TITLE
SITE LAYOUT PLAN

DRAWN	TLE	REVIEWED	PRM
CHECKED	PCM	APPROVED	
DATE	DECEMBER 2009		
SCALE	AS SHOWN		
JOB NO.	083-94322		
DWG. NO.	083-94322-301		

FIGURE NUMBER
V.8.2

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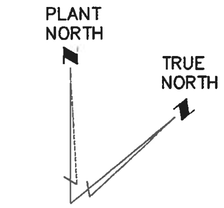
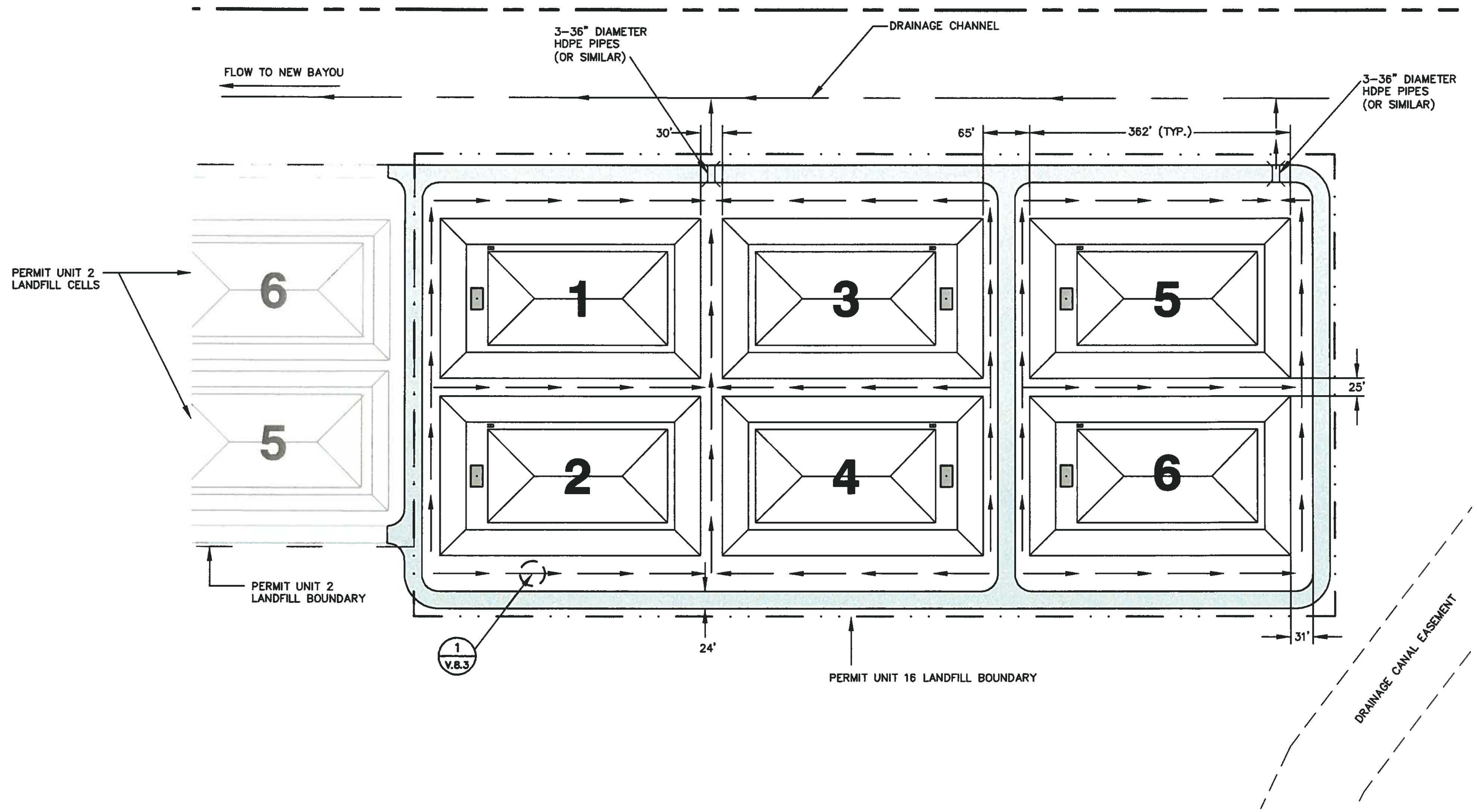


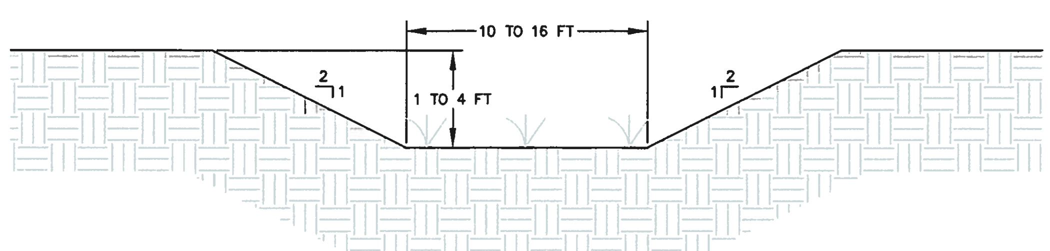


LEGEND

	ASCEND PROPERTY LINE
	PERMIT UNIT 16 LANDFILL BOUNDARY
	EXISTING PERMIT UNIT 2 LANDFILL BOUNDARY (MODIFIED)
	ROADS
)(	CULVERT
	PERSONAL DECON AREA
	EQUIPMENT DECON AREA
6	CELL NUMBER AND CONSTRUCTION SEQUENCE
	DRAINAGE FLOW PATH

NOTES

1. SIZE AND DIMENSIONS OF PERIMETER DITCHES AND CULVERTS ARE PROVIDED IN TABLE 5 OF APPENDIX V.8.7, SURFACE WATER DRAINAGE CALCULATIONS.



100 0 100 200
scale feet

1 V.8.3 DETAIL

TYPICAL GRASS LINED PERIMETER DITCH

SCALE: NOT TO SCALE

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ASCEND PERFORMANCE MATERIALS

PROJECT: ASCEND PERFORMANCE MATERIALS LLC. CHOCOLATE BAYOU PLANT PERMIT UNIT 16 ALVIN, TX

TITLE: DRAINAGE PLAN

DRAWN	TLE	REVIEWED	PRM
CHECKED	PCM	APPROVED	
DATE	DECEMBER 2009		
SCALE	AS SHOWN		
JOB NO.	083-94322		
DWG. NO.	083-94322-301		

FIGURE NUMBER

V.8.3

REV. | DATE | DESCRIPTION | DR. BY | APP. BY

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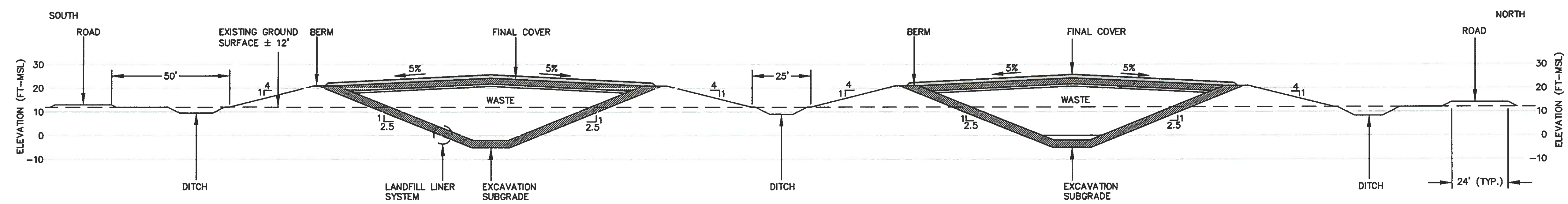
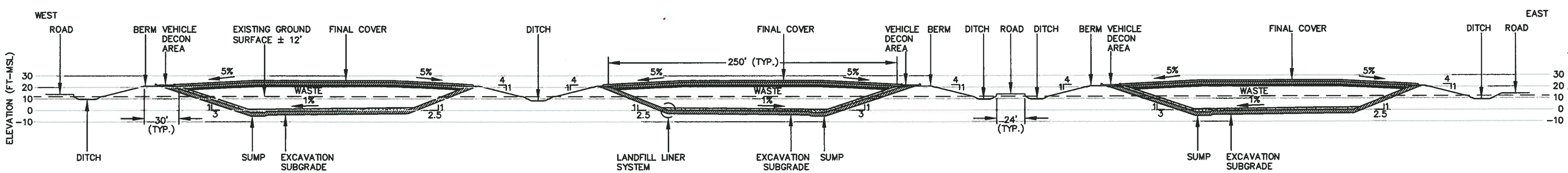


A SECTION V.8.2
SOUTH TO NORTH SECTION

25 0 25 50
scale feet



B SECTION V.8.2
WEST TO EAST SECTION

50 0 50 100
scale feet

P:\083-94322 Soluba Chocolate Bayou\Drawings\Permit Drawings\083-94322-301.dwg, HOU1-P-KM352.pc3

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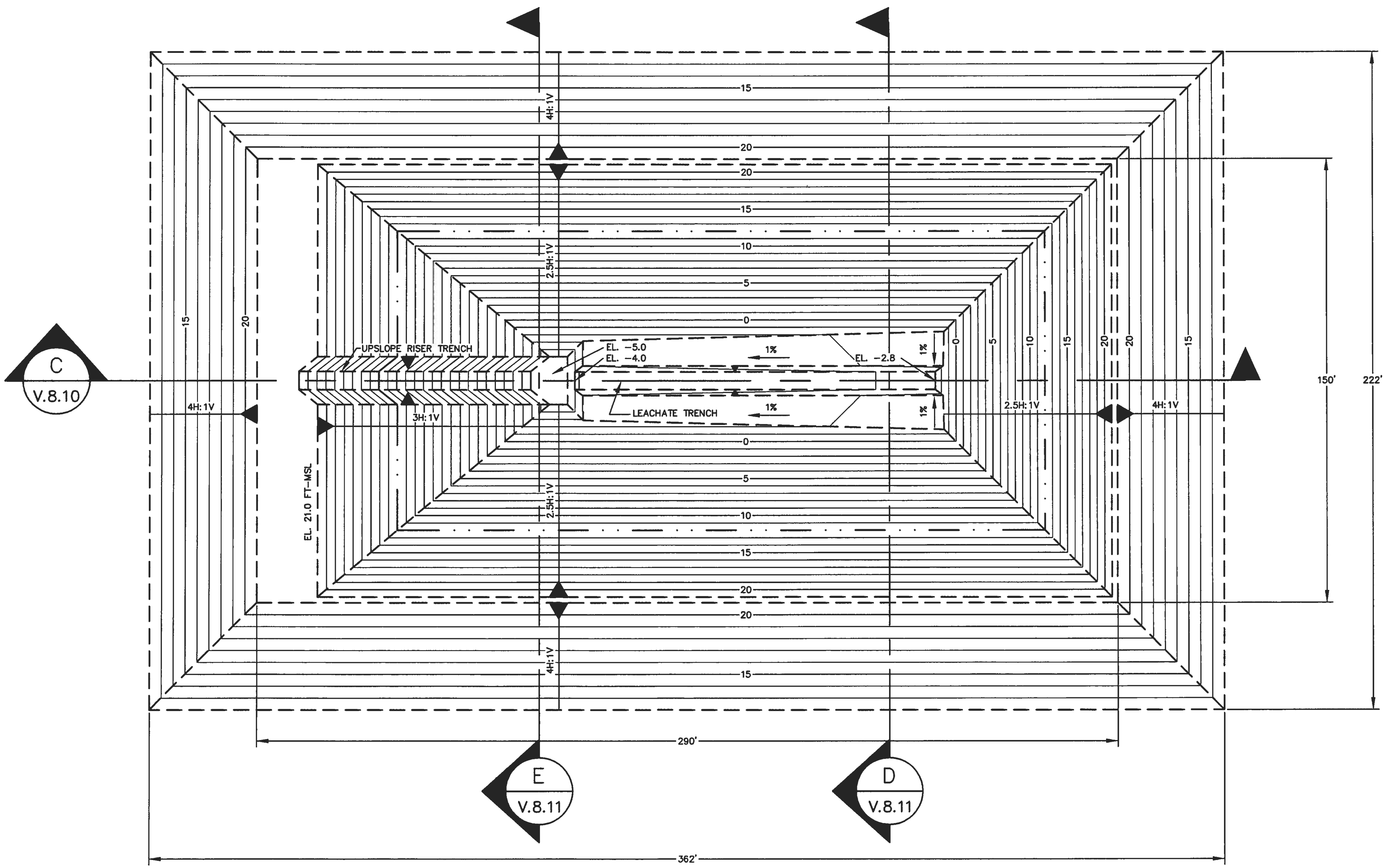
ASCEND PERFORMANCE MATERIALS

ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PERMIT UNIT 16
ALVIN, TX

SITE CROSS SECTIONS

DRAWN	TLE	REVIEWED	PRM
CHECKED	PCM	APPROVED	
DATE	DECEMBER 2009		
SCALE	AS SHOWN		
JOB NO.	083-94322		
DWG. NO.	083-94322-301		

FIGURE NUMBER
V.8.4



LEGEND

— — — — —	SUBGRADE GRADE BREAK LINES
— · — · —	CUT & FILL BOUNDARY
——15——	MAJOR CONTOUR LINES WITH LABEL
————	MINOR CONTOUR LINES
▶———	SLOPE INDICATORS

NOTES

1. EXCAVATION PLAN IS APPLICABLE TO ALL PERMIT UNIT 16 LANDFILL CELLS. SEE SHEET V.8.2 FOR CELL ORIENTATION.
2. ALL ELEVATIONS SHOWN ARE IN FT-MSL.
3. EXISTING GROUND SURFACE IS AT APPROXIMATELY EL. 12 FT-MSL.
4. THE CUT & FILL BOUNDARY IS BETWEEN THE EXCAVATION CUT AND BERM FILL.

20 0 20 40
scale feet

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ASCEND PERFORMANCE MATERIALS

PROJECT: ASCEND PERFORMANCE MATERIALS LLC. CHOCOLATE BAYOU PLANT PERMIT UNIT 16 ALVIN, TX

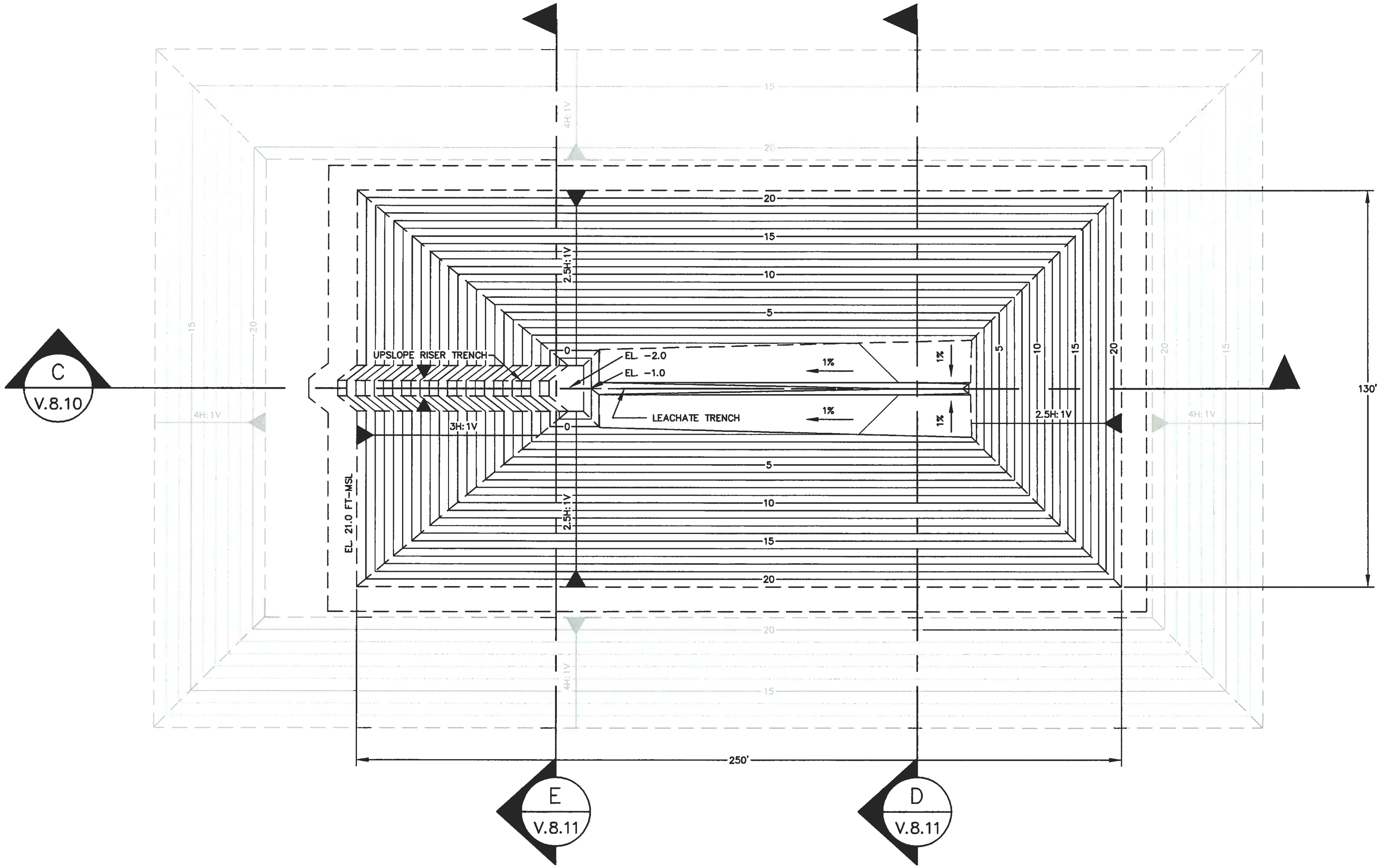
TITLE: TYPICAL EXCAVATION PLAN

DRAWN	TLE	REVIEWED	PRM
CHECKED	PCM	APPROVED	
DATE	DECEMBER 2009		
SCALE	AS SHOWN		
JOB NO.	083-94322		
DWG. NO.	083-94322-301		

FIGURE NUMBER

V.8.5

P:\083-94322 Solutia Chocolate Bayou\Drawings\Permit Drawings\083-94322-301.dwg, HOU1-P-KM352.pc3



LEGEND

- CLAY GRADE BREAK LINES
- CLAY CONTOUR LINES WITH LABEL
- CLAY CONTOUR LINES
- GRADE BREAK LINES
- MAJOR GRADE CONTOUR LINES WITH LABEL
- MINOR GRADE CONTOUR LINES
- SLOPE INDICATORS

NOTES

1. TOP OF COMPACTED CLAY LINER PLAN IS APPLICABLE TO ALL PERMIT UNIT 16 LANDFILL CELLS. SEE SHEET V.8.2 FOR CELL ORIENTATION.
2. ALL ELEVATIONS SHOWN ARE IN FT-MSL.

20 0 20 40
scale feet

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ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PERMIT UNIT 16
ALVIN, TX

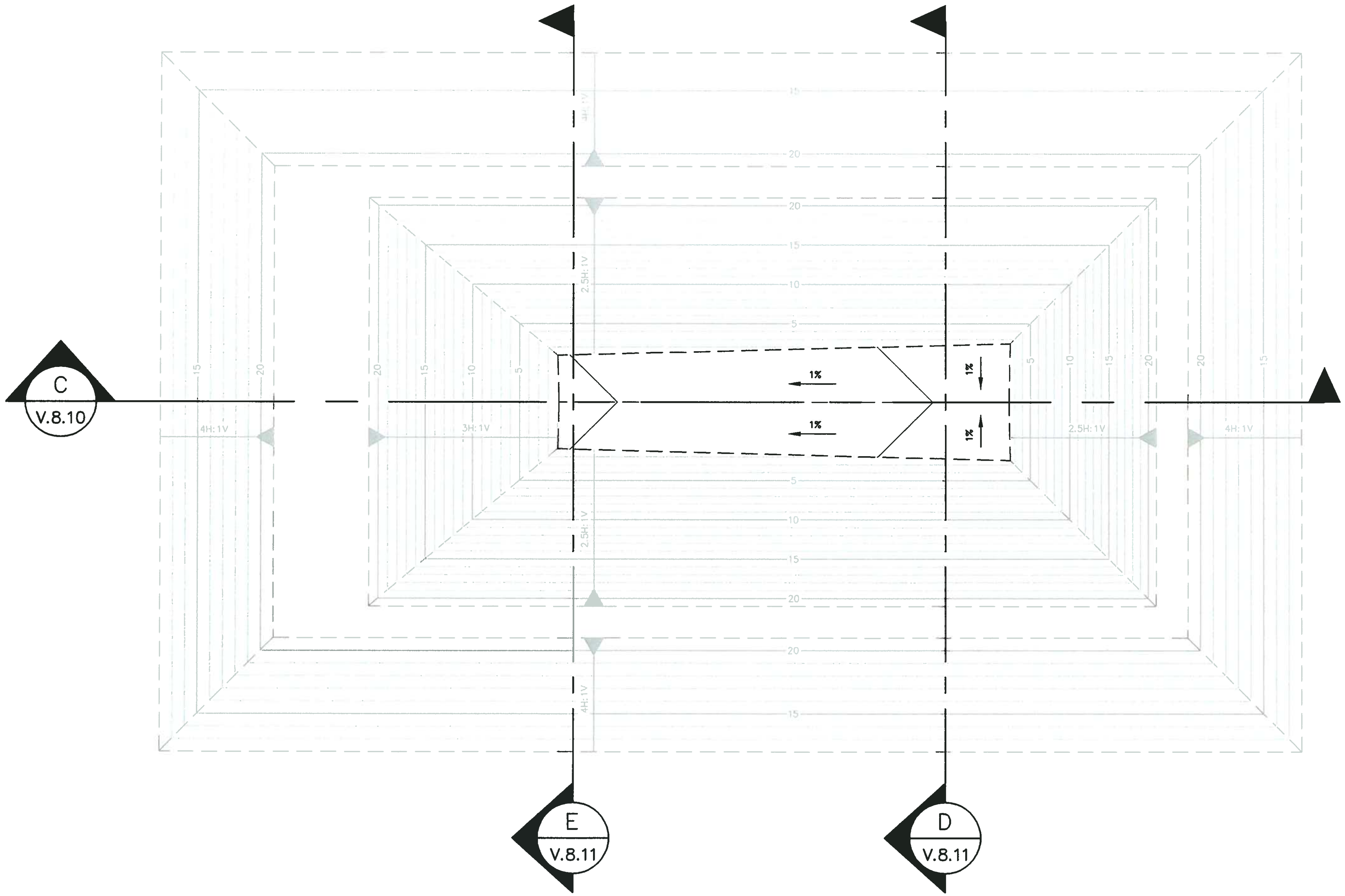
TOP OF COMPACTED CLAY LINER PLAN

DRAWN	TLE	REVIEWED	PRM
CHECKED	PCM	APPROVED	
DATE	DECEMBER 2009		
SCALE	AS SHOWN		
JOB NO.	083-94322		
DWG. NO.	083-94322-301		

FIGURE NUMBER

V.8.6

P:\083-94322 Soluta Chocolate Bayou\Drawings\Permit Drawings\083-94322-301.dwg, HOU1-P-KM352.pc3



LEGEND

- PRIMARY LCS GRADE BREAK LINES
- GRADE BREAK LINES
- MAJOR GRADE CONTOUR LINES WITH LABEL
- MINOR GRADE CONTOUR LINES
- SLOPE INDICATORS

NOTES

1. TOP OF PRIMARY LEACHATE COLLECTION SYSTEM PLAN IS APPLICABLE TO ALL PERMIT UNIT 16 LANDFILL CELLS. SEE SHEET V.8.2 FOR CELL ORIENTATION.
2. ALL ELEVATIONS SHOWN ARE IN FT–MSL.

20 0 20 40
scale feet

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ASCEND PERFORMANCE MATERIALS

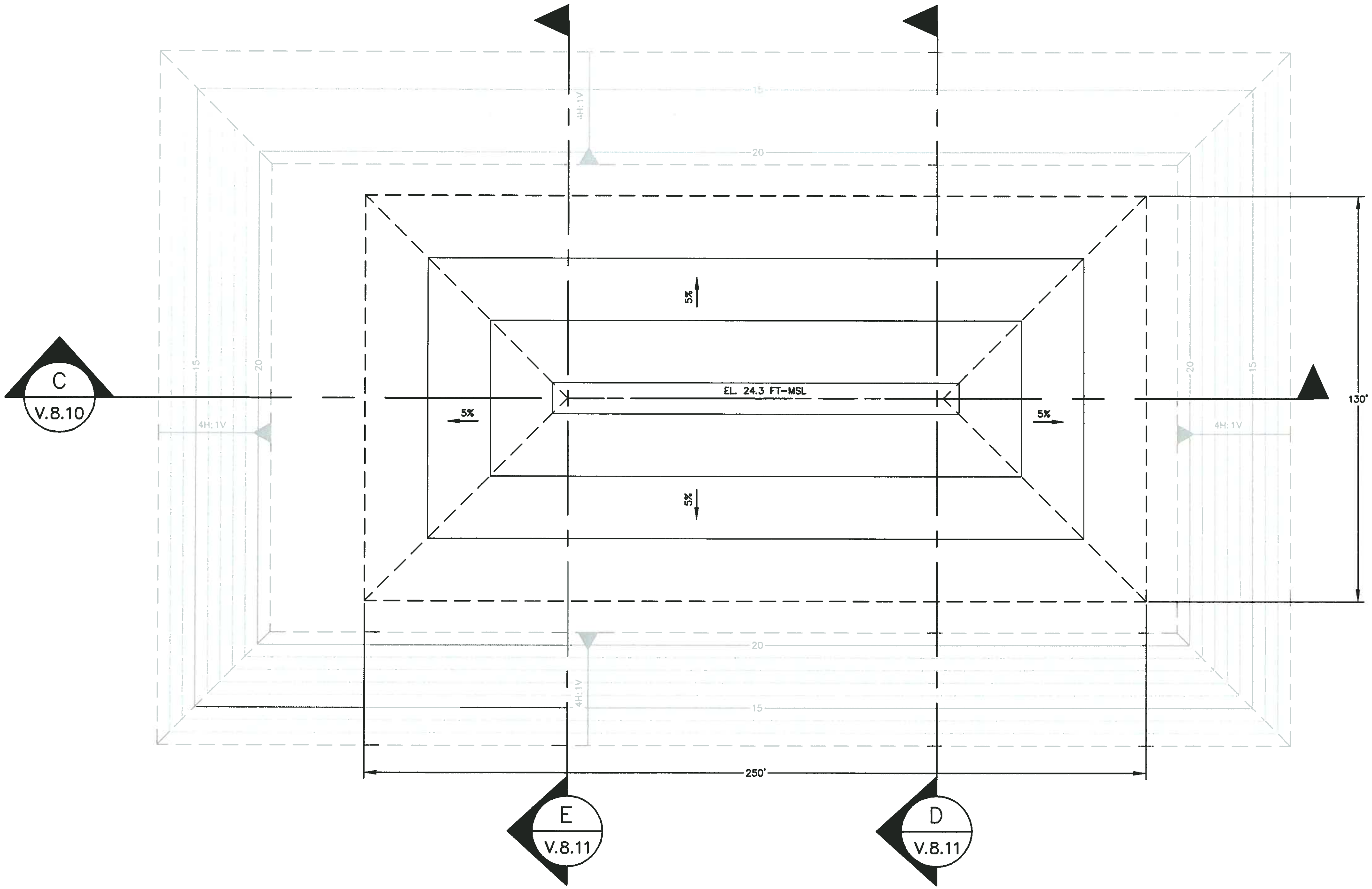
ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PERMIT UNIT 16
ALVIN, TX

TOP OF PRIMARY LEACHATE COLLECTION SYSTEM PLAN

DRAWN	TLE	REVIEWED	PRM
CHECKED	PCM	APPROVED	
DATE	DECEMBER 2009		
SCALE	AS SHOWN		
JOB NO.	083-94322		
DWG. NO.	083-94322-301		

FIGURE NUMBER
V.8.7

P:\083-94322 Solutia Chocolate Bayou\Drawings\Permit Drawings\083-94322-301.dwg, HOU1-P-KM352.pc3



LEGEND

— — — —	FINAL COVER CLAY GRADE BREAK LINES
——15——	CLAY CONTOUR LINES WITH LABEL
————	CLAY CONTOUR LINES
- - - -	GRADE BREAK LINES
——15——	EXISTING MAJOR GRADE CONTOUR LINES WITH LABEL
	EXISTING MINOR GRADE CONTOUR LINES

NOTES

1. TOP OF COMPACTED CLAY CAP PLAN IS APPLICABLE TO ALL PERMIT UNIT 16 LANDFILL CELLS. SEE SHEET V.8.2 FOR CELL ORIENTATION.
2. ALL ELEVATIONS SHOWN ARE IN FT–MSL.

20 0 20 40
scale feet

STATE OF TEXAS
PHILLIP REID MATTHEWS II
83554
LICENSED
PROFESSIONAL ENGINEER

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Tel: (281) 821–6868
Texas Registration Number: F–2578

ASCEND PERFORMANCE MATERIALS

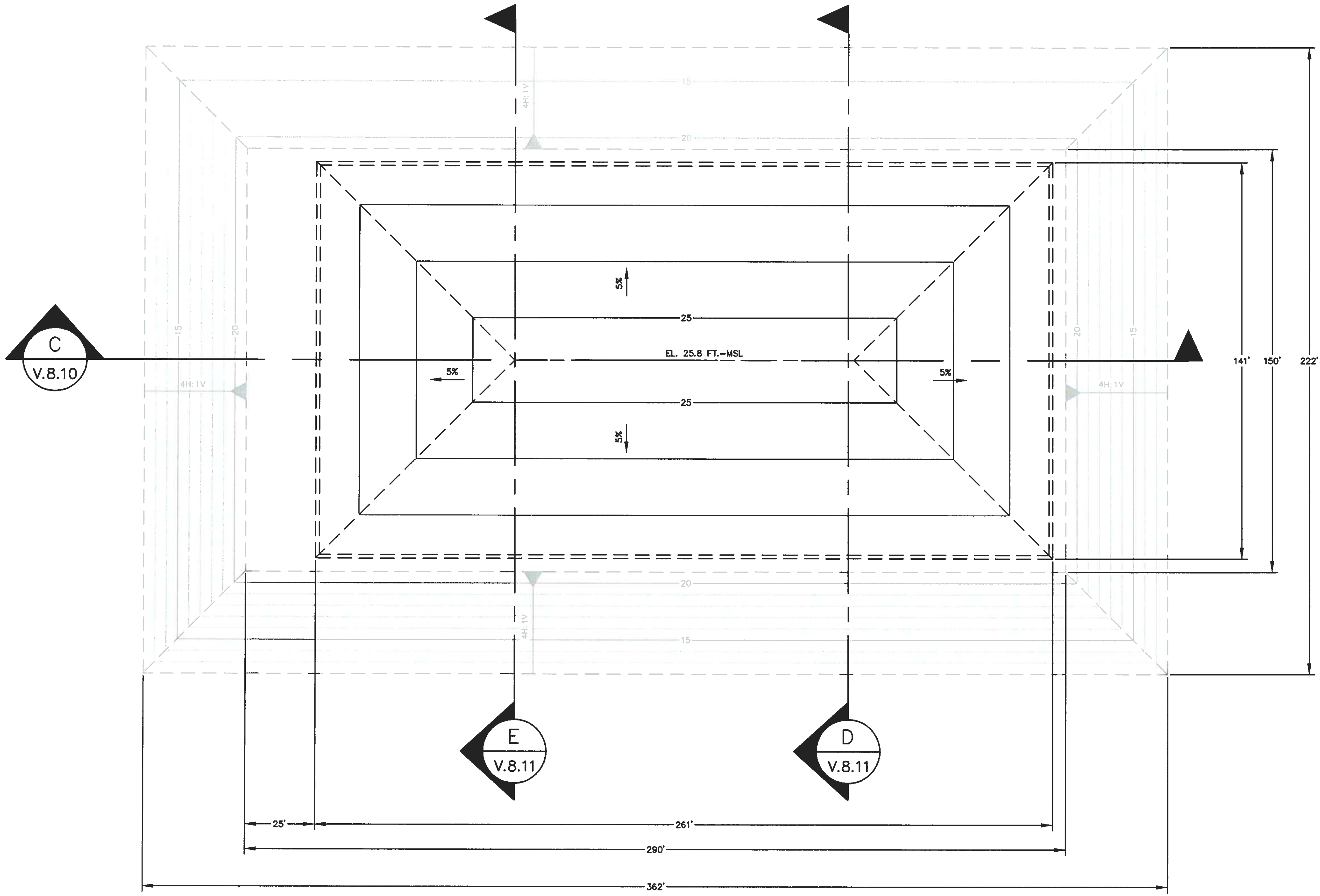
PROJECT
ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PERMIT UNIT 16
ALVIN, TX

TITLE
TOP OF COMPACTED CLAY CAP

DRAWN	TLE	REVIEWED	PRM
CHECKED	PCM	APPROVED	
DATE	DECEMBER 2009		
SCALE	AS SHOWN		
JOB NO.	083-94322		
DWG. NO.	083-94322-301		

FIGURE NUMBER
V.8.8

P:\083-94322 Solutia Chocolate Bayou\Drawings\Permit Drawings\083-94322-301.dwg, HOU1-P-KM352.pc3



LEGEND

(dashed line)	FINAL COVER TOPSOIL GRADE BREAK LINES
—15—	FINAL COVER CONTOUR LINES WITH LABEL
(solid line)	FINAL COVER CONTOUR LINES
(light dashed line)	GRADE BREAK LINES
—15—	MAJOR GRADE CONTOUR LINES WITH LABEL
	MINOR GRADE CONTOUR LINES
▶—	SLOPE INDICATORS

NOTES

1. FINAL COVER PLAN IS APPLICABLE TO ALL PERMIT UNIT 16 LANDFILL CELLS. SEE SHEET V.8.2 FOR CELL ORIENTATION.

2. ALL ELEVATIONS SHOWN ARE IN FT–MSL.

20 0 20 40
feet

STATE OF TEXAS
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ASCEND
PERFORMANCE MATERIALS

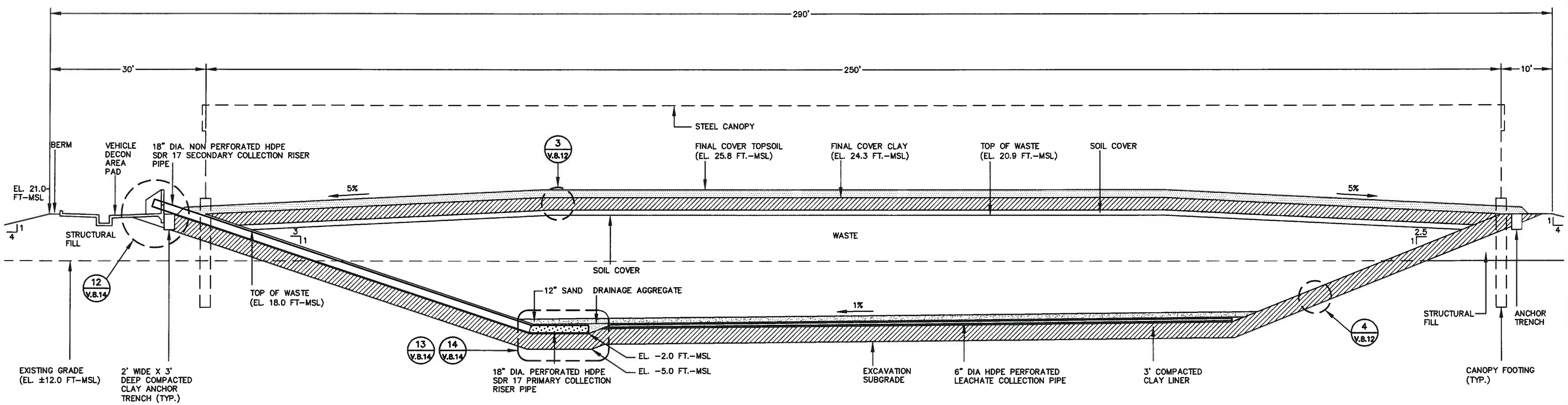
PROJECT
ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PERMIT UNIT 16
ALVIN, TX

TITLE
FINAL COVER PLAN

DRAWN	TLE	REVIEWED	PRM
CHECKED	PCM	APPROVED	
DATE	DECEMBER 2009		
SCALE	AS SHOWN		
JOB NO.	083-94322		
DWG. NO.	083-94322-301		

FIGURE NUMBER
V.8.9

P:\083-94322 Solutia Chocolate Bayou\Drawings\Permit Drawings\083-94322-301.dwg, HOU1-P-KM352.pc3



C
V.8.5

SECTION

SECTION C (WEST TO EAST)

10 0 10 20
scale feet

NOTES

1. APPROXIMATE SIZE OF STEEL CANOPY OF FOOTINGS SHOWN FOR PERMITTING PURPOSES ONLY. ACTUAL FOOTINGS SHALL BE DESIGNED BY A QUALIFIED PROFESSIONAL ENGINEER PRIOR TO CONSTRUCTION.
2. SOIL COVER INDICATED FOR FINAL COVER GRADING PURPOSES ONLY.

12/30/09

STATE OF TEXAS
PHILLIP REED MATTHEWS II
83554
LICENSED
PROFESSIONAL ENGINEER

INTENDED FOR PERMITTING PURPOSES ONLY

REV. | DATE | DESCRIPTION | DR. BY | APP. BY

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas USA 77073
Tel: (281) 821-6868
Texas Registration Number: F-2578

ASCEND
PERFORMANCE MATERIALS

PROJECT
ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PERMIT UNIT 16
ALVIN, TX

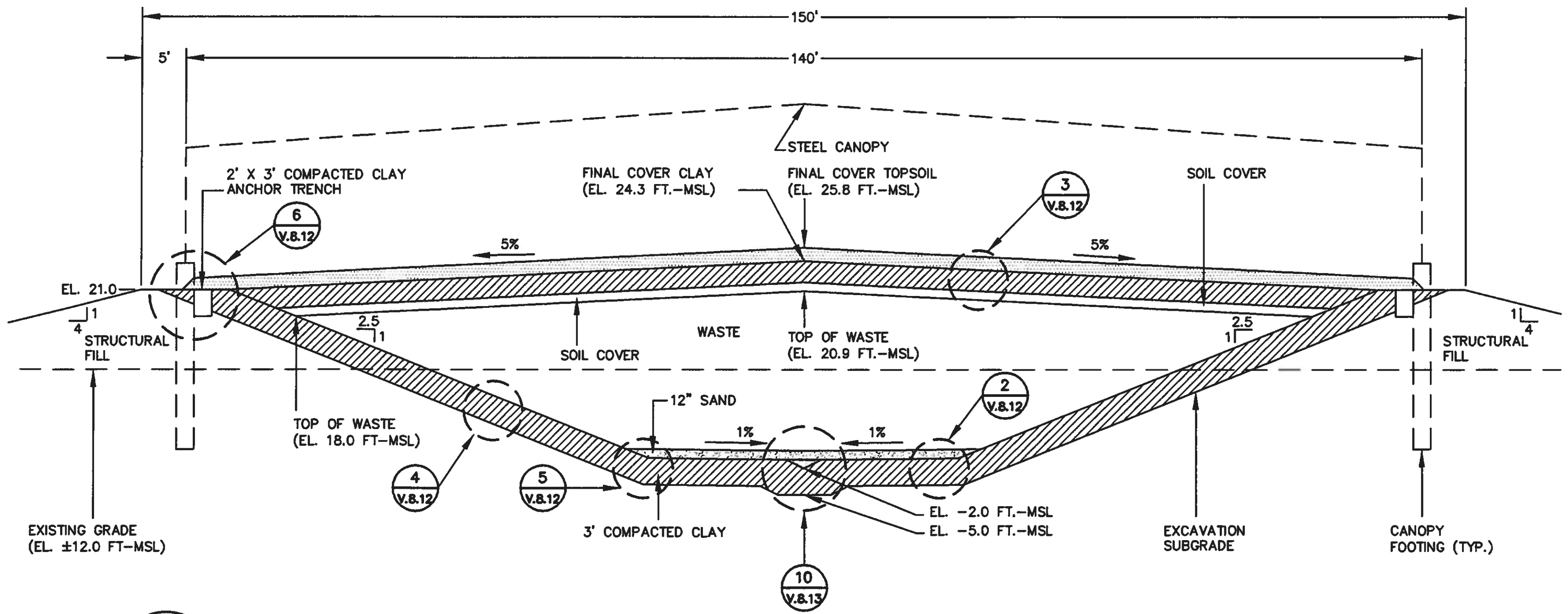
TITLE
CELL CROSS SECTIONS
(WEST TO EAST)

DRAWN	TLE	REVIEWED	PRM
CHECKED	PCM	APPROVED	
DATE	DECEMBER 2009		
SCALE	AS SHOWN		
JOB NO.	083-94322		
DWG. NO.	083-94322-301		

FIGURE NUMBER

V.8.10

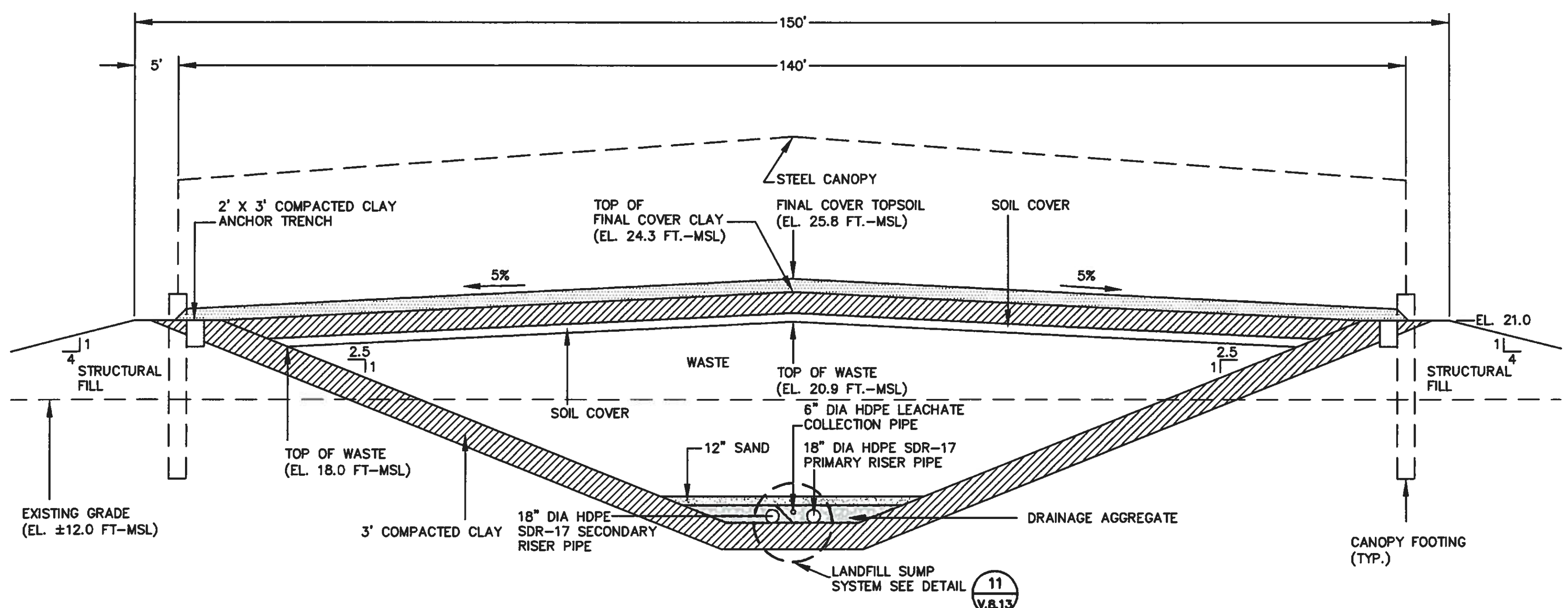
P:\083-94322 Solutia Chocolate Bayou\Drawings\Permit Drawings\083-94322-301.dwg, HOU1-P-KM352.pc3



D V.8.5 **SECTION**

SECTION D (SOUTH TO NORTH)

10 0 10 20
scale feet



E V.8.5 **SECTION**

SECTION E (SOUTH TO NORTH)

10 0 10 20
scale feet

NOTES

1. APPROXIMATE SIZE OF STEEL CANOPY OF FOOTINGS SHOWN FOR PERMITTING PURPOSES ONLY. ACTUAL FOOTINGS SHALL BE DESIGNED BY A QUALIFIED PROFESSIONAL ENGINEER PRIOR TO CONSTRUCTION.

12/30/09

STATE OF TEXAS
PHILLIP REID MATTHEWS II
85554
LICENSED PROFESSIONAL ENGINEER

INTENDED FOR PERMITTING PURPOSES ONLY

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Tel: (281) 821-6868
Texas Registration Number: F-2578

ASCEND PERFORMANCE MATERIALS

PROJECT: ASCEND PERFORMANCE MATERIALS LLC. CHOCOLATE BAYOU PLANT PERMIT UNIT 16 ALVIN, TX

TITLE: CELL CROSS SECTIONS (SOUTH TO NORTH)

DRAWN	TLE	REVIEWED	PRM
CHECKED	PCM	APPROVED	
DATE			DECEMBER 2009
SCALE			AS SHOWN
JOB NO.			083-94322
DWG. NO.			083-94322-301

FIGURE NUMBER

V.8.11

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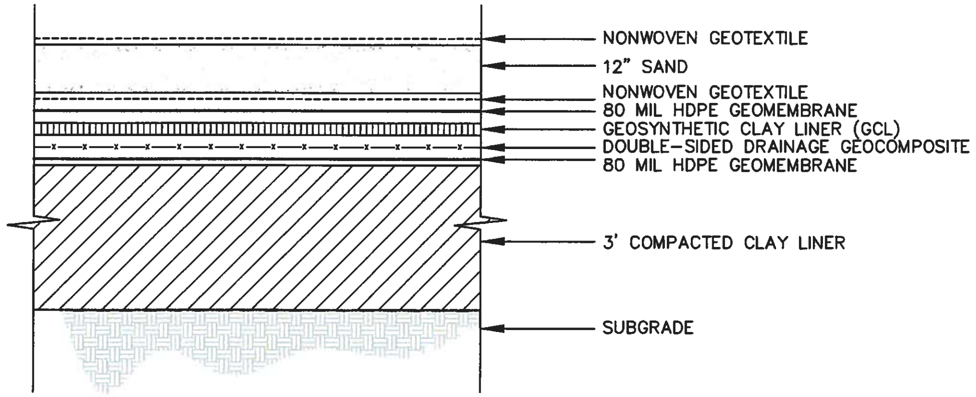
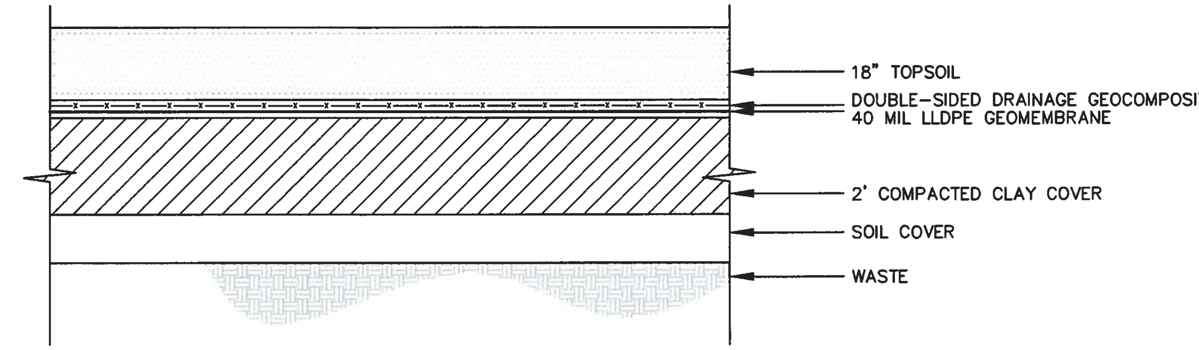


2 DETAIL V.8.11

TYPICAL LANDFILL LINER SYSTEM ON FLOOR

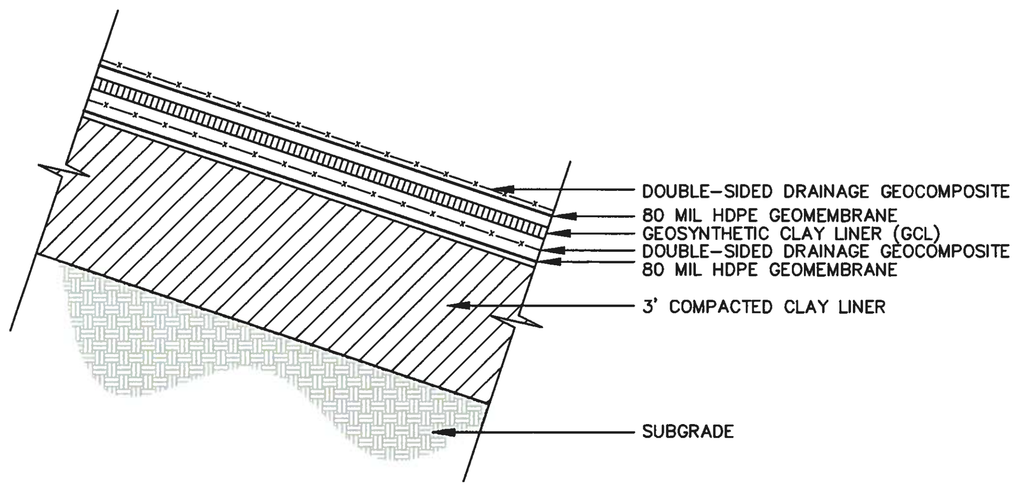
2 0 2 4 scale feet



3 DETAIL V.8.10

FINAL COVER SYSTEM

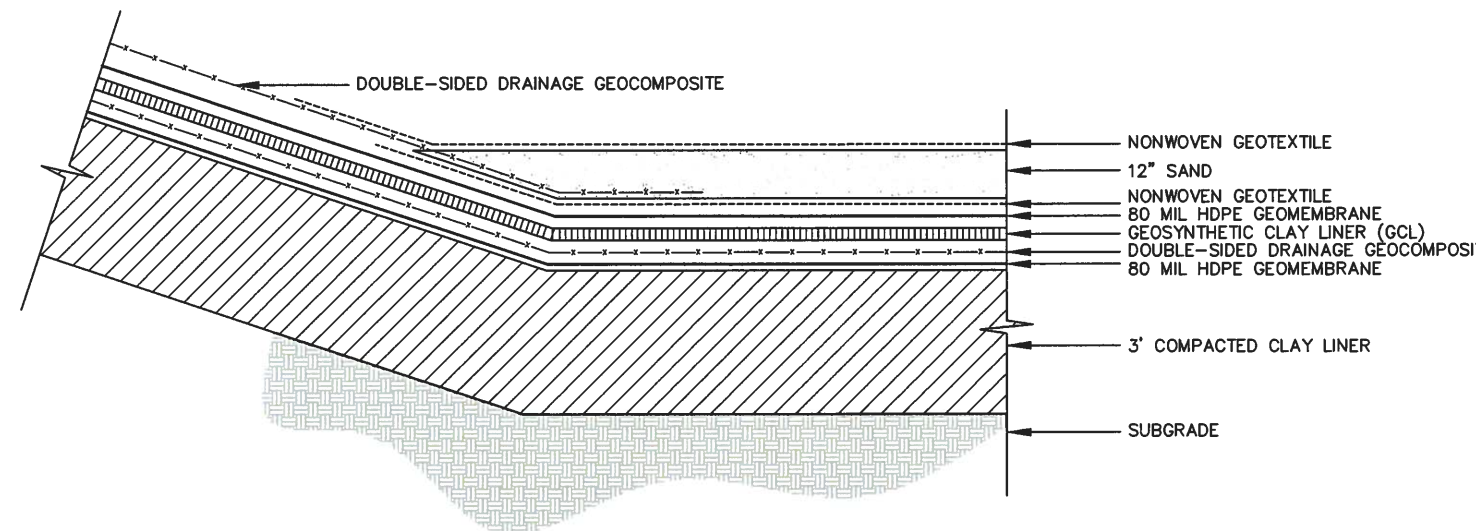
2 0 2 4 scale feet



4 DETAIL V.8.10

TYPICAL LANDFILL LINER SYSTEM ON SIDESLOPE

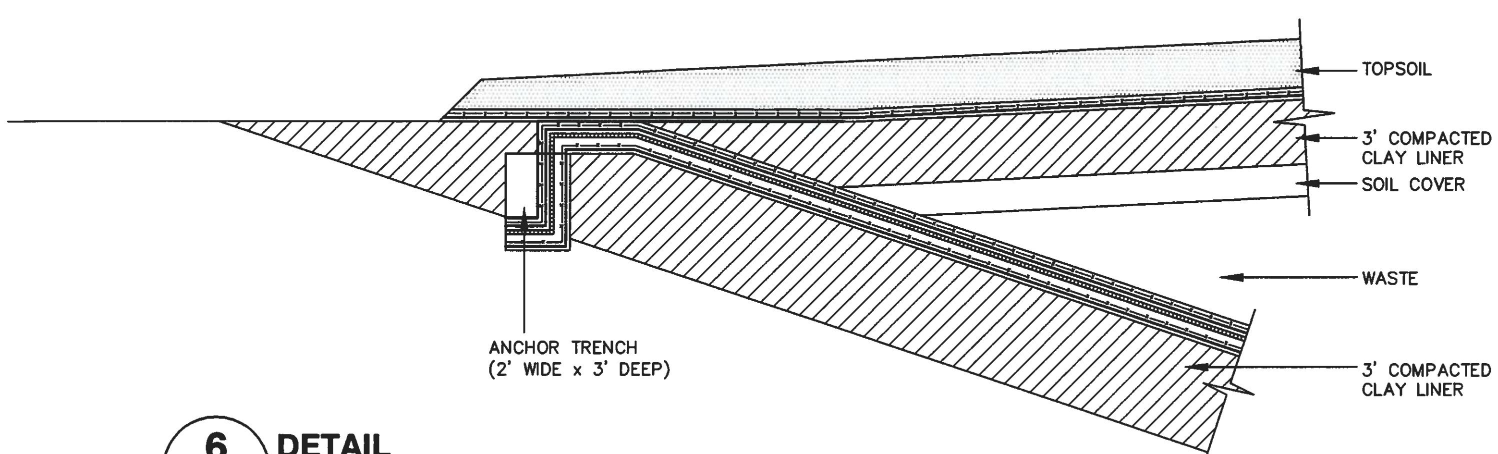
2 0 2 4 scale feet



5 DETAIL V.8.11

TYPICAL LANDFILL LINER TIE-IN

3 0 3 6 scale feet



6 DETAIL V.8.11

TYPICAL LANDFILL PERIMETER

3 0 3 6 scale feet

STATE OF TEXAS
PHILLIP REID MATTHEWS
83554
LICENSED PROFESSIONAL ENGINEER
12/30/09

INTENDED FOR PERMITTING PURPOSES ONLY

Golder Associates
500 Century Plaza Drive, Suite 190
Houston, Texas USA 77073
Tel. (281) 821-6868
Texas Registration Number: F-2578

ASCEND PERFORMANCE MATERIALS

PROJECT: ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PERMIT UNIT 16
ALVIN, TX

TITLE: LINER SYSTEM DETAILS

DRAWN	ML	REVIEWED	PRM
CHECKED	PCM	APPROVED	–
DATE	DECEMBER 2009		
SCALE	AS SHOWN		
JOB NO.	083-94322		
DWG. NO.	083-94322-302		

FIGURE NUMBER

V.8.12

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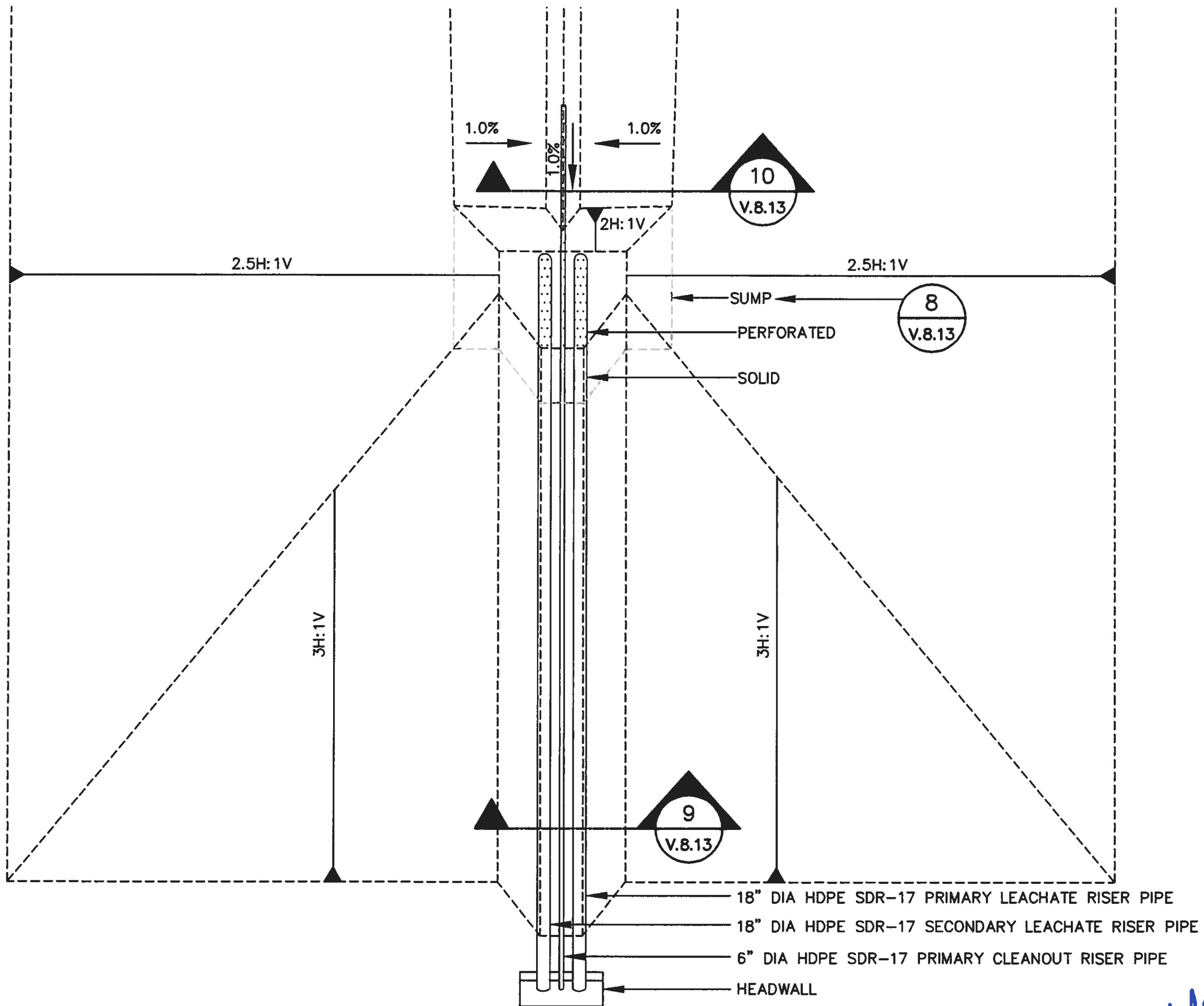
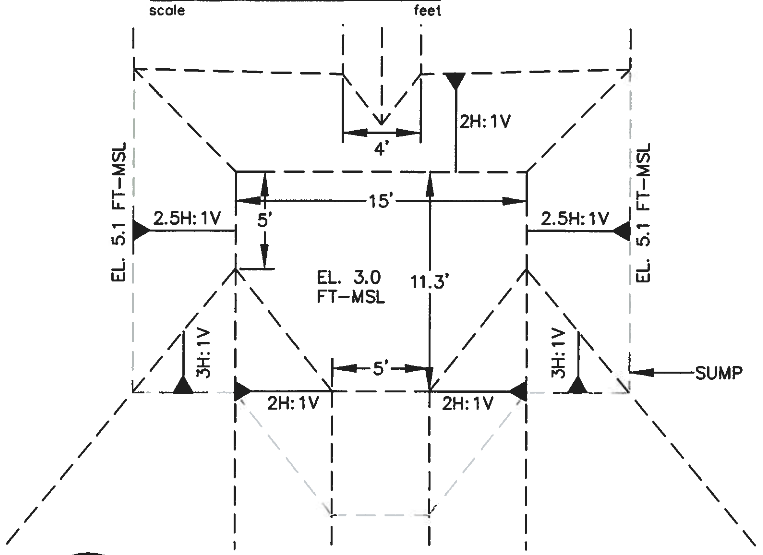


7 V.8.13 **DETAIL**
SUMP LAYOUT

scale 10 0 10 20 feet

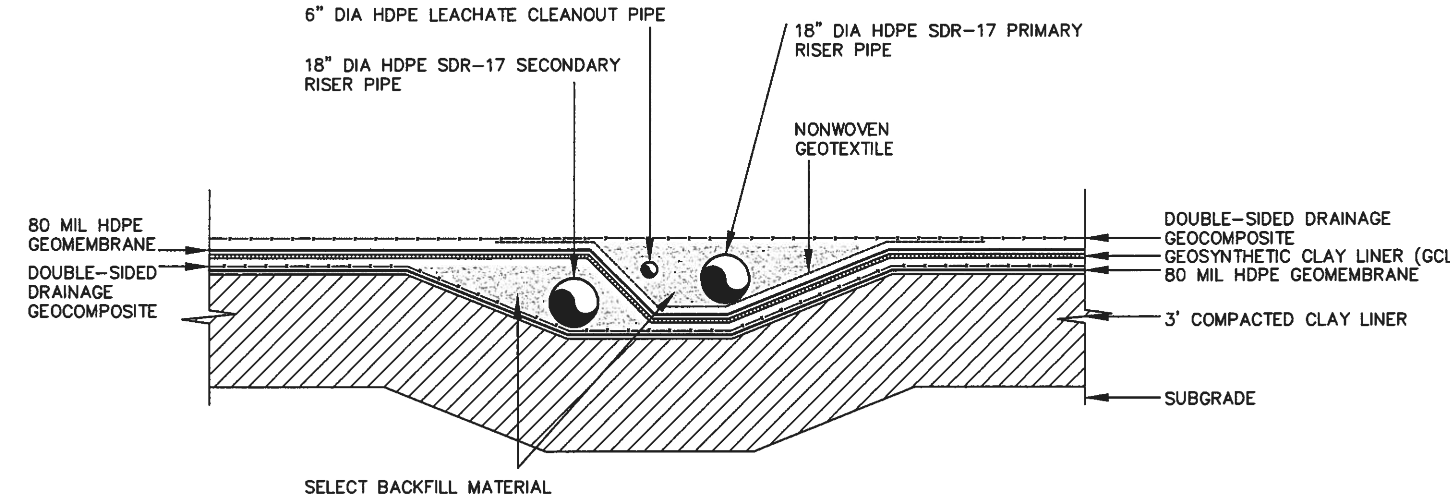
STATE OF TEXAS
PHILLIP REID MATTHEWS II
83554
LICENSED
PROFESSIONAL ENGINEER

Phillip R. Matthews
12/30/09



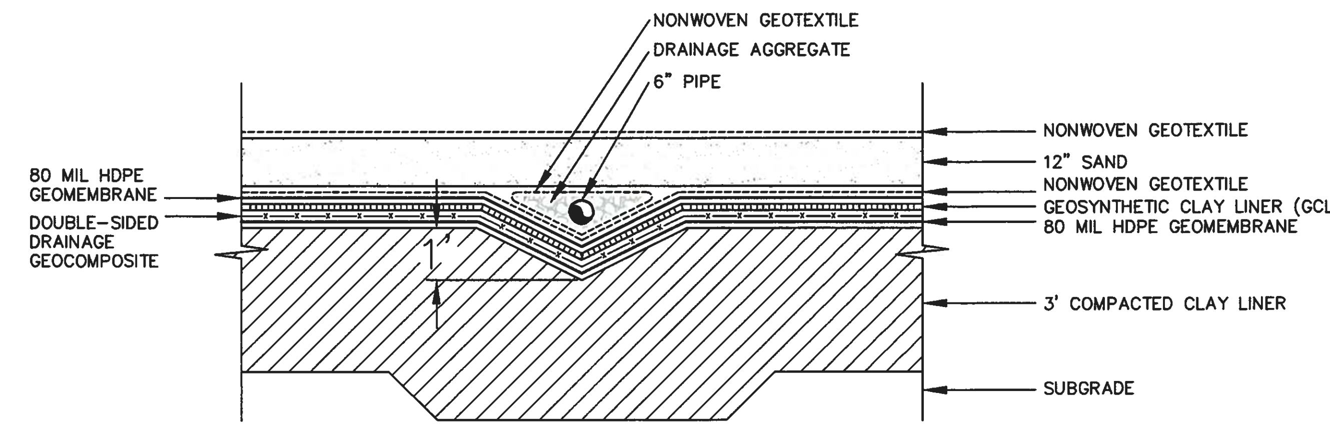
8 V.8.13 **DETAIL**
SUMP LAYOUT DIMENSIONS

scale 5 0 5 10 feet



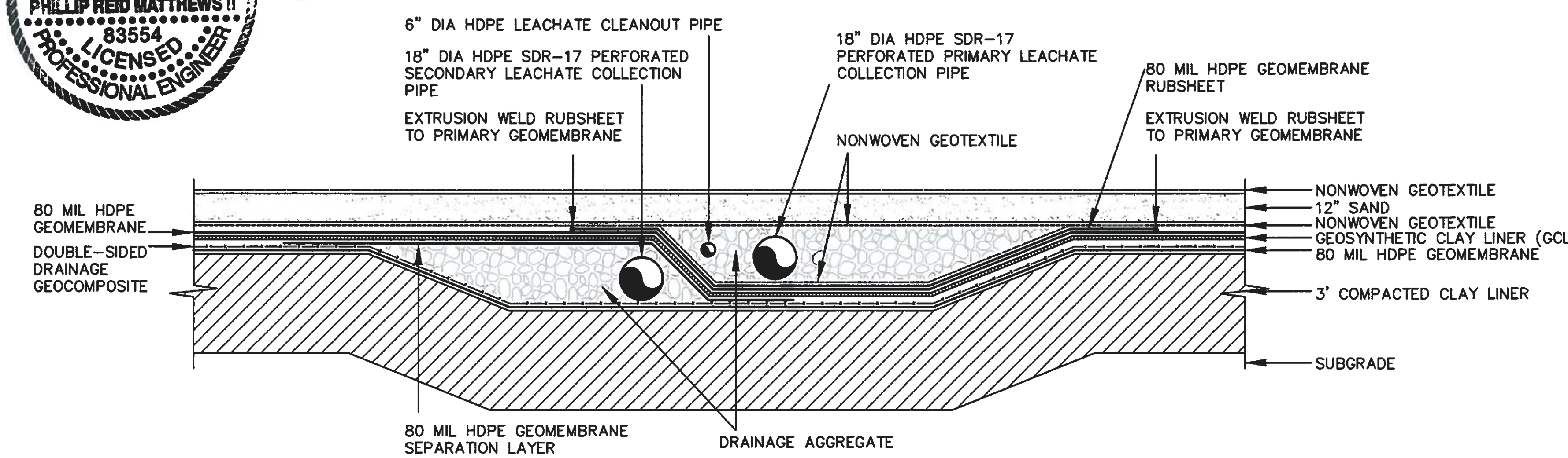
9 V.8.13 **DETAIL**
TYPICAL SIDEWALL RISER SECTION

scale 3 0 3 6 feet



10 V.8.11 **DETAIL**
TYPICAL LEACHATE COLLECTION LINE SECTION

scale 2 0 2 4 feet



11 V.8.11 **DETAIL**
SUMP

scale 3 0 3 6 feet

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500 Century Plaza Drive, Suite 190
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Tel: (281) 821-6868
Texas Registration Number: F-2578

ASCEND PERFORMANCE MATERIALS

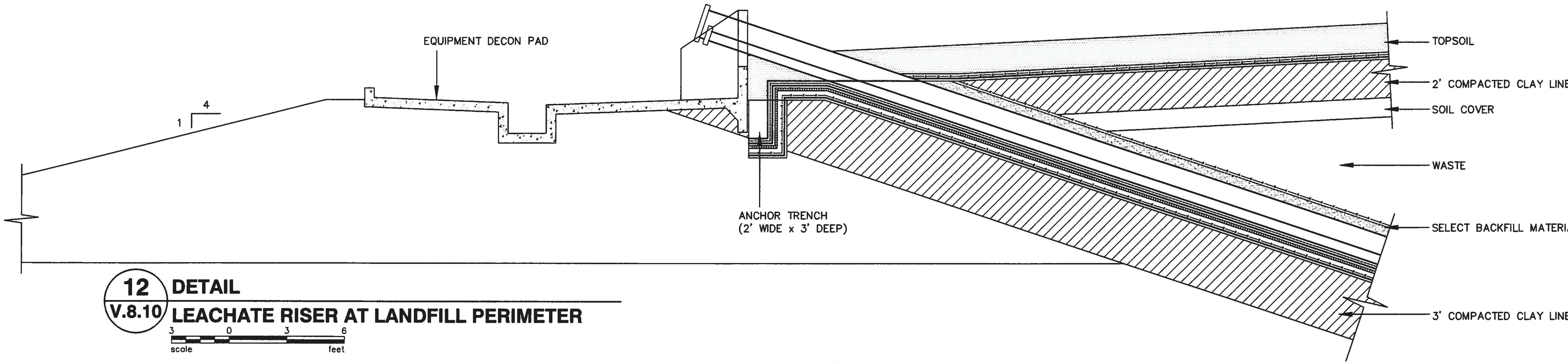
PROJECT
ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PERMIT UNIT 16
ALVIN, TX

TITLE
LEACHATE COLLECTION SYSTEM SUMP DETAILS

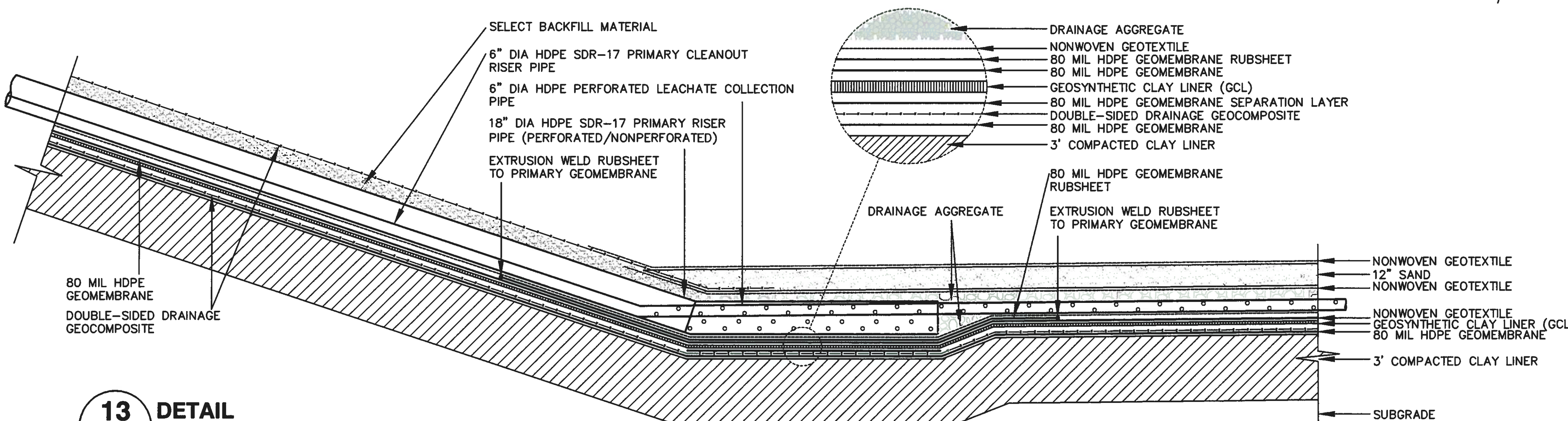
DRAWN	ML	REVIEWED	PRM
CHECKED	PCM	APPROVED	
DATE	DECEMBER 2009		
SCALE	AS SHOWN		
JOB NO.	083-94322		
DWG. NO.	083-94322-302		

FIGURE NUMBER
V.8.13

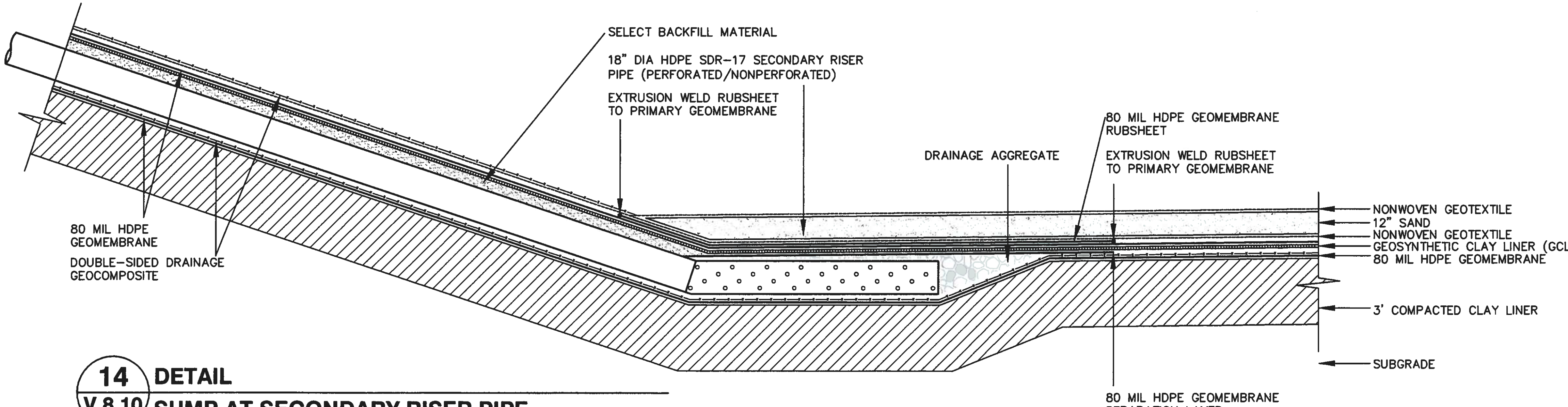
P:\083-94322 Solutia Chocolate Bayou\Drawings\Permit Drawings\083-94322-302.dwg, HOU1-P-KM352.pc3



12 DETAIL
V.8.10 LEACHATE RISER AT LANDFILL PERIMETER
3 0 3 6
scale feet



13 DETAIL
V.8.10 SUMP AT LEACHATE COLLECTION PIPE
3 0 3 6
scale feet



14 DETAIL
V.8.10 SUMP AT SECONDARY RISER PIPE
3 0 3 6
scale feet

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ASCEND
PERFORMANCE MATERIALS

PROJECT
ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PERMIT UNIT 16
ALVIN, TX

TITLE
LEACHATE COLLECTION SYSTEM DETAILS

DRAWN	ML	REVIEWED	PRM
CHECKED	PCM	APPROVED	-
DATE	DECEMBER 2009		
SCALE	AS SHOWN		
JOB NO.	083-94322		
DWG. NO.	083-94322-302		

FIGURE NUMBER
V.8.14

REV. DATE DESCRIPTION DR. BY APP. BY

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GSI Job No. G-3379
Issued: 31 December 2009

ATTACHMENT V.8
ENGINEERING REPORT FOR
NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDICES

Appendix V.8.1	Ascend CQA Plan
Appendix V.8.2	Liner and Cover System Analyses
Appendix V.8.3	Compatibility Demonstration
Appendix V.8.4	Settlement Analysis
Appendix V.8.5	Stability Analysis
Appendix V.8.6	Leachate Collection System Calculations
Appendix V.8.7	Surface Water Drainage Analyses

ATTACHMENT V.8
ENGINEERING REPORT FOR
NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.8.1

Ascend CQA Plan

Issued: 31 December 2009

GSI ENVIRONMENTAL

APPENDIX V.8.1
CONSTRUCTION QUALITY ASSURANCE PLAN
PERMIT UNIT 16 LANDFILL
CHOCOLATE BAYOU FACILITY
BRAZORIA COUNTY, TEXAS

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

Prepared by:

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APPENDIX V.8.1
CONSTRUCTION QUALITY ASSURANCE PLAN
PERMIT UNIT 16 LANDFILL
CHOCOLATE BAYOU FACILITY
BRAZORIA COUNTY, TEXAS

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

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STATE OF TEXAS
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PROFESSIONAL ENGINEER
Golder Associates Inc.
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12/30/09

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LIST OF ATTACHMENTS

1.0 INTRODUCTION

1.1 Purpose

This Construction Quality Assurance Plan (CQAP) has been prepared by Golder Associates Inc. (Golder) for use during construction of the proposed landfill cells at the Chocolate Bayou New Landfill (RCRA Permit Unit 16) in Brazoria County, Texas. The purpose of this CQAP is to describe the quality assurance program that will be implemented during construction of the perimeter dike, cell liner system and final cover.

This CQAP addresses the construction of the primary and secondary composite liner systems and the composite final cover system in new disposal cells. Specifically, this CQAP addresses the preparation of the soil subgrade, construction of the compacted clay liner component of the secondary liner, installation of the geosynthetic components of the primary and secondary liner systems, installation of the primary and secondary leachate collection system, construction of the compacted clay liner component of the final cover system, installation of the geosynthetic components of the final cover, and placement of the cover soil layer within the final cover.

1.2 Use of Terms

In the context of this CQAP, the terms construction quality assurance (CQA) and construction quality control (CQC) are used as follows:

- CQA refers to measures taken by the Owner to determine if the Contractor is in compliance with the design plans and specifications.

- CQC refers to measure taken by the Contractor to determine compliance with the requirements for materials and workmanship as stated in the design plans and specifications.

Note: For the purposes of this CQAP, the term "geosynthetics" represents geosynthetic clay liner, geomembrane, geotextile, geonet, and geocomposite materials.

1.3 General Responsibilities

It is the Owner's/Operator's responsibility to fully implement this CQAP. The Owner/Operator shall be responsible for contracting with a qualified Quality Assurance (QA) Professional prior to initiating cell excavation and lining operations.

Each phase of the cell construction, including all field sampling and testing, both during and after completion, shall be conducted by or under the supervision of the QA Professional. The QA Professional shall be an independent third-party professional engineer (P.E.) licensed in the State of Texas with experience in geotechnical engineering and soils testing. A qualified engineering technician (QA Technician) performing daily QA observation and testing shall be under the direct supervision of the QA Professional. The QA Technician shall have at least one of the following qualifications: be certified as a Compacted Clay Liner Inspector and Geosynthetic Inspector by the Geosynthetics Institute's Geosynthetic Certification Institute branch; an engineering technician with a minimum of 2 years of directly related experience; a graduate engineer or geologist; or an engineering technician with other applicable certificates (e.g., Certified Engineering Technologist, CET) approved by the Texas Commission on Environmental Quality (TCEQ).

2.0 CONSTRUCTION ACTIVITIES

The following is a brief discussion of the major construction activities the QA Professional or QA Technician will monitor.

2.1 Earthwork

Earthwork activities include:

- Perimeter dike construction;
- Excavation and subgrade preparation;
- Placement of a 3-foot thick compacted clay liner for the liner system and 2-foot thick compacted clay liner for the final cover system;
- Surface preparation and maintenance of the compacted clay liner prior to geosynthetics installation;
- Placement of a 1-foot thick sand leachate collection layer;
- Waste surface preparation and final grading in the final cover area; and
- Placement of soil cover and vegetative support layer over the final cover system.

2.2 Geosynthetics

Geosynthetics installation activities include:

- Installation and seaming of geomembrane components of the primary and secondary liners;
- Installation and seaming of the geosynthetic clay liner (GCL) of the primary liner system;
- Installation and seaming of the geocomposite drainage layer and geotextile filter within the primary and secondary leachate collection systems; and
- Installation and seaming of the geocomposite drainage layer, geotextile and geomembrane components of the final cover system.

3.0 PERIMETER DIKE EVALUATION

This section outlines generally acceptable construction practices, specifications, and the minimum quality assurance testing requirements for the perimeter dike.

3.1 Pre-Construction Testing

The first step in the construction of the perimeter dike is to pre-qualify the soil materials that are selected for dike construction. Fill material shall consist of clean soils free of deleterious materials. Fill material may be obtained from in-situ soil strata that will be excavated during cell construction or from a select borrow source. Representative samples from either source shall be subject to the minimum pre-construction testing program shown in Table 1.

Table 1: Perimeter Dike Material Pre-Construction Testing Schedule

Test	Test Method(1)	Frequency(2)	Specification
Particle-Size Analysis	ASTM D422	5,000 yd^3	≤ 1 inch
Atterberg Limits	ASTM D4318	5,000 yd^3	-- --
Soil Classification	ASTM D2487	5,000 yd^3	SW, SP, SC, SM, CH, or CL,
Standard Proctor Tests	ASTM D698	10,000 yd^3	--
Moisture Content	ASTM D4643 or D2216	5,000 yd^3	--

Notes:
(1) In all cases, the most current ASTM test method shall be used.
(2) Specified frequency refers to one per the presented volume or one per material type or source, whichever is greater.

The Proctor moisture-density curves shall be developed for each type of soil determined suitable as dike material and shall be used during the construction phase as a performance reference for compaction and moisture control.

As soil is usually made available subsequent to excavation during construction, additional pre-construction samples should be taken and tests performed when soils vary or as soon as the initial pre-construction test results appear inappropriate or questionable. If and when the same borrow source is utilized for the soil supply of more than one dike area, previously approved test results may be used to supplement the pre-construction data with prior approval of the QA Professional.

3.2 Dike Construction

The dike shall be constructed in accordance with the following requirements, except where otherwise required by the design plans. Certain construction practices shall be utilized as described herein when appropriate.

- Instrument survey methods shall be used to determine the subgrade lines and grades prior to dike construction.

- The dike fill material shall be placed in loose lifts not to exceed 8 inches in thickness. In areas where hand operated tampers must be used, the loose lift thickness shall not exceed 4 inches.
- The dike fill material shall be compacted to meet the density requirements using approved compaction equipment over all areas of each lift. Hand operated tampers shall be used in areas where standard compaction equipment cannot be operated.

3.3 Construction Monitoring and Conformance Testing

Quality assurance of perimeter dike fill materials shall consist of monitoring the work as dike construction proceeds and performing laboratory and field testing to assure that dike material conformance and construction performance specifications are achieved.

3.3.1 Monitoring and Observations

Quality assurance monitoring and testing will be performed during the course of dike construction. The QA Professional or QA Technician working under the general supervision of the QA Professional will perform the work. The QA Professional or QA Technician will be on-site at all times when dike construction is ongoing, so that all relevant activities can be observed and documented.

3.3.2 Construction Testing

The QA Technician shall perform moisture content and density tests following dike fill compaction. The tests shall be conducted at a frequency of one test per 500 yd^3. Moisture content, density tests, and field sampling for laboratory testing shall be performed in accordance with Table 2.

Table 2: Required Testing Frequencies of Perimeter Dike Soils

Test	Method[(1)]	Min. Construction Testing Frequency	Specification
In-Place Density: Nuclear Gage	ASTM D2922	1/500 yd^3	95% of maximum dry density (as determined by ASTM D698)
In-Place Moisture Content	ASTM D3017, D4643, or D2216	1 per in-place density test	

Notes:
(1) In all cases, the most current ASTM test method shall be used.

Nuclear Density Tests: Nuclear density readings shall be taken in the direct transmission mode. Nuclear density curves shall be checked and adjusted in accordance with the procedures described in ASTM D 2922. The nuclear gauge calibration checks shall be made at the beginning of a job, on each different type of material to be placed, and at intervals as directed. Nuclear density gauges shall also be standardized daily in accordance with ASTM D 2922.

4.0 SOIL LINER EVALUATION

This section outlines generally acceptable construction practices, specifications, and the minimum quality assurance testing requirements for soil liners. This guidance shall be followed during construction of the compacted clay liner for the liner system, and compacted clay liner for the final cover system.

4.1 Pre-Construction Testing

The first step in the construction of a soil liner is to pre-qualify the soil materials that are selected for liner construction. Soil liner material may be obtained from in-situ soil strata that will be excavated as the liner is constructed or from a select borrow source. Representative samples from either source shall be subject to the minimum pre-construction testing program shown in Table 3.

Table 3: Soil Liner Material Pre-Construction Testing Schedule

Test	Test Method(1)	Frequency(2)	Specification
Particle-Size Analysis	ASTM D422	5,000 yd^3	≤ 1 inch
Atterberg Limits	ASTM D4318	5,000 yd^3	PI $\geq$ 15 LL $\geq$ 30
Soil Classification	ASTM D2487	5,000 yd^3	SC, CH, or CL
Standard Proctor Tests	ASTM D698	10,000 yd^3	--
Moisture Content	ASTM D4643 or D2216	5,000 yd^3	--
Remolded Hydraulic Conductivity	ASTM D5084	5,000 yd^3	≤ $1x10^{-7}$ cm/sec (3)

Notes:

(3) In all cases, the most current ASTM test method shall be used.

(4) Specified frequency refers to one per the presented volume or one per material type or source, whichever is greater.

(5) Conduct this test on a remolded sample that is compacted at or less than 95% of the maximum dry density and at the optimum moisture content as determined from the standard Proctor test. If pre-construction samples are compacted at higher densities and/or respective moisture contents, then the higher values will govern for field control. Pre-construction tests should represent the "worst-case" condition in the field concerning hydraulic conductivity results.

The Proctor moisture-density curves shall be developed for each type of soil determined suitable as liner material and shall be used during the construction phase as a performance reference for compaction and moisture control.

As soil is usually made available subsequent to excavation during liner construction, additional pre-construction samples should be taken and tests performed when soils vary or as soon as the initial pre-construction test results appear inappropriate or questionable. If and when the same borrow source is utilized for the soil supply of more than one liner area, previously approved test results may be used to supplement the pre-construction data with prior approval of the QA Professional.

4.1.1 Test Pad Preparation

A test pad may be constructed for each distinct borrow source at the QA Professional's or Owner's discretion. If the test pad is constructed, the QA Professional shall delineate distinct borrow sources and distinct compaction equipment. The test pad shall verify the moisture/density and permeability relationships developed during borrow source qualification. Each test pad shall be constructed with the designated materials and construction methods proposed to be used as part of the landfill construction. Observations and testing results shall be used to evaluate the following:

- Minimum material placement and compaction effort requirements;
- Minimum number of equipment passes required to achieve specified density;
- Lift thickness;
- In-situ moisture/density; and
- Permeability.

The width of the test pad shall be at least twice the width of the proposed compaction equipment while the length of the test pad shall be at least twice the test pad width. The test pad shall include at least four lifts, for a total compacted thickness of not less than 2 feet.

The QA Technician shall obtain samples and shall perform field tests as required. The method and frequency of field and laboratory tests to be conducted during the test pad program are listed in Table 4.

Table 4: Required Testing Frequencies of Test Pad

Test	Test Method (1)	Frequency	Specification
Standard Proctor Tests	ASTM D698	1 per test pad	Moisture content/density relationship (Proctor Test)
In-Place Density: Nuclear Gage	ASTM D2922	1 per 400 ft^2 per lift	Min. 95% of the Standard Proctor maximum dry density or as required to obtain the required hydraulic conductivity.
In-Place Moisture	ASTM D3017, D4643 or D2216	1 per in-place density test	0% to +5% of optimum moisture content
Grain Size	ASTM D 422	1 per hydraulic conductivity test	≤ 1 inch
Atterberg Limits	ASTM D4318	1 per hydraulic conductivity test	PI ≥ 15 LL ≥ 30
Classification	ASTM D2487	1 per hydraulic conductivity test	SC, CH, or CL
Laboratory Hydraulic Conductivity	ASTM D5084	2 per lift, starting with second lift for a total of 6 tests per test pad	≤ $1x10^{-7}$ cm/sec

Note:
(1) In all cases, the most current ASTM test method shall be used.

4.2 Soil Liner Construction

The soil liner shall be constructed in accordance with the following requirements, except where otherwise required by the design plans. Certain construction practices shall be utilized as described herein when appropriate.

- Instrument survey methods shall be used to determine the subgrade lines and grades prior to soil liner construction.
- The soil liner shall be placed in loose lifts not to exceed 8 inches in thickness. In areas where hand operated tampers must be used, the loose lift thickness shall not exceed 4 inches.
- The use of grade stakes is discouraged. If grade stakes are driven into the soil liner to control lift thickness, they shall be numbered and accounted for at the end of each shift. When removing grade stakes, no broken portion of the grade stakes shall be left in the soil liner layer. Holes left by grade stakes shall be backfilled and compacted.
- The soil liner shall be placed and compacted according to the same procedures developed during the test pad program.
- The soil liner shall be compacted to meet the density requirements by at least 4 passes of the approved compaction equipment over all areas of each lift. For self-propelled compactors, one pass is defined as one pass of the entire vehicle. For towed rollers, one pass of the drum constitutes a pass. Hand operated

tampers shall be used in areas where standard compaction equipment cannot be operated.

- Interlift bonding shall be accomplished by scarifying the top of the finished lift and adjusting the moisture content, if needed, prior to placement of the subsequent loose lift. When soil is scarified it is usually roughened to a depth of about 1 inch. In some cases, the surface may not require scarification if the surface is already rough after compaction of the previous lift. The final lift of soil liner shall not be scarified. The final lift shall be smooth rolled with at least 3 passes of the approved smooth steel-wheeled roller to provide a smooth surface with no ridges or depressions.
- Voids created in the soil liner during construction (including, but not limited to, penetrations for test samples, grade stakes, and other penetrations necessary for construction) shall be repaired by removing sand or other non-soil liner material, placing bentonite or soil liner backfill in lifts no thicker than 3 inches, and tamping each lift with a steel rod. Other ruts and depressions in the surface of the lifts shall be scarified, filled, and then compacted to grade.

4.3 Construction Monitoring and Conformance Testing

Quality assurance of recompacted soil liners shall consist of monitoring the work as soil liner construction proceeds and performing laboratory and field testing to assure that liner material conformance and construction performance specifications are achieved.

4.3.1 Monitoring and Observations

Full-time quality assurance monitoring and testing will be performed during the course of soil liner construction. The QA Professional, or a qualified QA Technician working under the general supervision of the QA Professional, will perform the work. The QA Technician will be on-site at all times when liner construction is ongoing, so that all relevant activities can be observed and documented. The QA Professional will visit the site periodically as construction progress warrants. Such visits will be frequent enough so that he/she is fully knowledgeable of the construction methods and performance and so that he/she can determine that quality assurance monitoring and testing activities are adequate to meet the terms and intent of this CQAP.

Visual observation shall include, but not be limited to, the following:

- Moisture content and distribution, particle size, and other physical properties of the soil during processing, placement, and compaction;
- Type and level of compactive effort, including roller type and weight, drum size, foot length and face area, and number of passes;
- Action of compaction equipment on soil surface (i.e. foot penetration, rolling, pumping, or shearing);
- Maximum clod size (approximately 1 inch in diameter) and breakdown of soil structure (to destroy any macrostructure evidenced after the compaction of the clods);
- Method of bonding lifts together and making liner tie-ins;

- Stones or other inclusions, which may damage overlying geosynthetics components or adversely affect compaction, lift bonding, and in-place testing/sampling. The liner soil material shall contain no rocks or stones larger than 1 inch in diameter or that total 10% by weight; and
- Areas where damage due to excess moisture, insufficient moisture, or freezing may have occurred.

4.3.2 Construction Testing

The QA Technician shall perform moisture content and density tests following soil liner compaction. The tests shall be conducted at a frequency of one test per 10,000 ft^2. The testing pattern shall be staggered for successive lifts so that sampling points are not at the same location in each lift. Moisture content, density tests, and field sampling for laboratory testing shall be performed in accordance with Table 5.

Table 5: Required Testing Frequencies of In-Place Soil Liner

Test	Method(1)	Min. Construction Testing Frequency	Specification
In-Place Density: Nuclear Gage	ASTM D2922	1 test per lift on each sideslope, and 2 tests per lift on base liner	95% of maximum dry density(2) (as determined by ASTM D698)
In-Place Moisture Content	ASTM D3017, D4643, or D2216	1 per in-place density test	0% to +5% of optimum moisture content (as determined by ASTM D698)
Hydraulic Conductivity	ASTM D5084	1 sample per lift	$\leq 1x10^{-7}$ cm/sec
Moisture Content	ASTM D2216	1 per Hydraulic Conductivity test.(3)	–
Unit Weight	ASTM D2922	1 per Hydraulic Conductivity test.	–
Atterberg Limit	ASTM D4318	1 per Hydraulic Conductivity test.	–

Notes:

(1) In all cases, the most current ASTM test method shall be used.

(2) Adjustments to the 95% of Standard dry density requirement or moisture content range may be allowed if it is found by the test pad or laboratory remolded permeabilities that a different (but no lower than 92%) density or change in moisture content range is required to maintain a maximum hydraulic conductivity of $1x10^{-7}$ cm/sec.

(3) Two Shelby tubes/drive cylinders should be retrieved. One tube/cylinder shall serve as the primary test sample. The second tube/cylinder shall serve as the backup sample in case of damage or sample disturbance in the first tube, or in case of a non-conforming permeability test.

Nuclear Density Tests: Nuclear density readings shall be taken in the direct transmission mode. Nuclear density curves shall be checked and adjusted in accordance with the procedures described in ASTM D 2922. The nuclear gauge calibration checks shall be made at the beginning of a job, on each different type of material to be placed, and at intervals as directed. Nuclear density gauges shall also be standardized daily in accordance with ASTM D 2922.

The QA Technician shall take undisturbed samples for hydraulic conductivity testing at a frequency of 1 test per lift.

If a sample fails to meet the requirements of the specifications, the areas of the soil liner from which the samples were obtained shall be retested with two additional samples. If either of these tests fails, the area must be recompacted or removed and replaced. If both samples pass, the area shall be accepted. The area of failure shall be localized by passing tests in four directions. The repaired area must be retested to demonstrate compliance with the CQAP. Repairs to the soil liner shall be documented and include location and volume of soil affected, corrective action taken, and results of retests.

4.4 Construction Tolerances

Only the instrument survey method shall be used to verify soil liner thickness; no test probes that create holes will be allowed. The verification points for record purposes shall be on a grid not exceeding 5,000 ft^2 per grid. If the area under evaluation is less than 5,000 ft^2, a minimum of 2 grid points is required for verification. The selected grid shall be the same for both beginning and finished elevations of the soil liner, so that minimum thicknesses can be calculated and verified.

The minimum thickness of the compacted clay liner shall be 3 feet for the liner system and 2 feet for the final cover system.

4.5 Post-Construction Care of Soil Liner

After soil liner placement, moisture content shall be maintained or adjusted to meet the acceptable zone criteria. Erosion that occurs in the soil liner shall be repaired and grades shall be re-established. Freezing and desiccation of the soil liner shall be prevented. If freezing or desiccation occurs, the affected soil shall be removed or reconditioned as directed. Areas that have required repair shall be retested as directed. Repairs to the soil liner shall be documented and include location and volume of soil affected, corrective action taken, and results of retests.

5.0 GEOSYNTHETICS

The CQA program for geosynthetics consists of the QA Professional reviewing the Geosynthetics Installer's QC submittals, material conformance testing, construction monitoring, and testing. The types of geosynthetics used in the construction of the disposal cell include geosynthetic clay liner (GCL), geomembrane, nonwoven geotextile, and double-sided geocomposite drainage layer (cell sideslopes and final cover). Prior to and during construction, these geosynthetics will be sampled and tested to determine whether the materials meet the requirements specified in the CQAP. A laboratory accredited via the Geosynthetic Accreditation Institute's Laboratory Accreditation Program (GAI-LAP) will perform the required laboratory tests.

5.1 Pre-Installation Material Evaluation

5.1.1 Geomembrane

The manufacturer shall perform geomembrane quality control tests using the test methods and frequencies listed in the most recent version of the Geosynthetic Research Institute (GRI) test method GM13 and GM 17. GRI test method GM13 is applicable for high-density polyethylene (HDPE) geomembrane, and GM17 is applicable for linear low-density polyethylene (LLDPE) geomembrane. Tables 2(a) and 2(a) from GRI GM13 and GRI GM17, respectively, are included in Attachment A.

5.1.2 Geosynthetic Clay Liner (GCL)

The manufacturer shall perform GCL quality control tests using the test methods and frequencies listed in Table 6.

Table 6: GCL Material Specification

Property	Qualifier	Unit	Value	Test Method[1]	Frequency[2]
Mass per Unit Area: Nonwoven Geotextile Woven Geotextile	 min. min.	 g/cc g/cc	 5.9 3.0	ASTM D5261	1/100,000 ft^2
GCL Product					
Bentonite Mass	min.	lb/ft2	0.75	ASTM D5993	1/40,000 ft^2
Needlepunched Peel Strength	min.	lb/in	2.5	ASTM D6496	1/100,000 ft^2
Hydraulic Flux or Permeability	max.	m^3/m^2-s cm/sec	1×10^{-8} 5×10^{-9}	ASTM D5887	1/100,000 ft^2
Hydraulic Flux at Seam/Lap	max.	m^3/m^2-s	1×10^{-8}	ASTM D5887	1 per material

Notes:
(1) Updated ASTM methods may be implemented based on a review by the QA Professional.
(2) Specified frequency or one per lot, whichever is greater.
(3) For those properties that do not indicate a value, the GCL material must meet the manufacturer's specification.

The GCL manufacturer shall independently test the bentonite clay supplied as specified in Table 7, prior to manufacturing the final product.

Table 7: Bentonite Clay Properties for Use in Geosynthetic Clay Liners

Property	Test Method	Qualifier	Manufacturing Testing Frequency	Required Value
Swell Index	ASTM D5890	Minimum	1 per 100,000 lbs	24 ml/g
Fluid Loss	ASTM D5891	Maximum	1 per 100,000 lbs	18 ml

5.1.3 Nonwoven Geotextile

The manufacturer shall perform quality control tests on the nonwoven geotextile using the test methods and frequencies listed in Table 8. Testing requirements for the geotextile component of the geocomposite drainage layer are listed separately in Table 9.

Table 8: Geotextile Material Specification

Property	Test Method[(1)]	Units	Qualifier	Value	Frequency[(2)]
Mass Per Unit Area	ASTM D5261	oz/yd^2	Nominal	10	1/100,000 ft^2
Grab Strength [(3)]	ASTM D4632	lbs	MARV[(4)]	230	1/100,000 ft^2
Puncture Strength	ASTM D4833	lbs	MARV	140	1/100,000 ft^2
Apparent Opening Size (AOS)[(5)]	ASTM D4751	US Sieve (mm)	MARV	70 (0.210)	1/100,000 ft^2
Permittivity	ASTM D4491	sec^{-1}	MARV	1.0	1/100,000 ft^2

Notes:
(1) Updated ASTM methods may be implemented based on a review by the QA Professional.
(2) Specified frequency or one per lot, whichever is greater.
(3) Measured in the weakest principal direction of the geotextile.
(4) The minimum average roll value (MARV) is defined as the mean value minus two times the standard deviation.
(5) For filter applications only.

5.1.4 Geocomposite Drainage Layer

The geocomposite shall consist of geotextile thermally bonded to each side of the HDPE geonet. Geocomposite properties shall meet or exceed the values specified in Table 9.

The manufacturer shall perform quality control tests on the individual components and completed geocomposite drainage layer using the test methods and frequencies listed in Table 9.

Table 9: Geocomposite Material Specification

Property	Qualifier	Unit	Value	Test Method[1]	Frequency[2]
Geocomposite					
Adhesion	MARV	lb/in	1	GRI-GC-7	1/100,000 ft^2
Transmissivity	Min.	m^2/sec	$1.1x10^{-4}$	ASTM D4716[3]	1/100,000 ft^2
Geonet Core					
Thickness	Min.	mils	200	ASTM D5199	1/100,000 ft^2
Density (Black Resin)	Min.	g/cm^3	0.940	ASTM D1505	1/100,000 ft^2
Carbon Black Content	Range	%	2 to 3	ASTM D4218	1/100,000 ft^2
Geotextile					
Fabric Weight	MARV	oz/yd^2	8	ASTM D5261	1/100,000 ft^2
Grab Strength	MARV	lb	160	ASTM D4632	1/100,000 ft^2
Puncture Resistance	MARV	lb	80	ASTM D4833	1/100,000 ft^2
Permittivity	MARV	sec^{-1}	1.3	ASTM D4491	1/100,000 ft^2
AOS	MARV	US Sieve (mm)	70 (0.210)	ASTM D4751	1/100,000 ft^2

Notes:
(1) Updated ASTM of GRI methods may be implemented based on a review by the QA Professional.
(2) Specified frequency or one per lot, whichever is greater.
(3) Transmissivity shall be measured at a minimum gradient of 0.1 under a minimum normal pressure of 10,000 psf with a minimum seating period of 15 minutes

5.2 Conformance Testing

Prior to geosynthetic installation, the QA Technician will obtain samples of the geosynthetics for conformance testing. The conformance testing minimum frequency and test methods are presented on Tables 10, 11, 12, and 13. Samples will be taken across the entire width of the roll and will not include the first "wrap" for a minimum of 3 feet. The samples will be about 3 feet long in the machine direction by the roll width. The QA Technician will mark the machine direction, roll number, project specific information, and date the sample was obtained on the sample and forward the sample to the approved geosynthetics laboratory.

Table 10: GCL Conformance Testing

Test	Test Method	Frequency(1)
Bentonite Content (at 0 % moisture)	ASTM D5993	1/100,000 ft^2
Hydraulic Conductivity (at 3 psi confining pressure)	ASTM D5887	1/100,000 ft^2
Internal / Interface Shear Strength (2)	ASTM D6243	1 test per GCL/adjoining material

Notes:
(1) Specified frequency or one per lot, whichever is greater.
(2) Interface strength parameters should agree with design values used for stability calculations.

Table 11: Geomembrane Conformance Testing

Test	Test Method	Frequency(1)
Density	ASTM D792/D1505	1/100,000 ft^2
Carbon Black Content	ASTM D1603/4218	1/100,000 ft^2
Thickness	ASTM D5994	1/100,000 ft^2
Tensile Properties	ASTM D6693	1/100,000 ft^2
Carbon Black Dispersion	ASTM D5596	1/100,000 ft^2

Notes:
(1) Specified frequency or one per lot, whichever is greater.

Table 12: Geotextile Conformance Testing and Frequencies

Test	Test Method	Frequency (1)
Mass per unit area	ASTM D5261	1/100,000 ft^2
Grab Tensile Strength and Elongation	ASTM D4632	1/100,000 ft^2
Puncture strength	ASTM D4833	1/100,000 ft^2
Apparent Opening Size	ASTM D4751	1/100,000 ft^2

Notes:
(1) Specified frequency or one per lot, whichever is greater.
(2) For filter applications only.

Table 13: Geocomposite Conformance Testing and Frequencies

Test	Test Method	Frequency (1)
Geonet Thickness	ASTM D5199	1/100,000 ft^2
Geonet Density	ASTM D1505	1/100,000 ft^2
Adhesion Strength	GRI-GC-7	1/100,000 ft^2
Transmissivity	ASTM D4716	1/100,000 ft^2

Notes:
(1) Specified frequency or one per lot, whichever is greater.

5.3 Construction Monitoring and Testing

All geosynthetic components will be monitored during installation. The QA Professional or QA Technician will review surveying information developed throughout the construction process to evaluate whether materials are placed to the lines and grades as shown on the drawings.

The QA Professional or QA Technician will review the following Geosynthetics Installer documentation:

- CQC documentation recorded during installation;
- Daily reports detailing the personnel present on-site, the progress of the work, the arrival of materials, and any problems encountered; and
- Subgrade surface acceptance certificates for each area to be covered by the geosynthetics, signed by the Geosynthetics Installer's Superintendent.

The QA Professional or QA Technician will observe and document the following items related to geosynthetics installation:

- Upon delivery and unloading of geosynthetic materials at the Site, verify that the materials are in good condition and properly labeled;
- Ensure that geosynthetic storage area is uniform and free of possible sources of damage, such as mud, dirt, debris, and dust;
- Retain geosynthetic packaging identification slips for verification and generation of an on-site materials inventory;
- Document subgrade conditions prior to geosynthetics installation. Verify that any identified deficiencies (e.g., surface irregularities, loose soil, protrusions, in-place construction stakes, excessively soft areas, stones, desiccation cracks) are corrected;
- Ensure that the surveyor has verified lines and grades;
- Note the method of handling geosynthetic materials from storage to the work area;
- Document temporary and permanent anchoring of geosynthetics; and,
- Record required overlap distances and orientation of the seams.

5.4 Geomembrane Monitoring and Testing

During installation, the QA Technician will observe the geomembrane deployment, trial seams, field seams, non-destructive and destructive seam testing, and repairs to document that the installation is in general accordance with the CQAP.

5.4.1 Deployment

Instrument survey methods shall be used to determine the subgrade lines and grades prior to subsequent soil liner construction. The QA Technician will verify that only favorably reviewed materials are used, that each panel is given a unique panel number, that geomembrane is not placed during inclement or other unsuitable weather conditions, that the geomembrane is not damaged during installation, and that anchoring is performed in accordance with the project drawings. The QA Technician will record pertinent information regarding deployment, including seam number, roll number, date, visual panel condition, seam overlaps, and length and width of panel.

5.4.2 Trial Seams

The Geosynthetics Installer will perform pre-weld testing (trial seaming) each day prior to production seaming, whenever there is a change in seaming personnel or seaming equipment, and at least once every 5 hours for each seamer and each piece of seaming equipment used that day.

One sample shall be obtained from each trial seam. This sample shall be at least 3 feet long by 1.5 feet wide with the seam centered lengthwise. Six (6) random 1-inch wide specimens shall be cut from the sample. Three (3) seam specimens shall be field tested for shear strength and 3 seam specimens shall be field tested for peel adhesion using an approved quantitative tensiometer. Jaw separation speed shall be in accordance with the Installer's approved CQC manual. To be acceptable, 3 out of 3 replicate test specimens shall meet seam strength requirements specified below under "Destructive Seam Testing". If the field tests fail to meet these requirements, the entire operation shall be repeated. If the additional trial seam fails, the seaming apparatus or seamer shall not be used until the Installer corrects the deficiencies and 2 consecutive successful trial seams are achieved.

Seaming operations will not commence until the QA Professional or QA Technician has determined that the seaming process is meeting the specification requirements and is acceptable. The QA Technician is required to visually observe the trial seam. The QA Technician will mark the test weld with date, ambient temperature, welding machine number, welding technician initials, machine temperature, and speed. For extrusion welding, the QA Technician will record the nozzle and extrusion settings. The QA Technician will record the trial seam test results as passing or failing, as well as peel strength values and failure mode based on ASTM D6392.

5.4.3 Field Seaming

Panels shall be seamed in accordance with the geomembrane manufacturer's recommendations. In corners and odd-shaped geometric locations, the number of field seams shall be minimized. Seaming shall extend to the outside edge of panels. Wet surfaces shall be thoroughly dried and soft subgrades shall be compacted and approved prior to seaming. At the time of seaming, the seam area shall be free of moisture, dust, dirt, and foreign material.

Thermal fusion methods shall be used to seam the panels. Extrusion welding shall only be used for patching and seaming in locations where thermal fusion methods are not feasible. Seam overlaps that are to be attached using extrusion welds shall be ground prior to welding. The QA Technician will verify that all failing seam lengths are repaired and re-tested until passing results are achieved. Fish mouths in seams shall be repaired. The QA Technician will record pertinent information pertaining to field seaming, including date, time, seam length, welder identification, welding device, ambient temperature, nozzle or wedge setting, actual temperature, and wedge speed.

5.4.4 Non-Destructive Seam Continuity Testing

The QA Technician will verify that the Installer non-destructively tests all seam lengths according to the CQAP.

Air Pressure Testing. The ends of the air channel of the dual-track fusion weld must be sealed and pressured to approximately 30 pounds per square inch (psi), if possible. The air pump must then be shut off and the air pressure observed after 5 minutes. A loss of less than 4 psi is acceptable if it is determined that the air channel is not blocked between the sealed ends. A loss of 4 or more psi indicates the presence of a seam leak that must then be isolated and repaired following the procedures described in this CQAP. Test results, initial and final pressure readings, and start and stop times will be recorded for all pressure tests. The QA Technician must observe and record all pressure gauge readings.

Vacuum-Box Testing. A suction value of approximately 3 to 5 inches of gauge vacuum must be applied to all extrusion welded seams that can be tested in this manner. Examples of extrusion welded seams that do not easily lend themselves to vacuum testing would be around boots, some sump areas, appurtenances, etc. The seam must be observed for leaks for at least 10 seconds while subjected to this vacuum. The QA Technician must observe 100% of this testing.

Other Testing. Other non-destructive testing must have prior written approval from the TCEQ.

If the seam cannot be tested, the QA Technician will observe cap strip operations, verify that test equipment and gauges are functioning properly, and verify that test procedures are in accordance with the CQAP. The QA Technician shall record all pertinent data relating to non-destructive testing. For air pressure testing, the recorded information shall include date, start and end times, initial and final pressure, seam segment, and indication of pass or fail. For vacuum testing, the record shall include date, seam segment, QC technician, and indication of pass or fail.

5.4.5 Destructive Seam Testing

The Installer will furnish destructive testing samples of the field seamed geomembrane in accordance with the CQAP, at locations selected by the QA Professional or QA Technician. The samples will be taken and prioritized as follows:

- Areas identified as suspect during seaming or non-destructive testing/monitoring;
- A minimum of 1 sample for each geomembrane seamer;
- A minimum of 1 sample for each representative working conditions (e.g., weather conditions); and
- A minimum of 1 sample for every 500 feet of seaming.

Each destructive sample will, at a minimum, measure 1 foot by 3 feet in length with the seam centered lengthwise. Two specimens, 1 from each end of the sample, will be cut and tested for shear strength and peel adhesion in the field by the Installer using a calibrated field tensiometer capable of quantitatively measuring peel strengths, in accordance with the Technical Specifications. The Installer shall provide the test results to the QA Professional upon completion of the tests.

If the specimen fails, the Installer will provide additional test samples 10 feet or more from the point of the failed test in each direction and repeat the field test procedure. If these additional tests fail, the procedure will be repeated until the length of the failed seam is established. Once the field tests have passed, the remainder of the sample shall be divided into 3 equal sections and be distributed as follows:

- One (1) sample to the QA Professional's Geosynthetic Laboratory for testing;
- One (1) sample to the Installer; and
- One (1) sample for site archives.

Each sample shall be subject to the following tests:

- Seam shear strength (5 specimens) - ASTM D6392; and
- Seam peel strength (5 specimens) – ASTM D6392.

Both tracks of double-track fusion seams will be destructively tested for peel.

The seam shear and peel strength results shall be evaluated using GRI Test Method GM19. Table 1(a), applicable for HDPE geomembranes, and Table 2(a), applicable for LLDPE geomembranes, are included in Attachment B. The peel separation (or incursion) shall be calculated as follows:

$$S = (A/A_0)(100)$$

Where:

S = separation (%)
A = average area of separation or incursion
A_0 = original bonding area

A minimum of 4 of the 5 samples must meet the minimum field seam properties listed in the Tables 1(a) and 2(a) from GRI GM19. The fifth sample must meet or exceed 80% of the given values.

All specimens must fail with acceptable break codes as determined by ASTM D6392:

Fusion (Hot Wedge): BRK, SE1, SE2, AD-BRK, SIP

Extrusion Fillet: AD-WLD (if strength requirements are obtained), SE1, SE2, SE3, BRK1, BRK2, AD-BRK, HT, and SIP

Failed seams will be tracked according to the welding apparatus and the machine operator. Samples taken as a result of failed tests will not be counted toward the total number of destructive tests required. All failed field seams must be documented to be bounded on both sides by passing destructive tests. The results of laboratory destructive tests conducted by the QA Professional shall govern the acceptability of seams.

The Installer shall be responsible for patching all areas cut for test samples and for non-destructive testing (e.g. vacuum box, etc.) in accordance with the CQAP. The QA Professional or QA Technician shall observe this work and record test locations, results, actions taken in conjunction with destructive test failures, and repairs.

5.4.6 Defect and Repairs

5.4.6.1 Destructive Seam Test Repairs

Seams that fail destructive seam testing may be overlaid with a strip of new material and seamed (cap stripped). Alternatively, the seaming path shall be retraced to an intermediate location a minimum of 10 feet on each side of the failed seam location. At each location a 1-foot by 3-foot minimum size seam sample shall be taken for 2 additional shear strength and 2 additional peel adhesion tests using an approved quantitative field tensiometer. If these tests pass, then the remaining seam sample portion shall be sent to the QA laboratory for 5 shear strength and 5 peel adhesion tests in accordance with the QC laboratory's approved procedures. To be acceptable, 4 out of 5 replicate test specimens must meet specified seam strength requirements. If these laboratory tests pass, then the seam shall be cap stripped between that location and the original failed location. If field or laboratory tests fail, the process shall be repeated. After cap stripping, the entire cap stripped seam shall be non-destructively tested in accordance with non-destructive field seam continuity testing procedure.

5.4.6.2 Patches

Tears, holes, blisters, and other defects shall be repaired with patches. Patches shall have rounded corners, be made of the same geomembrane, and extend a minimum of 6 inches beyond the edge of defects. Repairs shall be non-destructively tested. The QA Professional may also elect to perform destructive seam tests on suspect areas.

The QA Technician shall observe and document that all materials, techniques, and procedures used for repairs are favorably reviewed in advance. All repairs shall be marked, recorded, repaired, and tested, prior to being covered by other materials. The QA Technician shall record pertinent data relating to the locations of defects and repairs, including the date and time of the repair, seam segment/location, defect type, repair type and dimensions, welder identification, welding device, and date and result of non-destructive testing.

5.5 GCL Monitoring

During shipment and storage, the GCL shall be wrapped in protective heavy-duty plastic or similar protective covering to prevent damage. Upon arrival to the Site, the QA Professional or QA Technician will inspect the material for damage. Damaged rolls will be rejected. Materials will be stored in a dry location, free from disturbance and protected from moisture, soil, mud, dust, debris, traffic, and vandalism.

5.5.1 Subgrade Condition

Prior to GCL placement, the QA Professional or QA Technician shall walk the prepared subgrade with the GCL Installer to confirm that the subgrade surface is in an acceptable condition. Foreign materials and protrusions shall be removed.

Prior to installation, the QA Professional or QA Technician shall confirm and document that the grades upon which the GCL is to be deployed are in agreement with the project, or are acceptable to the Engineer, if they differ from the proposed grades.

5.5.2 Installation

Installation of the GCL shall be performed with great care to prevent damage to the underlying geosynthetics and the GCL itself. Heavy construction equipment shall not be operated directly on the GCL.

During the installation of the GCL, the QA Technician will confirm and document the following:

- Placement of GCL is in accordance with the Specifications;
- Materials are not damaged during deployment;
- Only GCL being placed that day will be unwrapped;
- Geomembrane shall be placed immediately upon the GCL;
- GCL shall be kept dry and not be installed in standing water or during any precipitation or high winds;
- Overlapping of GCL is in accordance with Specifications;
- No soil or debris shall be entrapped in the overlapping zone;
- No hydrated edges of previously placed GCL are present at overlap of new work areas;
- Rolls deployed match the roll numbers of the manufacturer's quality control testing;
- GCL shall be inspected continuously for damage and shall be repaired or replaced, if defected; and
- Placement of overlying materials shall be performed without damage to GCL.

5.6 Geotextile and Geocomposite Monitoring

During geotextile and geocomposite installation, the QA Technician shall observe deployment, field seaming, and repairs, and document whether the installation is in accordance with the CQAP.

5.6.1 Deployment

The QA Technician shall verify that the underlying layers are clean and free of deleterious materials prior to deployment, anchoring is achieved as specified, methods are used to minimize wrinkles, and underlying layers are protected during cutting of materials.

5.6.2 Seams

All geotextiles, including the one which forms part of the geocomposite, shall be seamed. All seams shall be continuously sewn, unless otherwise approved by the QA Professional. No cross seams are allowed on slopes steeper than 10%. Geotextiles shall be overlapped a minimum of 6 inches prior to seaming. The stitching shall be a minimum of 1 inch from the selvage (exposed edge of the material). Seaming shall not be attempted in the presence of frost, condensation, or any precipitation events unless adequate measures are taken to ensure seam quality, the QA Professional approves the activities, and the Installer implements proper safety precautions. All geotextile seams shall be exposed to allow for visual observation and documentation.

Adjacent sections of geocomposite shall be overlapped a minimum of 4 inches, or according to the manufacturer's directions, whichever is the larger overlap. Overlaps shall be secured by spot welding or tying. Acceptable tying devices include strings, plastic fasteners, or polymer braid. Overlaps shall be secured every 5 feet along slopes and on the floor of the landfill. Overlaps shall be secured every 6 inches in anchor trenches. Along end to end seams, spot weld or tie one row 3 inches apart. No horizontal seams shall be allowed on sideslopes except at roll ends.

The QA Technician shall verify there is sufficient seam overlap and that the specified seam procedures are followed.

5.6.3 Defects and Repairs

If defects are identified in the geocomposite, remove the damaged area and cut a piece of geonet to fit into the repair area. The geonet shall fit into repair area to form a flush surface with the geocomposite. Cut the geonet so that the ribs are in the same orientation as existing geocomposite. Remove any dirt or other foreign material that may have entered the geocomposite. Place the geonet patch into the repair area. Then, place the geotextile over the geonet patch. Cut the geotextile to overlap existing geocomposite at least 6 inches in all directions. Heat seam the geotextile to the geocomposite around the entire perimeter.

5.6.4 Protection

The roof system that covers the cell will provide the geotextiles and geocomposites with protection from ultraviolet (UV) light. In any areas where the roof does not provide protection from sunlight, the QA Professional will verify that geotextiles and geocomposites shall be covered within the maximum exposure time recommended by the manufacturer, but in no case longer than 30 days following placement. If the geotextiles or geocomposites are not covered within the specified maximum exposure time, they shall be covered with soil or geosynthetic material, for protection.

6.0 LEACHATE COLLECTION SYSTEM EVALUATION

6.1 Leachate Collection System and Drainage Materials

Leachate collection and associated leachate removal systems will be constructed of materials that are chemically resistant and radioactive compatible to the leachate expected to be generated; of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and by any equipment used at the landfill; and designed and operated to function through the scheduled closure and post-closure period of the landfill.

The drainage layer for the secondary leachate collection system (or leak detection system) consists of a double-sided geocomposite over both the floor and sideslopes of the disposal cells. The primary leachate collection system is comprised of granular material on the floor and double-sided geocomposite on the sideslopes. For the final cover system, the drainage layer material specified for the project is a double-sided geocomposite. The geosynthetic drainage layers shall meet the requirements shown on Table 9. Granular materials for drainage media shall be tested or otherwise certified at appropriate frequencies for conformance to gradation and hydraulic conductivity requirements specified in the design.

Geotextile panels placed in the leachate collection system shall be overlapped and either heat-bonded or field sewn. Only low ground pressure rubber-tired support equipment approved by the QA Professional may be allowed on the geotextile. Personnel working on the geotextile shall not smoke, wear damaging shoes, or engage in any activity that damages the geotextile or underlying geosynthetics.

Granular drainage materials shall be selected to meet the performance requirements specified in the design. At least 1 set of pre-construction tests shall be conducted for each drainage medium from each proposed source. Gravel/sand source pre-construction tests shall include a complete grain-size analysis, including minus No. 200 Sieve (ASTM D422) and calcium carbonate content (ASTM D3042 modified to use hydrochloric acid with a pH of 5 or the J&L method). The grain-size analysis will be used to determine if the material is compatible with the perforations in the leachate collection pipes and if the material is expected to achieve a minimum hydraulic conductivity of 1.5×10^{-2} cm/sec. No more than 10% of the gravel will be smaller than the diameter of the perforations in the leachate collection pipes. The measured calcium carbonate content must not exceed 15%.

Granular drainage materials selected for use shall be tested at regular intervals for conformance during construction. Minimum testing frequency shall include 1 grain-size analysis for every 3,000 yd^3, or portion thereof, for each material being used.

7.0 DOCUMENTATION AND REPORTING

7.1 Liner Evaluation Reports

Upon completion of all required liner construction and evaluation, and prior to disposal of industrial waste in the cell or area, the QA Professional shall prepare and submit the Liner Evaluation Report (LER) to the TCEQ for review. The LER shall be signed and sealed by the QA Professional performing the evaluation and counter-signed by the site operator or his authorized representative. The LER will be submitted in triplicate. Any deviation from this CQAP requires prior written approval from the TCEQ.

If the Executive Director provides no response to the LER, either written or verbal, within 14 days of receipt, the Owner or Operator may continue facility construction and operation.

If the TCEQ determines that a report is incomplete or that the test data provided are insufficient to support the evaluation conclusions, additional test data or other information may be required, and use of the cell or disposal area will not be allowed until the data is received, reviewed, and accepted.

The construction documentation provided in the LER will contain a narrative describing the conduct of work and testing programs required by the CQAP, "as-built" or record drawings, documentation that demonstrates that the QA Professional was on-site during all of the liner construction, and appendices of field and laboratory data.

The construction documentation report will contain or discuss the following information at a minimum:

For soil liners and perimeter dike:

- Pre-construction soil test results
- Summary of field moisture-density control test methods and results
- Summary of hydraulic conductivity test results
- Soil liner construction practices for floor and sideslope sections
- Placement and processing methods
- Observations of soil conditions prior to and after compaction, including soil structure, clod size, and presence of inclusions
- Compaction methods, equipment type, compactor weight and foot length, and number of passes
- Lift tie-in and bonding observations
- Repair of failed and damaged lifts
- Any and all deviations from the permitted design
- Liner thickness verification
- Post-construction care of soil liner
- Laboratory worksheets for hydraulic conductivity tests

- Sample calculations for hydraulic conductivity tests

For geomembrane liners:

- Roll shipment and receipt information
- Manufacturer's quality control certificates and results
- Storage and handling information
- Conformance test sampling and test results
- Seamer's names and résumés of experience and qualifications
- Subgrade acceptance
- Anchor trench preparation and backfilling
- Panel deployment, identification, and placement
- Panel wrinkling, fishmouthing, and manufacturer's creases
- Seam preparation, orientation, and identification
- Weather and ambient/sheet temperatures
- Equipment placed or operated on geomembrane
- 100% visual inspection for defects, damage, etc.
- Trial seam tests for each combination of seaming equipment and personnel
- Seaming methods, times, temperature, and equipment shutdowns and startups
- Continuous 100% non-destructive seam testing, methods, criteria, and results
- Destructive testing methods, criteria, and results
- Repairs, including preparation and procedures, failure delineation, patch size and shape, and retesting

For GCLs:

- Roll shipment and receipt information
- Manufacturer's quality control certificates and results
- Storage and handling information
- Conformance test sampling and test results
- Anchor trench preparation and backfilling
- Panel deployment, identification, and placement
- Seaming methods
- Equipment placed or operated on GCL
- Repair locations, including patch size and shape

For leachate collection system:

- Pre-construction soil test results

- Roll shipment and receipt information for geosynthetic layers
- Manufacturer's quality control certificates and testing results for geosynthetics layers
- Geosynthetic conformance test results
- Placement of leachate collection system and protective cover layers

The report shall also include pertinent record drawings including:

- Site layout plan
- Location of the subject cell with cell boundarymarkers
- Previous filled and active areas
- As-built soil liner drawings, showing sample and test locations and soil liner thickness
- As-built geomembrane panel layout drawings, showing location of destructive test samples, patches, and repairs
- As-built GCL panel layout drawing, showing location of repairs
- As-built drawings showing elevations of protective cover to confirm its thickness.

ATTACHMENT A

GEOSYNTHETIC RESEARCH INSTITUTE (GRI) TEST METHOD GM13 TABLE 2(A) AND GRI TEST METHOD GM17 TABLE 2(A)

ENGLISH UNITS

Table 2(a) – High Density Polyethylene (HDPE) Geomembrane - Textured

Properties	Test Method	Test Value							Testing Frequency (minimum)
		30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils	
Thickness mils (min. ave.) • lowest individual for 8 out of 10 values • lowest individual for any of the 10 values	D 5994	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	per roll
Asperity Height mils (min. ave.) *(1)*	GM 12	10 mil	10 mil	10 mil	10 mil	10 mil	10 mil	10 mil	every 2nd roll *(2)*
Density (min. ave.)	D 1505/D 792	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	200,000 lb
Tensile Properties (min. ave.) *(3)* • yield strength • break strength • yield elongation • break elongation	D 6693 Type IV	63 lb/in. 45 lb/in. 12% 100%	84 lb/in. 60 lb/in. 12% 100%	105 lb/in. 75 lb/in. 12% 100%	126 lb/in. 90 lb/in. 12% 100%	168 lb/in. 120 lb/in. 12% 100%	210 lb/in. 150 lb/in. 12% 100%	252 lb/in. 180 lb/in. 12% 100%	20,000 lb
Tear Resistance (min. ave.)	D 1004	21 lb	28 lb	35 lb	42 lb	56 lb	70 lb	84 lb	45,000 lb
Puncture Resistance (min. ave.)	D 4833	45 lb	60 lb	75 lb	90 lb	120 lb	150 lb	180 lb	45,000 lb
Stress Crack Resistance *(4)*	D 5397 (App.)	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	per GRI GM10
Carbon Black Content (range)	D 1603 *(5)*	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	20,000 lb
Carbon Black Dispersion	D 5596	note *(6)*	note *(6)*	note *(6)*	note *(6)*	note *(6)*	note *(6)*	note *(6)*	45,000 lb
Oxidative Induction Time (OIT) (min. ave.) *(7)* (a) Standard OIT — or — (b) High Pressure OIT	 D 3895 D 5885	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	200,000 lb
Oven Aging at 85°C *(7), (8)* (a) Standard OIT (min. ave.) - % retained after 90 days — or — (b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5721 D 3895 D 5885	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	per each formulation
UV Resistance *(9)* (a) Standard OIT (min. ave.) — or — (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(11)*	GM11 D 3895 D 5885	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	per each formulation

(1) Of 10 readings; 8 out of 10 must be ≥ 7 mils, and lowest individual reading must be ≥ 5 mils; also see Note 6.
(2) Alternate the measurement side for double sided textured sheet
(3) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
Yield elongation is calculated using a gage length of 1.3 inches
Break elongation is calculated using a gage length of 2.0 inches
(4) P-NCTL test is not appropriate for testing geomembranes with textured or irregular rough surfaces. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials.
The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.
(5) Other methods such as D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to D 1603 (tube furnace) can be established.
(6) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3
(7) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
(8) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
(9) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
(10) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
(11) UV resistance is based on percent retained value regardless of the original HP-OIT value.

Table 2(a) – Linear Low Density Polyethylene (LLDPE) Geomembrane (TEXTURED)

Properties	Test Method	Test Value								Testing Frequency (minimum)
		20 mils	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils	
Thickness mils (min. ave.) • lowest individual for 8 out of 10 values • lowest individual for any of the 10 values	D 5994	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	per roll
Asperity Height mils (min. ave.) *(1)*	GM 12	10	10	10	10	10	10	10	10	Every 2nd roll *(2)*
Density g/ml (max.)	D 1505/D 792	0.939	0.939	0.939	0.939	0.939	0.939	0.939	0.939	200,000 lb
Tensile Properties *(3)* (min. ave.) • break strength – lb/in. • break elongation - %	D 6693 Type IV	30 250	45 250	60 250	75 250	90 250	120 250	150 250	180 250	20,000 lb
2% Modulus – lb/in. (max.)	D 5323	1200	1800	2400	3000	3600	4800	6000	7200	per formulation
Tear Resistance – lb (min. ave.)	D 1004	11	16	22	27	33	44	55	66	45,000 lb
Puncture Resistance – lb (min. ave.)	D 4833	22	33	44	55	66	88	110	132	45,000 lb
Axi-Symmetric Break Resistance Strain - % (min.)	D 5617	30	30	30	30	30	30	30	30	per formulation
Carbon Black Content - %	D 1603 *(4)*	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	45,000 lb
Carbon Black Dispersion	D 5596	note *(5)*	note *(5)*	note *(5)*	note *(5)*	note *(5)*	note *(5)*	note *(5)*	note *(5)*	45,000 lb
Oxidative Induction Time (OIT) (min. ave.) *(6)* (e) Standard OIT — or — (f) High Pressure OIT	 D 3895 D 5885	 100 400	 100 400	 100 400	 100 400	 100 400	 100 400	 100 400	 100 400	200,000 lb
Oven Aging at 85°C *(7)* (a) Standard OIT (min. ave.) - % retained after 90 days — or — (b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5721 D 3895 D 5885	 35 60	 35 60	 35 60	 35 60	 35 60	 35 60	 35 60	 35 60	per formulation
UV Resistance *(8)* (a) Standard OIT (min. ave.) — or — (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(10)*	 D 3895 D 5885	 N. R. *(9)* 35	 N.R. *(9)* 35	 N.R. *(9)* 35	 N.R. *(9)* 35	 N.R. *(9)* 35	 N.R. *(9)* 35	 N.R. *(9)* 35	 N.R. *(9)* 35	per formulation

(1) Of 10 readings; 8 out of 10 must be ≥ 7 mils, and lowest individual reading must be ≥ 5 mils; also see Note 9.
(2) Alternate the measurement side for double sided textured sheet
(3) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
- Break elongation is calculated using a gage length of 2.0 in. at 2.0 in./min.

(4) Other methods such as D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to D 1603 (tube furnace) can be established.
(5) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
- 9 in Categories 1 or 2 and 1 in Category 3

(6) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
(7) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
(8) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
(9) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
(10) UV resistance is based on percent retained value regardless of the original HP-OIT value.

ATTACHMENT B
GRI TEST METHOD GM19 TABLES 1(A) AND 2(B)

Table 1(a) – Seam Strength and Related Properties of Thermally Bonded Smooth and Textured High Density Polyethylene (HDPE) Geomembranes **(English Units)**

Geomembrane Nominal Thickness	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils
Hot Wedge Seams(1)							
shear strength(2), lb/in.	57	80	100	120	160	200	240
shear elongation at break(3), %	50	50	50	50	50	50	50
peel strength(2), lb/in.	45	60	76	91	121	151	181
peel separation, %	25	25	25	25	25	25	25
Extrusion Fillet Seams							
shear strength(2), lb/in.	57	80	100	120	160	200	240
shear elongation at break(3), %	50	50	50	50	50	50	50
peel strength(2), lb/in.	39	52	65	78	104	130	156
peel separation, %	25	25	25	25	25	25	25

Notes for Tables 1(a) and 1(b):

1. Also for hot air and ultrasonic seaming methods
2. Value listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing

Table 1(b) – Seam Strength and Related Properties of Thermally Bonded Smooth and Textured High Density Polyethylene (HDPE) Geomembranes **(S.I. Units)**

Geomembrane Nominal Thickness	0.75 mm	1.0 mm	1.25 mm	1.5 mm	2.0 mm	2.5 mm	3.0 mm
Hot Wedge Seams(1)							
shear strength(2), N/25 mm.	250	350	438	525	701	876	1050
shear elongation at break(3), %	50	50	50	50	50	50	50
peel strength(2), N/25 mm	197	263	333	398	530	661	793
peel separation, %	25	25	25	25	25	25	25
Extrusion Fillet Seams							
shear strength(2), N/25 mm	250	350	438	525	701	876	1050
shear elongation at break(3), %	50	50	50	50	50	50	50
peel strength(2), N/25 mm	170	225	285	340	455	570	680
peel separation, %	25	25	25	25	25	25	25

Table 2(a) – Seam Strength and Related Properties of Thermally Bonded Smooth and Textured Linear Low Density Polyethylene (LLDPE) Geomembranes (English Units)

Geomembrane Nominal Thickness	20 mils	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils
Hot Wedge Seams[(1)]								
shear strength[(2)], lb/in.	30	45	60	75	90	120	150	180
shear elongation[(3)], %	50	50	50	50	50	50	50	50
peel strength[(2)], lb/in.	25	38	50	63	75	100	125	150
peel separation, %	25	25	25	25	25	25	25	25
Extrusion Fillet Seams								
shear strength[(2)], lb/in.	30	45	60	75	90	120	150	180
shear elongation[(3)], %	50	50	50	50	50	50	50	50
peel strength[(2)], lb/in.	22	34	44	57	66	88	114	136
peel separation, %	25	25	25	25	25	25	25	25

Notes for Tables 2(a) and 2(b):

1. Also for hot air and ultrasonic seaming methods
2. Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing

Table 2(b) – Seam Strength and Related Properties of Thermally Bonded Smooth and Textured Linear Low Density Polyethylene (LLDPE) Geomembranes (S.I. Units)

Geomembrane Nominal Thickness	0.50 mm	0.75 mm	1.0 mm	1.25 mm	1.5 mm	2.0 mm	2.5 mm	3.0 mm
Hot Wedge Seams[(1)]								
shear strength[(2)], N/25 mm	131	197	263	328	394	525	657	788
shear elongation[(3)], %	50	50	50	50	50	50	50	50
peel strength[(2)], N/25 mm	109	166	219	276	328	438	547	657
peel separation, %	25	25	25	25	25	25	25	25
Extrusion Fillet Seams								
shear strength[(2)], N/25 mm	131	197	263	328	394	525	657	788
shear elongation[(3)], %	50	50	50	50	50	50	50	50
peel strength[(2)], N/25 mm	95	150	190	250	290	385	500	595
peel separation, %	25	25	25	25	25	25	25	25

GSI Job No. G-3379
Issued: 31 December 2009

ATTACHMENT V.8
ENGINEERING REPORT FOR
NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.8.2

Liner and Cover System Analyses

Issued: 31 December 2009

GSI ENVIRONMENTAL

APPENDIX V.8.2
LINER AND COVER SYSTEM ANALYSES
PERMIT UNIT 16 LANDFILL
CHOCOLATE BAYOU FACILITY
BRAZORIA COUNTY, TEXAS

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

Prepared by:

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APPENDIX V.8.2
LINER AND COVER SYSTEM ANALYSES
PERMIT UNIT 16 LANDFILL
CHOCOLATE BAYOU FACILITY
BRAZORIA COUNTY, TEXAS

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

LIST OF ATTACHMENTS

Attachment A Puncture Resistance
Attachment B Action Leakage Rate
Attachment C Waste Migration Analysis
Attachment D Lateral Drainage Analysis for Final Cover

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ATTACHMENT A
PUNCTURE RESISTANCE

OBJECTIVE:

To evaluate the puncture resistance of the geomembrane layer.

METHOD:

There are situations where geomembranes are placed on or beneath soils containing relatively large-sized stones; for example, when crushed stone drainage layers are placed above the geomembrane. In these situations, a nonwoven needle-punched geotextile can provide significant puncture protection to the geomembrane. This analysis will detemine the mass per unit area of geotextile required to protect the geomembrane.

The method presented herein (Koerner, 2005) focuses on the protection of 60 mil (1.5 mm) thick HDPE textured geomembrane. Since 80 mil (2.0 mm) thick textured HDPE geomembranes will be used, this analysis is conservative.

$$FS = P_{allow} / P_{actual} \qquad \text{(Eq. 1)}$$

where:
FS = factor of safety against geomembrane puncture.
P_{actual} = actual pressure due to the landfill contents.
P_{allow} = allowable pressure using different types of geotextiles and site specific conditions.

The allowable pressure, P_{allow} is determined by the following equation:

$$P_{allow} = [50 + 0.00045^* (M/H^2)] * [1/(MFs^* MF_{PD} * MF_A)] * [1/(RF_{CR} * RF_{CBD})] \qquad \text{(Eq. 2)}$$

where:

P_{allow} = allowable pressure (kPa)
M = geotextile mass per unit area (g/m^2)
H = protrusion height (m)
MFs = modification factor for protrusion shape
MF_{PD} = modification factor for packing density
MF_A = modification factor for arching in solids
RF_{CR} = reduction factor for long-term creep
RF_{CBD} = reduction factor for long-term chemical/biological degradation

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ASSUMPTIONS/CALCULATIONS:

Assume required Factor of Safety (F.S.) = 3.0

Table 1 - Modification and Reduction Factors for Geomembrane Protection. (From Koerner, Table 5.18)

MF_S		MF_{PD}		MF_A	
Angular:	1	Isolated	1	Hydrostatic	1
Subrounded:	0.5	Dense, 38 mm	0.83	Geostatic, shallow	0.75
Rounded:	0.25	Dense, 25 mm	0.67	Geostatic, mod.	0.5
		Dense, 12mm	0.5	Geostatic, deep	0.25

RF_{CBD}			RF_{CR}			
			Mass per unit area (g/m^2)	Protrusion (mm) 38	25	12
Mild leachate		1.1	Geomembrane	N/R	N/R	N/R
Moderate leachate		1.3	270	N/R	N/R	>1.5
Harsh leachate		1.5	550	N/R	1.5	1.3
			1100	1.3	1.2	1.1
			>1100	1.2	1.1	1

Determine P_{actual}:

Max. depth of material on top of geomembrane, d = 8.5 m (Max. 28 ft)
Unit weight of material on top of geomembrane, γ = 15.7 kN/m^3 (100 pcf)
$P_{actual} = d * \gamma$ = 133.45 kPa

Determine geotextile mass per unit area, M, required for a factor of safety of 3.0:

$P_{allow} = P_{actual} * F.S.$ = 400.35 kPa

Assume Modification and Reduction Factors:

MF_S = 0.5
MF_{PD} = 0.83
MF_A = 0.75
RF_{CR} = 1.5
RF_{CBD} = 1.5

Assume protrusion height, H = 0.0127 m (0.5 inches)

From Eq. 2, required geotextile mass per unit area, M = 82.6 g/m^2 (2.4 oz/square yard).

CONCLUSION:

The results show that a geotextile with a minimum mass per unit area of 2.4 oz/square yard is required to protect the geomembrane from puncture (with a factor of safety of 3) when the geomembrane is adjacent to stone materials.

Golder Associates	SUBJECT	PUNCTURE RESISTANCE OF GEOMEMBRANE				
	Job No.: 083-94322		Made By	PCM	Date	9/15/2009
	Ref.: Proposed Permit Unit 16, Alvin, TX		Checked	MX	Sheet	3 of 3
			Reviewed	JBF		

REFERENCES:

1- Koerner, R.M. (2005), *Designing with Geosynthetics*, Prentice Hall Publishing Co., Englewood Cliffs, NJ, 5th edition.

ATTACHMENT B

ACTION LEAKAGE RATE

Golder Associates	Subject: Action Leakage Rates - Chocolate Bayou Plant		
	Job No.: 083-94322 Ref: Permit App. Unit 16	Made by: MX Checked: JBF Reviewed: FCM	Date: 9/23/2009 Sheet: 1 of 2

OBJECTIVE: Determine the Action Leakage Rate (ALR) for the proposed Unit 16 landfill cells at Chocolate Bayou Plant.

METHOD: In accorance with 40 CFR 264.302, the action leakage rate is the maximum design flow rate that the leak detection system (i.e. the secondary leachate collection system for the proposed Unit 16 design) can remove without the fluid head on the bottom liner exceeding 1 foot.

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The secondary leachate collection system includes the following components:

1. Double-sided geocomposiste leachate drainage layer
2. Secondary leachate collection sump and pump
3. Secondary leachate collection riser pipe

Of which, the geocomposite layer conveying the flow into the sump has the least drainage capacity. Therefore, the flow capacity into the secondary sump through the geocomposite layer is the ALR.

The leachate flow capacity into the secondary sump is calculated as follows:

$Q = kiA$ where k = hydraulic conductivity, i = hydraulic gradient, A = area of flow

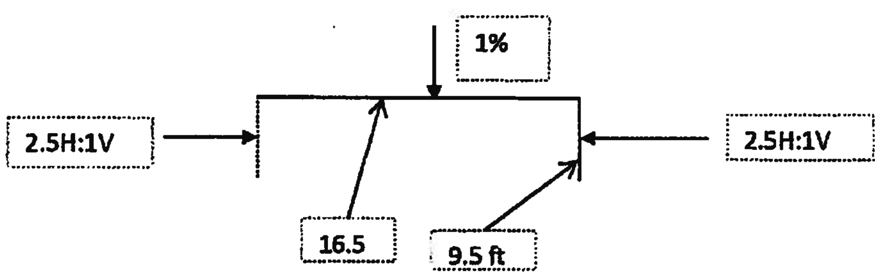
or

$Q = TiL$ where T = transmissivity of geocomposite, L = width of flow

Reduction factors will be applied to the transmissivity of geocomposite to account for long term creep, chemical clogging and biological clogging.

GIVEN:

1. The cell area is: 0.7 acres
2. The cell grades and secondary sump dimensions are shown below:



the majority of the leachate collected in the secondary system is conveyed to the sump through the 1% floor slope, therefore, the hydraulic gradient is conservatively assumed at 1%.

3. The specified geocomposite transmissivity is: 1.1E-04 m^2/sec

Golder Associates	Subject: Action Leakage Rates - Chocolate Bayou Plant		
	Job No.: 083-94322	Made by: MX	Date: 9/23/2009
	Ref: Permit App. Unit 16	Checked: JBF Reviewed: PCM	Sheet: 2 of 2

CALCULATIONS:

$Q = kiA$

$Q = TiL$ where $T =$ transmissivity of geocomposite

$i =$ hydraulic gradient

width of flow

The transmissivity of the drainage geocomposite (per project specifications) $T =$ 1.10E-04 m^2/sec

1.18E-03 ft^2/sec

The transmissivity of the leak detection geocomposite is reduced using the procedures presented in the Geosynthetic Research Institute GC8- "Determination of the Allowable Flow Rate in a Drainage Geocomposite" (Ref. 1).

RF=RFcr X RFcc X RFbc = 2.45

where:

RFcr =	1.7	Reduction Factor for Creep
RFcc =	1.2	Reduction Factor for Chemical Clogging
RFbc =	1.2	Reduction Factor for Biological Clogging

Geocomposite transmissivity adjusted by reduction factors: $T_{allowed} =$ 4.84E-04 ft^2/sec

Head is limited to thickness of geocomposite and hydraulic gradient is 1% $i =$ 0.01

Length is around the lip of the sump $L =$ 36 ft (see Figure V.8.6)

$Q =$ 111 gpd

CONCLUSION: Action Leakage Rate (ALR) for the proposed cell design is: 111 gpd

or: 159 gallons per acre per day

ATTACHMENT C

WASTE MIGRATION ANALYSIS

Golder Associates	Subject: Waste Migration Analysis		
	Job No 083-94322	Made by PCM	Date 09/01/09
	Ref: Proposed Permit Unit 16	Checked by JBF	Sheet No 1 of 1
	Alvin, TX	Reviewed by PAM	

OBJECTIVE:

Evaluate the potential pathway for waste contaminant migration from the landfill.

DISCUSSION:

During the active, closure, and post-closure phases of the landfill cells, leachate is collected and removed via the primary and secondary leachate collection systems to prevent hydraulic head build-up on the landfill base liner system. Also, during this time period, the groundwater gradient around the landfill is inward toward the landfill because the excavation extends below the groundwater level and the hydraulic head on top of the landfill base liner is near zero. Therefore, there is no outward hydraulic gradient acting on the landfill base liner.

The HELP model calculations presented in Appendix V.8.6 show that leachate generation should be negligible once the cell is closed. Nonetheless, some leachate build-up on the liner could occur over time. If the base liner system were to fail, the most likely pathway for leachate migration would be through the underlying clay layer toward the uppermost sand layer below the landfill. Once the leachate reaches the sand stratum, the contaminants would migrate in same direction as the site groundwater flow.

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ATTACHMENT D

LATERAL DRAINAGE ANALYSIS FOR FINAL COVER

Golder Associates	Subject: Lateral Drainage Analysis for Final Cover		
	Job No.: 083-94322 Ref: Proposed Permit Unit 16, Alvin, TX	Made by: LFG Checked: PCM Reviewed: JBF	Date: 9/1/2009 Sheet: 1 of 4

OBJECTIVE: I) Determine the required transmissivity of the final cover geocomposite drainage layer on the maximum final cover slope length.

II) Determine the maximum flow length for geocomposite drainage layers with a transmissivity less than the required value determined in I).

GIVEN: Maximum length of the 5% slope is approximately (L) = 69 ft.

ASSUMPTIONS: The permeability of the vegetative cover, K_{veg} = 1.0E-05 cm/s

METHOD: Determine the required transmissivity of the final cover geocomposite after applying reduction factors and a factor of safety.

$$\Theta_{measured\text{-}req} = FS\Pi(RF)q_h L/(\sin\beta) \qquad \text{(Ref. 1)}$$

$\Theta_{measured\text{-}req}$ = required transmissivity of geocomposite measured in laboratory test
Test Conditions: i = 0.1 (min)
Normal Stress = 200 psf (min)
Boundary Cond'ns = soil/geocomposite/geomembrane
Seating Time = 15 min.

FS = factor of safety = 1.5
RF = reduction factors (see below)
Π(RF) = product of all reduction factors
q_h = rate of liquid supply expressed per unit surface area measured horizontally. Worst case condition consists of a saturated vegetative cover over geocomposite. Under this condition, the gradient = 1.0 and q_h is equal to the hydraulic conductivity of the soil.
L = length of geocomposite in direction of flow
β = slope angle

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Reduction Factor	Description	Value (Ref. 2)
RF_{in} =	Reduction Factor for intrusion of geotextile into geonet	1.1
RF_{cr} =	Reduction Factor for geonet creep	1.1
RF_{cc} =	Reduction Factor for chemical clogging of geotextile and/or geonet	1.0
RF_{bc} =	Reduction Factor for biological clogging of geotextile and/or geonet	1.5
	Π(RF) =	1.8

CALCULATIONS: I) Transmissivity for maximum flow length

$\Theta_{\text{measured -req}}$ = **1.2E-03 ft^3/s-ft** = **1.1E-04 m^3/s-m**

II) Maximum flow length for variable transmissivity

Based on the above equation, the maximum flow length varies linearly with transmissivity. Therefore, if the transmissivity value determined above is not met by the geocomposite drainage layer, the maximum flow length must be reduced (i.e., the drainage layer must be "daylighted") as follows (and as shown on the attached chart):

$$L_{max} = [\Theta_{\text{measured}}/\Theta_{\text{measured -req}}]*69 \quad \text{ft}$$

CONCLUSIONS: The required measured transmissivity of a geocomposite drainage layer to adequately convey surface water infiltration on the maximum slope length on the final cover system is 1.1 x 10^{-4} m^3/s/m. If the measured transmissivity is less than this value, the maximum allowable slope length must be reduced in direct proportion to the ratio of the actual measured transmissivity and the required measured transmissivity.

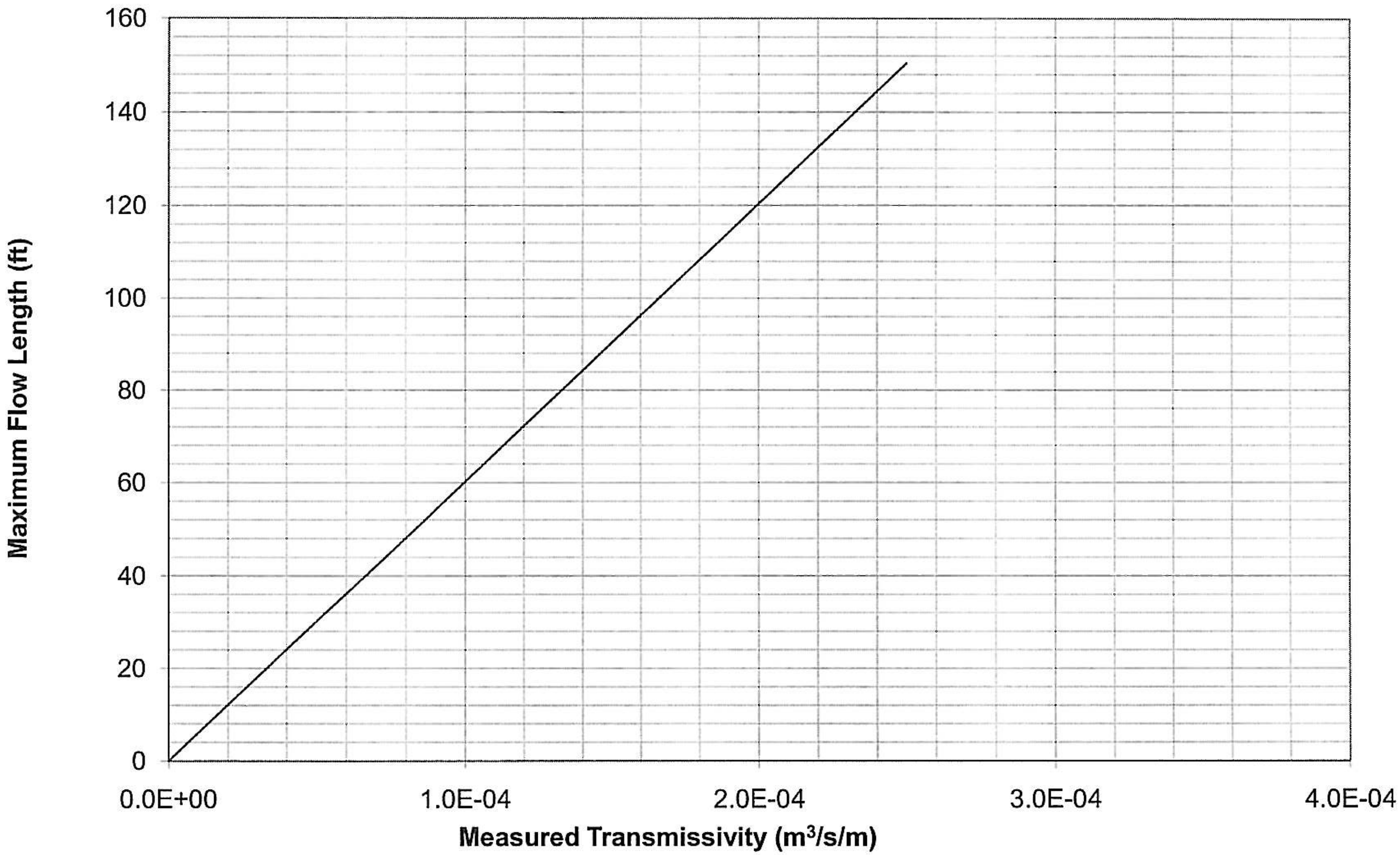
Based on GSE transmissivity data available in the "GSE Drainage Design Manual, second edition", a 200-mil FabriNet Geocomposite Double-sided with 6 or 8 oz. Geotextile (or similar) would meet the transmissivity required under low load conditions (see attached "Performance Transmissivity of a 200 mil FabriNet Geocomposite under soil").

REFERENCES:

1. 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, 2000.

2. Richardson, G.M., Giroud, J.P., and Zhao, A., "Design of Lateral Drainage Systems for Landfills," Draft, 2000.

FINAL COVER GEOCOMPOSITE DRAINAGE LAYER



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GSE FabriNet Geocomposite

GSE FabriNet geocomposite consists of a 200 mil thick GSE HyperNet geonet heat-laminated on one or both sides with a GSE nonwoven needlepunched geotextile. The geotextile is available in mass per unit area range of 6 oz/yd^2 (200 g/m^2) to 16 oz/yd^2 (540 g/m^2). The geocomposite is designed and formulated to perform drainage function under a range of anticipated site loads, gradients and boundary conditions.

Product Specifications

TESTED PROPERTY	TEST METHOD	FREQUENCY	MINIMUM AVERAGE VALUE[1]		
Geocomposite			**6 oz/yd^2**	**8 oz/yd^2**	**10 oz/yd^2**
Transmissivity[2], gal/min/ft (m^2/sec)	ASTM D 4716	1/540,000 ft^2			
Double-Sided Composite			0.48 (1 x 10^{-4})	0.48 (1 x 10^{-4})	0.43 (9 x 10^{-5})
Single-Sided Composite			4.83 (1 x 10^{-3})	4.83 (1 x 10^{-3})	4.34 (9 x 10^{-4})
Ply Adhesion, lb/in (g/cm)	ASTM D 7005	1/50,000 ft^2	1.0 (178)	1.0 (178)	1.0 (178)
Geonet Core[3] - GSE HyperNet					
Transmissivity[2], gal/min/ft (m^2/sec)	ASTM D 4716		9.66 (2 x 10^{-3})	9.66 (2 x 10^{-3})	9.66 (2 x 10^{-3})
Density, g/cm^3	ASTM D 1505	1/50,000 ft^2	0.94	0.94	0.94
Tensile Strength (MD), lb/in (N/mm)	ASTM D 5035/7179	1/50,000 ft^2	45 (7.9)	45 (7.9)	45 (7.9)
Carbon Black Content, %	ASTM D 1603*/4218	1/50,000 ft^2	2.0	2.0	2.0
Geotextile[3,4]					
Mass per Unit Area, oz/yd^2(g/m^2)	ASTM D 5261	1/90,000 ft^2	6 (200)	8 (270)	10 (335)
Grab Tensile, lb (N)	ASTM D 4632	1/90,000 ft^2	160 (710)	220 (975)	260 (1,155)
Puncture Strength, lb (N)	ASTM D 4833	1/90,000 ft^2	90 (395)	120 (525)	165 (725)
AOS, US sieve (mm)	ASTM D 4751	1/540,000 ft^2	70 (0.212)	80 (0.180)	100 (0.150)
Permittivity, (sec^{-1})	ASTM D 4491	1/540,000 ft^2	1.5	1.3	1.0
Flow Rate, gpm/ft^2 (lpm/m^2)	ASTM D 4491	1/540,000 ft^2	110 (4,480)	95 (3,865)	75 (3,050)
UV Resistance, % retained	ASTM D 4355 (after 500 hours)	once per formulation	70	70	70
NOMINAL ROLL DIMENSIONS					
Geonet Core Thickness, mil (mm)	ASTM D 5199	1/50,000 ft^2	200 (5)	200 (5)	200 (5)
Roll Width[5], ft (m)			14.5 (4.4)	14.5 (4.4)	14.5 (4.4)
Roll Length[5], ft (m)	Double-Sided Composite		270 (82.3)	260 (79.2)	230 (70.1)
	Single-Sided Composite		300 (91.4)	310 (94.5)	290 (88.4)
Roll Area, ft^2 (m^2)	Double-Sided Composite		3,915 (364)	3,770 (350)	3,335 (310)
	Single-Sided Composite		4,350 (404)	4,495 (418)	4,205 (391)

NOTES:
- [1]AOS in mm is a maximum value.
- [2]Gradient of 0.1, normal load of 10,000 psf, water at 70°F between steel plates for 15 minutes. Contact GSE for performance transmissivity value for use in design.
- [3]Component properties prior to lamination.
- [4]Refer to geotextile product data sheet for additional specifications.
- [5]Roll widths and lengths have a tolerance of ±1%.
- *Modified.

DS8FN R07/10/09

GSI Job No. G-3379
Issued: 31 December 2009

ATTACHMENT V.8
ENGINEERING REPORT FOR
NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.8.3

Compatibility Demonstration

Issued: 31 December 2009

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APPENDIX V.8.3
COMPATIBILITY DEMONSTRATION
PERMIT UNIT 16 LANDFILL
CHOCOLATE BAYOU FACILITY
BRAZORIA COUNTY, TEXAS

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

Prepared by:

Golder Associates

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Texas Registration Number: F-2578

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Golder Associates	SUBJECT	Compatibility Demonstration				
	Job No.	063-94322	Made By	LFG	Date	9/9/2009
	Ref.	Proposed Permit	Checked	PCM	Sheet	1 of 42
		Unit 16, Alvin, TX	Reviewed	JBW		

The liner system and leachate collection system components included in the landfill design are commonly used in hazardous waste landfills and provides good chemical resistance to most waste streams, including low-level radioactive waste. They are the materials of choice for similar facilities throughout the United States.

See attached References. The chemical resistance presented in the attached manufacturers' literature is not manufacturer specific.

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CHEMICAL COMPATIBILITY OF POLY-FLEX LINERS

Chemical compatibility or resistance as applied to geomembranes is a relative term. Actually compatibility would mean that one material will dissolve in the other such as alcohol in water or grease in gasoline. An example of incompatibility would be oil and water. In liners it is undesirable to have the chemicals dissolve in the liner hence the term compatibility is the reverse of what is normally meant in the chemical industry. In the strictest sense and from a laboratory prospective, chemical compatibility, as the term applies to this industry, would imply that the chemical has no effect on the liner. On the other hand, from an engineering prospective, chemical compatibility means that a liner will survive the exposure to a given chemical even though the chemical could have some effect on the performance of the liner, but not enough to cause failure. Therefore, one must understand and define chemical compatibility for a specific project.

Generally polyethylene will be effected by chemicals in one of three ways.

1. No effect—This means that the chemical in question and the polyethylene do not interact. The polyethylene does not gain (lose) weight, swell, and the physical properties are not significantly altered.
2. Oxidizes (cross linking)—Chemicals classed as oxidizing agents will cause the polyethylene molecules to cross link and cause irreversible changes to the physical properties of the liner. Basically it makes the liner brittle.
3. Plasticizes—Chemicals in this classification are soluble in the polyethylene structure. They do not change the structure of the polyethylene itself but will act as a plasticizer. In doing so, the liner will experience weight gain of 3-15%, may swell by up to 10%, and will have measurable changes in physical properties (i.e. the tensile strength at yield may decrease by up to 20%). Even under these conditions the liner will maintain its integrity and will not be breached by liquids, provided the liner has not been subjected to any stress. These effects are reversible once the chemicals are removed and the liner has time to dry out.

Aside from the effect that chemicals have on a liner is the issue of vapor permeation through the liner. Vapor permeation is molecular diffusion of chemicals through the liner. Vapor transmission for a given chemical is dependent primarily on liner type, contact time, chemical solubility, temperature, thickness, and concentration gradient, but not on hydraulic head or pressure. Transmission through the liner can occur in as little as 1-2 days. Normally, a small amount of chemical is transmitted. Generally HDPE has the lowest permeation rate of the liners that are commercially available.

As stated above chemical compatibility is a relative term. For example, the use of HDPE as a primary containment of chlorinated hydrocarbons at a concentration of 100% may not be recommended, but it may be acceptable at 0.1% concentration for a limited time period or may be acceptable for secondary containment. Factors that go into assessment of chemical compatibility are type of chemical(s), concentration, temperature and the type of application. No hard and fast rules are available to make decisions on chemical compatibility. Even the EPA 9090 test is just a method to generate data so that an opinion on chemical compatibility can be more reliably reached.

A simplified table on chemical resistance is provided to act as a screening process for chemical containment applications.

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CHEMICAL RESISTANCE INFORMATION

CHEMICAL CLASS	CHEMICAL EFFECT	PRIMARY CONTAINMENT (LONG TERM CONTACT) HDPE	PRIMARY CONTAINMENT (LONG TERM CONTACT) LLDPE	SECONDARY CONTAINMENT (SHORT TERM CONTACT) HDPE	SECONDARY CONTAINMENT (SHORT TERM CONTACT) LLDPE
CARBOXYLIC ACID	1				
- Unsubstituted (e.g. Acetic acid)		B	C	A	C
- Substituted (e.g. Lactic acid)		A	B	A	A
- Aromatic (e.g. Benzoic acid)		A	B	A	A
ALDEHYDES	3				
- Aliphatic (e.g. Acetaldehyde)		B	C	B	C
- Hetrocyclic (e.g. Furfural)		C	C	B	C
AMINE	3				
- Primary (e.g. Ethylamine)		B	C	B	C
- Secondary (e.g. Diethylamine)		C	C	B	C
- Aromatic (e.g. Aniline)		B	C	B	C
CYANIDES (e.g. Sodium Cyanide)	1	A	A	A	A
ESTER (e.g. Ethyl acetate)	3	B	C	B	C
ETHER (e.g. Ethyl ether)		C	C	B	C
HYDROCARBONS	3				
- Aliphatic (e.g. Hexane)		C	C	B	C
- Aromatic (e.g. Benzene)		C	C	B	C
- Mixed (e.g. Crude oil)		C	C	B	C
HALOGENATED HYDROCARBONS	3				
- Aliphatic (e.g. Dichloroethane) +A4		C	C	B	C
- Aromatic (e.g. Chlorobenzene)		C	C	B	C
ALCOHOLS	1				
- Aliphatic (e.g. Ethyl alcohol)		A	A	A	A
- Aromatic (e.g. Phenol)		A	C	A	B
INORGANIC ACID					
- Non-Oxidizers (e.g. Hydrocloric acid)	1	A	A	A	A
- Oxidizers (e.g. Nitric Acid)	2	C	C	B	C
INORGANIC BASES (e.g. Sodium hydroxide)	1	A	A	A	A
SALTS (e.g. Calcium chloride)	1	A	A	A	A
METALS (e.g. Cadmium)	1	A	A	A	A
KETONES (e.g. Methyl ethyl ketone)	3	C	C	B	C
OXIDIZERS (e.g. Hydrogen Peroxide)	2	C	C	C	C

Chemical effect (see discussion on Chemical Resistance)

1. No Effect–Most chemicals of this class have no or minor effect.
2. Oxidizer–Chemicals of this class will cause irreversible degradaton.
3. Plasticizer–Chemicals of this class will cause a reversible change in physical properties.

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Chart Rating

A. Most chemicals of this class have little or no effect on the liner.
Recommended regardless of concentration or temperature (below 150° F).

B. Chemicals of this class will effect the liner to various degrees.
Recommendations are based on the specific chemical, concentration and temperature.
Consult with Poly-Flex, Inc.

C. Chemicals of this class at high concentrations will have significant effect on the physical properties of the liner.
Generally not recommended but may be acceptable at low concentrations and with special design considerations.
Consult with Poly-Flex, Inc.

This data is provided for informational purposes only and is not intended as a warranty or guarantee. Poly-Flex, Inc. assumes no responsibility in connection with the use of this data. Consult with Poly-Flex, Inc. for specific chemical resistance information and liner selection.

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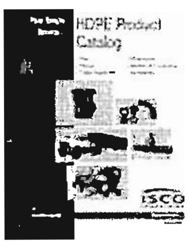

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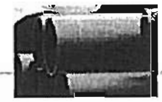
High Density Polyethylene



HDPE CHARACTERISTICS
TYPICAL PROPERTIES
CHEMICAL RESISTANCE CHART
SIZE AND DIMENSION CHARTS BY APPLICATION
CALCULATION PROGRAMS

Chemical Resistance of High Density Polyethylene Pipe

Reagents A through B
Reagents C through E
Reagents F through M
Reagents N through R
Reagents S through Z

For additional chemical resistance listings, consult the P.P.I. technical report #TR 19/10-84, Table I and the ISO technical report #ISO/Data 8-1979, Tables I, II, III.

Chemical Resistance of High Density Polyethylene Pipe
Reagents A through B

S- Satisfactory
U - Unsatisfactory
M - Marginal
N - Not known

All concentrations are 100% unless noted otherwise.

On reagents marked marginal, chemical attack will be recognized by a loss of physical properties of the pipe which may require a change in design factors.

Reagent	**70 deg. F** (21 deg. C)	**140 deg. F** (60 deg. C)
Acetic Acid 1-10%	S	S
Acetic Acid 10-60%	S	M
Acetic Acid 80-100%	S	M
Acetone	M	U
Acrylic Emulsions	S	S
Aluminum Chloride-Dilute	S	S
Aluminum Chloride Conc.	S	S
Aluminum Fluoride Conc.	S	S
Aluminum Sulfate Conc.	S	S
Alums (All Types) Conc.	S	S
Ammonia 100% Dry Gas	S	S
Ammonium Carbonate	S	S
Ammonium Chloride Sat'd	S	S
Ammonium Fluoride 20%	S	S
Ammonium Hydroxide 0.8S S.G.	S	S
Ammonium Metaphosphate Sat'd	S	S
Ammonium Nitrate Sat'd	S	S
Ammonium Persulfate Sat'd	S	S
Ammonium Sulfate Sat'd	S	S
Ammonium Sulfide Sat'd	S	S
Ammonium Thiocyanate Sat'd	S	S
Amyl Acetate	M	U
Amyl Alcohol 100%	S	S
Amyl Chloride 100%	N	U
Aniline 100%	S	N
Antimony Chloride	S	S

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Aqua Regia	U	U
Barium Carbonate Sat'd	S	S
Barium Chloride	S	S
Barium Hydroxide	S	S
Barium Sulfate Sat'd	S	S
Barium Sulfide Sat'd	S	S
Beer	S	S
Benzene	M	U
Benzene Suffonic Acid	S	S
Bismuth Carbonate Sat'd	S	S
Bleach Lye 10%	S	S
Black Liquor	S	S
Borax Cold Sat'd	S	S
Boric Acid Dilute	S	S
Boric Acid Conc.	S	S
Bromic Acid 10%	S	S
Bromine Liquid 100%	M	U
butanediol 10%	S	S
butanediol 60%	S	S
butanediol 100%	S	S
butyl Alcohol 100%	S	S

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Chemical Resistance of High Density Polyethylene Pipe
Reagents C through E

S- Satisfactory
U - Unsatisfactory
M - Marginal
N - Not known

All concentrations are 100% unless noted otherwise.

On reagents marked marginal, chemical attack will be recognized by a loss of physicalproperties of the pipe which may require a change in design factors.

Reagent	**70 deg. F** (21deg. C)	**140 deg. F** (60deg. C)
Calcium Bisulfide	S	S
Calcium Carbonate Sat'd	S	S
Calcium Chlorate Sat'd	S	S
Calcium Chloride Sat'd	S	S
Calcium Hydroxide	S	S
Calcium Hypochlorite RRGH	S	S
Calcium Nitrate 50%	S	S
Calcium Sulfate	S	S
Camphor Oil	N	U
Carbon Dioxide 100% Dry	S	S
Carbon Dioxide 100%Wet	S	S
Carbon Dioxide Cold Sat'd	S	S
Carbon Disulfide	N	U
Carbon Monoxide	S	S
Carbon Tetrachloride	M	U
Carbonic Acid	S	S
Castor Oil Conc.	S	S
Chlorine Dry Gas 100%	S	M
Chlorine Moist Gas	M	U
Chlorine Liquid	M	U
Chlorobenzene	M	U
Chloroform	M	U
Chlorosulfonic Acid 100%	M	U
Chrome Alum Sat'd	S	S
Chromic Acid 20%	S	S
Chromic Acid Up to 50%	S	S

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Chromic Acid and Sulfuric Acid	S	M
Cider	S	S
Citric Acid Sat'd	S	S
Coconut Oil Alcohols	S	S
Cola Concentrates	S	S
Copper Chloride Sat'd	S	S
Copper Cyanide Sat'd	S	S
Copper Fluoride 2%	S	S
Copper Nitrate Sat'd	S	S
Copper Sulfate Dilute	S	S
Copper Sulfate Sat'd	S	S
Cottonseed Oil	S	S
Crude Oil	S	M
Cuprous Chloride Sat'd	S	S
Cychohexanol	S	S
Cyclohexanone	M	U
Detergents Synthetic	S	S
Developers, Photographic	S	S
Dextrin Sat'd	S	S
Dextrose Sat'd	S	S
Dibutylphthalate	S	M
Disodium Phosphate	S	S
Diazo Salts	S	S
Diethylene Glycol	S	S
Diglycolic Acid	S	S
Dimethylamine	M	U
Emulsions, Photographic	S	S
Ethyl Acetate 100%	M	U
Ethyl Alcohol 100%	S	S
Ethyl Alcohol 35%	S	S
Ethyl butyrate	M	U
Ethyl Chloride	M	U
Ethyl Ether	U	U
Ethylene Chloride	U	U
Ethylene Chlorohydrin	U	U
Ethylene Dichloride	M	U
Ethylene Glycol	S	S

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Chemical Resistance of High Density Polyethylene Pipe
Reagents F through M

S- Satisfactory
U - Unsatisfactory
M - Marginal
N - Not known

All concentrations are 100% unless noted otherwise.

On reagents marked marginal, chemical attack will be recognized by a loss of physical properties of the pipe which may require a change in design factors.

Reagent	**70 deg. F** (21 deg. C)	**140 deg. F** (60 deg. C)
Ferric Chloride Sat'd	S	S
Ferric Nitrate Sat'd	S	S
Ferrous Chloride Sat'd	S	S
Ferrous Sulfate	S	S
Fish Solubles	S	S
Fluoboric Acid	S	S
Fluorine	S	U
Fluosilicic Acid 32%	S	S
Fluosilicic Acid Conc.	S	S
Formaldehyde 40%	S	N

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Formic Acid 0-20%	S	S
Formic Acid 20-50%	S	S
Formic Acid 100%	S	S
Fructose Sat'd	S	S
Fruit Pulp	S	S
Fuel Oil	S	U
Furfural 100%	M	U
Furfuryl Alcohol	M	U
Gallic Acid Sat'd	S	S
Gas Liquids	S	M
Gasoline	M	U
Gin	S	U
Glucose	S	S
Glycerine	S	S
Glycol	S	S
Glycolic Acid 30%	S	S
Grape Sugar Sat'd Aq.	S	S
Hexanol, Tert.	S	S
Hydrobromic Acid 50i/O	S	S
Hydrocyanic Acid Sat'd	S	S
HydrochloricAcid 10%	S	S
Hydrochloric Acid 30%	S	S
Hydrochloric Acid 35%	S	S
Hydrochloric Acid Conc.	S	S
Hydrofluoric Acid 40%	S	S
Hydrofluoric Acid 60%	S	S
Hydrofluoric Acid 75%	S	S
Hydrogen 100%	S	S
Hydrogen Bromide 10%	S	S
Hydrogen Chloride Gas Dry	S	S
Hydrogen Peroxide 30%	S	S
Hydrogen Peroxide 90%	S	M
Hydrogen Phosphide 100%	S	S
Hydroquinone	S	S
Hydrogen Sulfide	S	S
Hypochlorus Acid Conc.	S	S
Inks	S	S
Lodine (Alc. Sol.) Conc.	S	U
Lactic Acid 10%	S	S
Lactic Acid 90i/O	S	S
Latex	S	S
Lead Acetate Sat'd	S	S
Lube Oil	S	M
Magnesium Carbonate Sat'd	S	S
Magnesium Chloride Sat'd	S	S
Magnesium Hydroxide Sat'd	S	S
Magnesium Nitrate Sat'd	S	S
Magnesium Sulfate Sat'd	S	S
Mercuric Chloride Sat'd	S	S
Mercuric Cyanide Sat'd	S	S
Mercurous Nitrate Sat'd	S	S
Mercury	S	S
Methyl Alcohol 100%	S	S
Methyl Bromide	M	U
Methyl Chloride	M	U
Methyl Ethyl Ketone 100%	M	U
Methylsulfuric Acid	S	S
Methylene Chloride 100%	M	U
Milk	S	S
Mineral Oils	S	U
Molasses Comm.	S	S

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Chemical Resistance of High Density Polyethylene Pipe
Reagents N through R

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S- Satisfactory
U - Unsatisfactory
M - Marginal
N - Not known

All concentrations are 100% unless noted otherwise.

On reagents marked marginal, chemical attack will be recognized by a loss of physical properties of the pipe which may require a change in design factors.

Reagent	**70 deg. F** (21 deg. C)	**140 deg. F** (60 deg. C)
Nickel Chloride Sat'd	S	S
Nickel Nitrate Conc.	S	S
Nickel Sulfate Sat'd	S	S
Nicotine Dilute	S	S
Nicotinic Acid	S	S
Nitric Acid 0-30%	S	S
Nitric Acid 30-50%	S	M
Nitric Acid 70%	S	M
Nitric Acid 95-98%	U	U
Nitrobenzene 100%	U	U
Octyl Cresol	S	U
Oils and Fats	S	M
Oleic Acid Conc.	S	U
Oleum Conc.	U	U
Orange Extract	S	S
Oxalic Acid Dilute	S	S
Oxalic Acid Sat'd	S	S
Ozone 100%	S	U
PerchloncAcid 10%	S	S
Petroleum Ether	U	U
Phenol 90%	U	U
Phosphoric Acid Up to 30%	S	S
Phosphoric Acid Over 30%	S	S
Phosphoric Acid 90%	S	S
Phosphorous (Yellow) 100%	S	N
Phosphorus Pentoxide 100%	S	N
Photographic Solutions	S	S
Pickling Baths		
• Sulfuric Acid	S	S
• Hydrochloric Acid	S	S
• Sulfuric-Nitric	S	U
Plating Solutions		
• Brass	S	S
• Cadmium	S	S
• Chromium	N	N
• Copper	S	S
• Gold	S	S
• Indium	S	S
• Lead	S	S
• Nickel	S	S
• Rhodium	S	S
• Silver	S	S
• Tin	S	S
• Zinc	S	S
Potassium Bicarbonate Sat'd	S	S
Potassium Borate 1%	S	S
Potassium Bromate 10%	S	S
Potassium Bromide Sat'd	S	S
Potassium Carbonate	S	S
Potassium Chlorate Sat'd	S	S
Potassium Chloride Sat'd	S	S
Potassium Chromate 40%	S	S
Potassium Cyanide Sat'd	S	S
Potassium Dichromate 40%	S	S
Potassium Ferri/Ferro Cyanide	S	S

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Sat'd		
Potassium Fluoride	S	S
Potassium Hydroxide 20%	S	S
Potassium Hydroxide Conc.	S	S
Potassium Nitrate Sat'd	S	S
Potassium Perborate Sat'd	S	S
Potassium Perchlorate 10%	S	S
Potassium Sulfate Conc.	S	S
Potassium Sulfide Conc.	S	S
Potassium Sulfite Conc.	S	S
Potassium Persulfate Satd	S	S
Propargyl Alcohol	S	S
Propyl Alcohol	S	S
Propylene Dichloride 100%	U	U
Propylene Glycol	S	S
Rayon Coagulating Bath	S	S

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Chemical Resistance of High Density Polyethylene Pipe
Reagents S through Z

S- Satisfactory
U - Unsatisfactory
M - Marginal
N - Not known

All concentrations are 100% unless noted otherwise.

On reagents marked marginal, chemical attack will be recognized by a loss of physicalproperties of the pipe which may require a change in design factors.

Reagent	**70 deg. F** (21 deg. C)	**140 deg. F** (60 deg. C)
Sea Water	S	S
Selenic Acid	S	S
Shortening	S	S
Silicic Acid	S	S
Silver Nitrate Sol.	S	S
Soap Solution Any Conc'n	S	S
Sodium Acetate Sat'd	S	S
Sodium Benzoate 35%	S	S
Sodium Bicarbonate Sat'd	S	S
Sodium Bisulfate Sat'd	S	S
Sodium Bisulfite Sat'd	S	S
Sodium Borate	S	S
Sodium Bromide Dilute Sol.	S	S
Sodium Carbonate Con.	S	S
Sodium Carbonate	S	S
Sodium Chlorate Sat'd.	S	S
Sodium Chkoride Sat'd	S	S
Sodium Cyanide	S	S
Sodium Dichromate Sat'd	S	S
Sodium Ferncyanide	S	S
Sodium Ferrocyanide Sat'd	S	S
Sodium Fluoride Sat'd	S	S
Sodium Hydroxide Conc.	S	S
Sodium Hypochlorite	S	S
Sodium Nitrate	S	S
Sodium Sulfate	S	S
Sodium Sulfide 25%	S	S
Sodium Sulfide Sat'd Sol.	S	S
Sodium Sulfite Sat'd	S	S
Stannous Chloride Sat'd	S	S
Stannic Chloride Sat'd	S	S

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Starch Solution SaUd	S	S
Steanc Acid 100%	S	S
Sulfuric Acid 0-50%	S	S
Sulfuric Acid 70%	S	M
Sulfuric Acid 80%	S	U
Sulfuric Acid 96%	M	U
Sulfuric Acid 98%	M	U
Sulfuric Acid, Fuming	U	U
Sulfurous Acid	S	S
Tallow	S	M
Tannic Acid 10%	S	S
Tanning Extracts Comm.	S	S
Tartaric Acid Sat'd	N	N
Tetrahydrofurane	N	U
Titanium Tetrachloride Sat'd	N	U
Toluene	M	U
Transformer Oil	S	M
Trisodium Phosphate Sat'd	S	S
Trichloroethylene	U	U
Urea Up to 30%	S	S
Urine	S	S
Vinegar Comm.	S	S
Vanilla Extract	S	S
Wetting Agents	S	S
Whiskey	S	N
Wines	S	S
Xylene	M	U
Yeast	S	S
Zinc Chloride Sat'd	S	S
Zinc Sulfate Sat'd	S	S

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Greg A. Whyatt, Rick K. Farnsworth(a)

THE HIGH pH CHEMICAL AND RADIATION COMPATIBILITY OF VARIOUS LINER MATERIALS

REFERENCE: Whyatt, G. A., and Farnsworth, R. K. "The High pH Chemical and Radiation Compatibility of Various Liner Materials," Geosynthetic Testing for Waste Containment Applications, ASTM STP 1081, Robert M. Koerner, editor, American Society for Testing and Materials, Philadelphia, 1990.

ABSTRACT: A flexible membrane liner has been proposed to line a concrete vault in which liquid low-level radioactive waste will be solidified. High-density polyethylene (HDPE) and polypropylene liners were tested at the Pacific Northwest Laboratory(b) in an EPA method 9090 format to determine their chemical compatibility with the waste. Radiation effects were also investigated. The liners were immersed in a highly caustic (pH>14), primarily inorganic solution at 90°C. The liners were subjected to radiation doses up to 38.9 Mrad, which was the expected dose the liner would receive over a 30-year life inside the vault. Recent changes have placed the liner outside the vault.

The acceptance criteria for judging the compatibility of the liner with radiation should be different than those used for judging chemical compatibility. The radiation damage over the life of the liner can be simulated in a short-term test. Both HDPE and polypropylene liners were judged to be acceptable from a chemical and radiation standpoint when placed outside of the vault, while several other liners were not compatible. Radiation did not have a significant effect on chemical degradation rates.

KEYWORDS: high-density polyethylene, HDPE, polyproplyene, geomembrane, liner, radiation, compatibility.

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INTRODUCTION

At the Hanford Site near Richland, Washington, plans current exist for disposing of low-level liquid waste in a grout form. is a mixture of liquid waste and grout formers, including fly as blast furnace slag, and Portland cement. The liquid waste will mixed with the grout formers and the resulting slurry will be pu to concrete vaults, where it will harden into large grout masses The waste stream considered here [double-shell slurry feed (DSSF a very high pH (>14) solution containing high concentrations of inorganic compounds and very small concentrations of organic compounds. Because the waste contains hazardous constituents, i disposal is governed by the Resource Conservation and Recovery A (RCRA) (Public Law 94-580) [1]. Therefore, the liners to be use the vault must be shown to be compatible with the DSSF grout slu and any leachate that might be generated from the DSSF grout.

Exothermic hydration reactions occurring after the grout is poured in the vault, combined with radiolytic heat, may produce temperatures as high as 90°C for extended periods. The liners w receive a radiation dose of 38.9 Mrad over 30 years (after this was completed, a design change placed the liner outside of the v thereby reducing the 30-year dose to approximately 14 rad and potentially reducing temperatures). To determine the compatibil of the liners with the waste, the testing was performed in accor with methods specified by the Environmental Protection Agency (E Method 9090 Compatibility Test for Wastes and Membrane Liners (E 9090 test) [2].

EXPERIMENTAL PROCEDURE

Immersion Procedure

The EPA 9090 test method calls for immersion of liner sample leachate. The disposal scenario considered here is unique since grout is pumped into the vault as a liquid and then solidifies. Leaching of the grout is not expected due to barriers over the system, which limit recharge and divert advecting water away fro grout. Therefore, no attempt was made to simulate a leachate fr the grout. Instead, the liners were immersed directly in a simu lated, nonradioactive DSSF waste. The simulated waste was produ by adding various chemicals to match the concentrations in the a waste. All radionuclides were omitted from the simulated waste. Since the tests were conducted, the estimate of the waste compos has been modified. Table 1 compares the waste composition used these tests, measured using inductively coupled plasma (ICP) spe scopy, to the current estimate of the waste composition. The im sion temperature was 90°C, which is the maximum temperature expe in the grout. With the current design, the immersion in simulat DSSF represented a conservatively severe condition for the follo reasons:

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TABLE 1 -- Comparison of immersion solution to actual waste composition

Component	Measured Molarity	Actual Expected Waste Molarity [3]
Ag	1.8×10^{-3}	5.18×10^{-5}
Al	0.47	0.578
Ba	4.7×10^{-3}	4.35×10^{-5}
Ca	5.5×10^{-3}	1.17×10^{-3}
Cd	6.55×10^{-5}	1.39×10^{-4}
Cl	8.0×10^{-2}	9.9×10^{-2}
Cr	3.0×10^{-2}	7.46×10^{-3}
Cu	5.25×10^{-5}	7.16×10^{-5}
F	$<4.5 \times 10^{-2}$	1.98×10^{-2}
Fe	2.73×10^{-2}	3.49×10^{-4}
Hg	1.3×10^{-5}	2.33×10^{-5}
K	0.21	0.233
Mn	4.8×10^{-2}	1.70×10^{-4}
Mo	3.1×10^{-4}	3.52×10^{-4}
Na	6.0	5.65
NO_2	1.9	0.961
NO_3	1.5	1.64
Ni	5.10×10^{-4}	4.65×10^{-4}
P	4.3×10^{-2}	5.75×10^{-2}
Pb	7.5×10^{-6}	3.95×10^{-4}
Se	3.4×10^{-5}	3.62×10^{-4}
SO_4	0.11	2.03×10^{-2}
Zn	1.6×10^{-2}	1.79×10^{-4}
EDTA	8.3×10^{-3}(a)	8.10×10^{-3}
Citrate	8.4×10^{-3}(a)	7.00×10^{-3}

(a) Represents amount added in simulant formulation, not analysis value.

- Reactions with the solid grout formers decrease the pH of the waste. Also, leachate would be diluted and therefore would have less effect.

- During a pilot-scale test, all separated liquid (if any existed) was absorbed by the grout in less than 24 hours. Therefore, any leak would only be of short duration.

- The disposal system incorporates barriers that divert advecting water away from the grout. The area of the system draining to the liner is gravel and should drain relatively quickly compared to a landfill after closure. Therefore, the duration and quantity of leachate is less than expected in a landfill after closure.

The liners tested included the following:

1) High-density polyethylene (HDPE) liner - 1.52 mm (60 mil)

2) Polypropylene liner - 4.32 mm (170 mil) polypropylene
3) Nonreinforced Hytrel polyester liner - 1.02 mm (40 mil)
4) Polyurethane liner - 1.52 mm (60 mil)
5) Ethylene interpolymer alloy (EIA) coated polyester fabri .89 mm (35 mil)

Per the standard EPA 9090 test format, samples were tested b immersion in the waste and after immersions of 30, 60, 90, and 120 days. A detailed description of the procedures used for mea ing various properties is provided in Farnsworth and Hymas (1989 [4].

Irradiation Procedure

Additional liner samples were tested to determine radiation compatibility. Samples were first immersed in DSSF for 30 days 90°C and then placed in a gamma irradiation pit and irradiated t dose of 0.6, 3.6, 16.1, or 38.9 Mrad while immersed in DSSF. Th doses represent the expected dose for material inside the grout over periods of 120 days, 2 years, 10 years, and 30 years based the radionuclide inventory in the waste [3]. Samples were teste each exposure level after removal from the irradiation pit. In addition, samples at the 0.6 Mrad and 38.9 Mrad levels were test after an additional 90 days of immersion to determine if radiati exposure increases the susceptibility of the liner to chemical a from the waste.

Selection of a 30-year dose as the maximum exposure value wa based on guidelines from RCRA, which specify that disposal facil must be monitored for 30 years after closure [1]. The purpose o 30-year post-closure period is to permit drainage of a landfill has been exposed to precipitation. The grout disposal system is expected to generate leachate over a long period of time and the fore may not require a leachate collection system to be function for a 30-year life.

The rate and type of radiation exposure in the tests differe from the low rate of alpha, beta, and gamma radiation that would expected in actual service. However, many studies have shown th radiation damage is only dependent on total dose, not dose rate type of radiation [5,6,7].

ACCEPTANCE CRITERIA

The chemical suitability of a liner for a particular service be judged from the results of compatibility tests. Compatibilit tests attempt to predict the long-term (30 year) compatibility f short-term (120 day) changes in properties. Compatibility is ju based on the magnitude of changes in liner properties and whethe changes stabilize over the 120 days of the test. Except in the

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where a liner is clearly not compatible, criteria are needed to help determine whether the liner is chemically suited for a particular service.

For the HDPE liner, the acceptance criteria suggested by the National Sanitation Foundation (NSF) [8] were used. The criteria includes a reference to the minimum as-received values for HDPE, as defined by NSF Standard 54 [9]. The published NSF criteria for HDPE liners are as follows:

- stability of weight change and mechanical properties with time
- a stabilized weight gain of not more than 3%
- a breaking factor (or strength) at least 80% of the initial value, and equal to or greater than the minimum as-received value in the material properties table of NSF Standard 54
- percent elongation at break at least 80% of the initial value, and equal to or greater than the minimum as-received value in the material property table of NSF Standard 54
- yield strength at least 80% of the initial value and equal to or greater than the minimum as-received value in the material property table of NSF Standard 54
- elongation change at yield no more than 20% in either direction, and elongation value equal to or greater than the minimum as-received value in the material property table of NSF Standard 54
- tear resistance at least 80% of the initial value, and equal to or greater than the minimum as-received value in the material property table of NSF Standard 54
- modulus of elasticity at least 70% of the initial value, and equal to or greater than the minimum as-received value in the material property table of NSF Standard 54.

In general, the specified limits on property changes were used rather than the comparison to minimum properties. This was done because the methods used for measuring elongation and elastic modulus differed from those used to specify minimum properties [9], so these values could not be compared. Specific exceptions to the NSF-proposed requirements are discussed in the results section, where appropriate.

For the non-HDPE liners, stability of properties was the primary acceptance criteria. Also, a ±25% criteria was used for reporting purposes based on the mean acceptance criteria for all flexible membrane liners tested by NSF [8].

Acceptance criteria for radiation compatibility have not been developed. However, since the lifetime dose can be simulated by accelerating the exposure rate, stability of properties should not be

considered as a criterion. Instead, the criteria should be base the required properties at the end of the service period. A shielding calculation based on the radioactive inventory in the has shown that the 30-year dose to the liner in the current DSSF posal scenario is only 14 rad [3]. Although direct exposure of liner to any leachate would cause some increase in the dose, it expected that the increase in dose would be less than two orders magnitude. As a result, the effect of radiation exposure on the liner properties is expected to be minimal.

TEST RESULTS

Failed Liners

After 60 days of immersion, the EIA liner was judged to be i patible due to swelling, weight gain, and 40% reduction in the measured break strength and elongation. Results from the radiat tests showed that the EIA liner is reasonably resistant to radi damage, with puncture elongation exhibiting the greatest change value (a 36% decrease) between the 0.6 Mrad and the 3.6 Mrad do The change was then stable at doses of 16.1 and 38.9 Mrad.

The polyurethane liner lost approximately 90% of its break strength after only 30 days, after which testing was stopped. I believed that the high temperature and pH of the waste caused hydrolysis of esters in the polyurethane structure.

A nonreinforced Hytrel polyester was immersed in DSSF at 90 Within 13 days the liner had completely dissolved, probably bec of hydrolysis of esters caused by the high temperature and high the waste.

HDPE and Polypropylene Chemical Compatibility

Chemical compatibility results for HDPE and polypropylene s immersed at 90°C are presented in Tables 2 and 3, respectively. Ambient temperature data are omitted since the effect of immers ambient temperature is generally less severe than at 90°C. Tot organic carbon (TOC) of the immersion solution was measured eve days to determine if replacement of the waste was required. Si decreases in the waste TOC level were not observed, the same wa was used for the entire test.

During the compatibility tests, the temperature of each imm cell was measured hourly to determine if the cell temperatures being controlled within a ±2°C temperature range, as called for EPA Method 9090 [2]. The temperature control was outside this fication several times. The loss of temperature control is not thought to have had a significant effect on the results. The t that the cells were below the specified temperature was a small centage of the total immersion time. Time periods during which temperature was greater than 92°C should provide conservative r if the liner is found to be satisfactory.

HDPE results: The results from chemical compatibility testing of the HDPE liner are listed in Table 2. The length, thickness, and weight of the liner samples were not significantly changed during the 120 days of immersion. The stability of these properties indicates that the HDPE liner will not absorb components of the waste, which would result in swelling and an increase in weight. In addition, it appears that the liner does not shrink or release significant quantities of material. These observations are substantiated by the small changes observed in the HDPE liner volatile and extractables contents, and the small observed change in liner specific gravity. In addition, visual observation of the immersed samples and the environmental stress cracking samples did not indicate any change in the material after 120 days (2880 hours) of immersion. The results imply that the liner is resistant to chemical attack by the DSSF at 90°C, and should retain its ability to resist permeation.

The effects of immersion on liner tear strength, elastic modulus, and hardness do not create a concern. In all cases the properties stabilized within the NSF-proposed criteria for HDPE liner during the 120 days of immersion testing.

Changes in the liner properties that may be reason for concern were the liner break strength and elongation and the puncture force and elongation. These properties do not appear to have stabilized within the 120-day test period, and therefore are not in accord with the NSF-proposed criteria for property stability. In all cases the changes result in improved liner properties. The liner requires more force to break or puncture and will stretch further before failure. It is believed that the changes are due to an increase in crystallinity in the HDPE liner. Previous studies have shown an increase in the crystallinity of HDPE at elevated temperatures [10]. Therefore, it is believed that the trend toward higher tensile and puncture forces and greater elongations does not indicate chemical incompatibility. The HDPE liner appears compatible with the DSSF slurry at 90°C. The results correspond with other sources that show HDPE's resistance to chemical attack and degradation at temperatures under 90°C [11,12,13,14].

Polypropylene results: The results from chemical compatibility testing of the polypropylene liner are listed in Table 3. The length, thickness, and weight of the liner samples were not significantly changed during 120 days of immersion. The stability of these properties indicates that the polypropylene liner will not absorb volatile or extractable materials that cause the polymeric material to swell and increase in weight. In addition, it appears that the liner does not shrink or release significant quantities of material. These observations are substantiated by the small changes in volatile and extractables contents, and the small change in specific gravity during immersion. Visual observations of the polypropylene liner samples (including the environmental stress cracking samples) found no sign of chemical degradation in the samples during 120 days (2880 hours) of immersion. The results imply that the polypropylene liner is resistant to chemical attack by the DSSF at 90°C, and should retain its ability to resist permeation.

TABLE 2 -- 120-day test results for HDPE liner immersed in DS at 90°C

Property and Units		Non-Irradiated Liner Samples 30 Day	60 Day	90 Day	120 Day
Tear Strength (% change)[a]	-md-[b]	-3.0	0.9	0.0	1.9
	-td-[b]	-4.8	-4.5	6.2	-0.4
Specific Gravity (% change)		0.8	0.3	0.3	0.6
Puncture Force (% change)		-3.1	1.5	3.6	9.1
Puncture Elongation (% change)		-3.7	14.9	22.2	33.5
Hardness, Duro D units (unexposed liner 60.2)		61.0	57.9	61.7	59.5
Dimensional Change (%)[c] (l,w,thk,wt)		≤0.5	≤0.5	≤0.8	≤0.8
Volatiles (%) (unexposed liner = 0.250%)		0.199	0.170	0.200	0.177
Extractables (%) (unexposed = 0.132%)		0.362	0.412	0.804	0.673
Environmental Stress Cracking		-no-[d]	-no-	-no-	-no-
Tensile Properties:[e]					
Yield Strength (% change)	-md-	6.0	1.1	7.6	5.4
	-td-	2.9	0.5	2.0	2.5
Yield Elongation (% change)	-md-	12.1	10.6	12.1	15.2
	-td-	4.5	0.0	6.1	4.5
Break Strength (% change)	-md-	-1.6	-0.1	-3.2	10.5
	-td-	7.6	7.6	2.8	25.2
Break Elongation (% change)	-md-	2.7	3.0	5.2	12.7
	-td-	9.2	8.2	1.2	21.5
Stress at 100% Elongation (% change)	-md-	10.1	9.5	10.2	9
	-td-	2.1	0.7	3.5	1.7
Stress at 200% Elongation (% change)	-md-	4.2	0.5	5.8	2.7
	-td-	3.4	1.0	5.2	3.7
Elastic Modulus (% change)	-md-	-18.5	-1.3	-1.1	-5.4
	-td-	-9.6	-0.3	-15.9	-0.7

(a) Compared to the measured value for unexposed specimens.
(b) -md- machine direction, -td- transverse direction.
(c) Values indicate the magnitude of the largest change.
(d) -no-: no stress cracking observed.
(e) Tensile values calculated from 5 unexposed and 3 exposed specimens at each immersion period. For individual measurement values and number of specimens for all tests, see Farnsworth and Hymas 1989 [4]. Elongations determined from grip separation.

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TABLE 3 -- 120-day test results for polypropylene liners immersed in DSSF at 90°C

Property and Units		Non-Irradiated Liner Samples			
		30 Day	60 Day	90 Day	120 Day
Tear Strength (% change)[(a)]	-md-[(b)]	-0.6	9.1	8.4	4.4
	-td-[(b)]	3.6	14.0	11.9	7.3
Specific Gravity (% change)		0.1	0.4	0.1	-0.1
Puncture Force (% change)		-2.5	-0.4	-2.7	-11.6
Puncture Elongation (% change)		-40.1	-38.7	-31.8	-17.4
Hardness, Duro D units (unexposed 68.6)		66.8	69.3	69.1	67.3
Dimensional Change (%)[(c)] (l,w,thk,wt)		<0.6	<0.6	<0.6	<1.1
Volatiles, wt% of Sample (0.01% unexposed)		0.0779	0.628	0.1112	0.0132
Extractables (wt%) (unexposed = 0.405%)		0.397	0.599	0.423	0.727
Environmental Stress Cracking		-no-[(d)]	-no-	-no-	-no-
Tensile Properties:[(e)]					
Yield Strength (% change)	-md-	-8.6	-4.0	-8.7	-4.8
	-td-	-11.5	-7.9	-9.9	-4.4
Yield Elongation (% change)	-md-	36.8	35.4	23.7	46.3
	-td-	41.8	37.3	31.7	21.1
Break Strength (% change)	-md-	10.7	13.6	12.2	12.2
	-td-	2.8	2.3	6.1	10.1
Break Elongation (% change)	-md-	104.1	112	129.7	30.0
	-td-	29.8	-6.7	-11.8	14.1
Stress at 100% Elongation (% change)	-md-	21.9	22	15.6	14.4
	-td-	3.3	13.3	6.6	20.6
Stress at 200% Elongation (% change)	-md-	5.1	4.2	2.6	6.6
	-td-	0.9	2.1	5.5	8.6
Elastic Modulus (% change)	-md-	-32.9	-29.1	-26.2	35
	-td-	-37.6	-32.8	-31.5	21

(a) Compared to the measured value for unexposed specimens.
(b) -md- machine direction, -td- transverse direction.
(c) Values indicate the magnitude of the largest change.
(d) -no-: no stress cracking observed.
(e) Tensile values calculated from 5 unexposed and 3 exposed specimens at each immersion period. For individual measurement values and number of specimens for all tests, see Farnsworth and Hymas 1989 [4]. Elongations determined from grip separation.

However, five properties (yield elongation, break elongation elastic modulus, puncture force, and puncture elongation) were c side of the qualitative criteria that were developed for nonirra ated, non-HDPE liner material. One problem encountered was that thickness of the polypropylene was not uniform. The actual thic of the nominally 4.3-mm liner varied from 4.0 mm to 5.6 mm. The dimensional samples for ambient and 90°C had thicknesses of 4.7 0.7 mm and 4.8 ± 0.4 mm, where ± represents one standard deviati The nonuniformity in liner thickness contributed to variability the results of mechanical property tests.

The yield elongation of the polypropylene liner increased by after 30 days of immersion but remained stable for the remaining 90 days of immersion. It is believed that the increase is a dir result of the temperature of the DSSF slurry, not an indication degradation. Since the yield elongation stabilized in a benefic direction, the concern over this deviation was minor. The liner elastic modulus decreased 30% to 35% during the first 30 days of immersion testing, but remained stable thereafter. This decreas caused by the increase in yield elongation of the liner over the 30-day period. Likewise, concern over this deviation is minor.

The break elongations of the polypropylene liner varied from +130% to -12% during the 120 days of 90°C immersion. The variat did not appear to be due to liner thickness, but rather a poor repeatability of the measurement. As an example, for unexposed samples, the percent elongation-at-break measurements were 344, 491, 266, 251 in the machine direction and 790, 850, 191, 582, (the transverse direction. Since data from immersed samples was in triplicate, changes in properties were masked by the variabil in the measurement. From visual observations, it appeared that liner would thin and break unpredictably during tensile testing.

The liner puncture force appeared to decrease 9% without sta bilizing over the last 30 days of immersion. However, this char was clearly correlated to the measured thickness of the specimer before testing. The puncture elongation showed a significant fluctuation after 30 days and then drifted back towards the unex value. The puncture elongation was more repeatable than break elongation and the variations were not correlated to the thickne individual specimens. Although puncture elongation causes some concern, it is suspected that the change in puncture elongation also related to the unpredictable elongation behavior of the polypropylene liner, and it was concluded that the changes did r indicate incompatibility. All specimens for one immersion peri were cut from the same coupon, and there may be variability betw coupons.

Although the HDPE liner appears to be superior from the star point of chemical compatibility, it is concluded that polypropy liner may also be suitable for the application. The property cl of the polypropylene liner, which appeared more significant thar those for the HDPE liner, were masked by variation in thickness lack of repeatability of some measurements. It is suggested th testing be performed using more uniform polypropylene liner mat

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Others have shown polypropylene to be more sensitive to thermal oxidative breakdown than polyethylene because of the carbon-hydrogen (C-H) linkages with tertiary carbon atoms [15].

Radiation Effects

High-density polyethylene: The results from radiation compatibility tests on HDPE samples are listed in Table 4. The table headings indicate the nominal dose to the liner, followed by the total immersion time for the sample in DSSF at 90°C. Radiation tests were not performed for ambient immersions. The effects of radiation on the liner can be seen by comparing the 30-day immersion data at different doses for each property. The effect of radiation on sample mass, dimensions, and volatile content is very small. The yield strength increases and yield elongation decreases with increasing dose. The most severe change in properties is a reduction in break strength and elongation of the samples. Also, significant changes were observed in the stress at 100% and 200% elongation at the 38.9 Mrad dose. These changes are believed to be due to crosslinking in the irradiated HDPE [16]. The puncture force increased, as would be expected. However, there was an increase in puncture elongation above what occurs in the absence of radiation. The reason for this is unknown, but does not cause concern since these changes represent 30-year-life changes. Environmental stress cracking was not performed as part of this testing, but previous work with HDPE using a more concentrated DSSF at 75°C showed no stress cracking when the samples were subjected to 0.93 Mrad over a 120-day (2880 hour) period. The effect of radiation on stress cracking has also been examined by others [17].

The 120-day immersion data are for samples irradiated at 30 days and then reimmersed and tested at 120 days of total immersion. In general, the 38.9 Mrad/120-day data are similar to the 38.9 Mrad/30-day data, indicating that radiation does not make the liner more susceptible to chemical degradation. Therefore, radiation and chemical degradation can be evaluated separately. It is concluded that the HDPE liner is resistant to radiation damage and is suitable for the environment of a grout vault.

Polypropylene results: The results from radiation compatibility tests of polypropylene liner are listed in Table 5. As with HDPE, radiation exposure did not change the sample dimensions. Significant changes were observed in the liner's tensile properties, tear strength, and puncture elongation at exposures of 16.1 Mrad and 38.9 Mrad. In general, the effect of radiation on a liner's mechanical properties appears to be greater for polypropylene than for HDPE. This observation is in accordance with previous studies that have shown polypropylene to be less resistant to radiation damage than HDPE. The decrease may be due to the increased amount of chain fracturing that occurs as the polypropylene cross-links during irradiation. In contrast, irradiated HDPE cross-links with very little main chain fracture [18].

TABLE 4 -- Results for irradiated, 120-day HDPE liner in DSSF

Property and Units		Radiation Dose (Mrad)/Immersion Time (days) 0/30	0.6/30	3.6/30	16.1/30	38.9/30	0/120	0.6/120
Tear Strength (% change)(a)	-md-(b)	-3.0	-3.8	-6.2	-5.9	-10.7	1.9	0.3
	-td-(b)	-4.8	3.7	6.8	4.4	4.9	-0.4	-1.7
Puncture Force (% change)		-3.1	5.0	3.9	7.0	13.0	9.1	8.4
Puncture Elong. (% change)		-3.7	7.1	66.7	14.9	24.2	33.5	39.8
Hardness, Duro D units (unexposed 60.2)		61.0	58.2	56.9	59.1	61.4	59.5	60.9
Dimensional (% change)(c) (l,w,thk,wt)		≤0.5	≤0.7	≤1.2	≤0.3	≤0.9	≤0.8	≤0.7
% Volatiles (wt%) (unexposed = 0.250%)		0.20	0.34	0.22	0.19	0.18	0.18	0.17
Tensile Properties:(d)								
Yield Strength (% change)	-md-	6.0	3.4	7.4	12.7	16.2	5.4	6.7
	-td-	2.9	1.8	6.7	11.1	11.9	2.5	0.5
Yield Elongation (% change)	-md-	12.1	10.2	10.6	4.5	3.0	15.2	10.6
	-td-	4.5	9.1	2.3	-3.0	-7.6	4.5	4.5
Break Strength (% change)	-md-	-1.6	-2.2	-3.4	-14.4	-29.4	10.5	-5.6
	-td-	7.6	-1.7	3.8	-30.4	-21.4	25.2	9.9
Break Elongation (% change)	-md-	2.7	3.7	-0.9	-30.4	-69.6	12.7	-6.1
	-td-	9.2	4.1	6.8	-40.1	-56.6	21.5	7.7
Stress at 100% Elongation (% change)	-md-	10.1	7.5	9.2	11.8	27.0	9.0	5.4
	-td-	2.1	3.5	7.5	17.9	27.0	1.7	2.8
Stress at 200% Elongation (% change)	-md-	4.2	1.3	3.6	13.1	23.6	2.7	2.1
	-td-	3.4	3.3	7.1	19.0	28.0	3.7	3.7
Elastic Modulus (% change)	-md-	-10.5	-11.8	1.6	5.9	1.4	-5.4	-0.2
	-td-	-9.6	-10.7	-1.3	21.2	0	-0.7	-9.0

(a) Compared to the measured value for unexposed specimens.
(b) -md- machine direction, -td- transverse direction.
(c) Values indicate the magnitude of the largest change.
(d) Tensile values calculated from 5 unexposed and 3 exposed specimens at each immersion period. Individual measurement values and number of specimens for all tests, see Farnsworth and Hymas Environmental stress cracking and extractables not performed on irradiated samples. Related w mentioned in text. Elongations determined from grip separation.

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TABLE 5 -- Results for irradiated, 120-day polypropylene liner in DSSF at 90°C

Property and Units		Radiation Dose (Mrad)/Immersion Time (days) 0/30	0.6/30	3.6/30	16.1/30	30.9/30	0/120	0.6/120	30.9/120
Tear Strength (% change)(a)	-md-(b)	-0.6	2.1	-1.5	-11.8	-31.1	4.4	6.9	-27.6
	-td-(b)	-3.6	4.2	-2.0	-12.5	-28.8	7.4	4.3	-29.9
Puncture Force (% change)		-2.5	5.0	0.8	2.4	16.4	-11.6	22.4	12.7
Puncture Elong (% change)		-40.1	-41.2	-44.3	-11.7	-44.9	-17.4	-23.6	-16.1
Hardness, Duro D units (unexposed 60.2)		66.8	70.3	67.1	67.7	70.6	67.3	68.7	72.5
Dimensional (% change)(c) (l,w,thk,wt)		≤0.6	≤0.3	≤0.4	≤0.4	≤0.2	≤1.2	≤0.3	≤0.2
% Volatiles (wt%) (unexposed = 0.01%)		0.00	0.05	0.05	0.09	0.11	0.01	0.05	0.08
Tensile Properties:(d)									
Yield Strength (% change)	-md-	-0.6	1.8	-14.8	-3.6	0.6	-4.8	-3.6	-7.7
	-td-	-11.5	-2.0	-6.5	-5.8	6.6	-4.4	-2.2	1.1
Yield Elongation (% change)	-md-	36.0	11.4	14.3	43.6	23.7	46.3	33.9	-14.8
	-td-	41.0	9.2	11.3	11.3	11.3	21.1	20.2	63.9
Break Strength (% change)	-md-	10.7	5.8	-14.0	-50.5	6.3	12.2	10.3	-16.4
	-td-	2.8	2.3	-21.0	-4.8	-4.9	10.1	2.0	29.9
Break Elongation (% change)	-md-	104.1	-44.1	58.9	-60.3	-73.6	30.0	40.5	-95.3
	-td-	29.8	-34.1	-12.9	-71.1	-86.3	14.1	-70.8	-89.2
Stress at 100% Elong. (% change)	-md-	21.9	4.4	-0.5	-26.0	(e)	14.4	19.4	(e)
	-td-	3.3	11.6	1.9	-4.3	(e)	20.6	4.1	(e)
Stress at 200% Elong. (% change)	-md-	5.1	2.5	-13.0	(e)	(e)	6.6	6.3	(e)
	-td-	0.9	6.1	-6.5	(e)	(e)	8.6	(e)	(e)
Elastic Modulus (% change)	-md-	-32.9	-8.6	-25.4	-27.5	-12.3	-35.0	-20.1	--
	-td-	-37.6	-10.0	-16.1	-15.4	-4.3	-21.0	-23.7	-38.3

(a) Compared to the measured value for unexposed specimens.
(b) -md- machine direction, -td- transverse direction.
(c) Values indicate the magnitude of the largest change.
(d) Tensile values calculated from 5 unexposed and 3 exposed specimens at each immersion period. For individual measurement values and number of specimens for all tests, see Farnsworth and Hymas 1989 [4]. Environmental stress cracking and extractables not performed on irradiated samples. Elongations determined from grip separation.
(e) Samples broke before reaching this elongation value.

The break elongation was the most severely affected proper The average break elongation after 120 days immersion and a 38 dose was reduced to only 8% of the elongation of the unexposed Therefore, a 30-year life for this liner in the interior envir of the grout vault is not supported by the data. It is questi if a 30-year life is required in the disposal scenario since tl waste solidifies quickly and leachate is not expected. Howeve to design changes, the actual expected 30-year dose is only 14 which should not have any appreciable effect on the liner.

Data from samples irradiated after 30 days of immersion an reimmersed for an additional 90 days were examined to determin radiation affected the chemical resistance of the liner. Ther appears to be some effect on the yield elongation and elastic values.(a) However, in general, it appears that radiation doe significantly affect the chemical degradation rate. Therefore chemical and radiation results can be considered separately in case.

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(a) Elastic modulus for polypropylene liner was calculated fr yield strength and elongation using ASTM D638.

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Richard W. Thomas and Mark W. Cadwallader

SOLVENT SWELL OF POLYETHYLENE BY THERMOMECHANICAL ANALYSIS

REFERENCE: Thomas, R. W. and Cadwallader, M., "Solve Swell of Polyethylene by Thermomechanical Analysis," Geosynthetic Testing for Waste Containment Applicatio ASTM STP 1081, Robert M. Koerner, Ed., American Socie for Testing and Materials, Philadelphia, 1990.

ABSTRACT: An important property of high density polyethylene (HDPE) for lining waste management facilities is how it behaves whe exposed to chemicals. A new method to study this has been develope with the use of a thermomechanical analyzer (TMA). The technique monitors the size of a sample as a function of time while it is exposed to a challenge chemical. The resulting absorption curve can be used t generate the coefficient of diffusivity and the percentage swell at equilibrium. Four different densities of PE were studied by this method. The results showed that the diffusivity, solubility and permeability of a PE resin are dramatically affected by the resin density.

KEYWORDS: Polyethylene, Diffusion, Permeation, Solvent Swell, Thermomechanical Analyzer.

INTRODUCTION

Because the primary function of a synthetic liner in waste containment is to prevent migration of chemicals into the groundwate properties of molecular movement through the liner such as chemical absorption, desorption, swelling and permeation are important. Amor polyethylene liners the level of crystallinity (measured indirectly by th density) is very important in preventing molecular movement through the liners. Exactly how much this molecular movement depends on density is an important question which can be very well addressed wit the techniques of thermomechanical analysis.

Permeation is the process in which permeant molecules migrate through a membrane. Mathematically, it is the product of two separa processes, diffusivity and solubility.

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Engineering Design File

Liner/Leachate Compatibility Study

Idaho National Engineering and Environmental Laboratory

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ENGINEERING DESIGN FILE

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	R/A	Typed Name/Organization	Signature	Date
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ABSTRACT

This study evaluates the compatibility of the liner materials with the leachate generated by the waste disposed in the INEEL CERCLA Disposal Facility. The liner system is composed of both natural and synthetic materials including compacted clay, geosynthetic clay liner, high-density polyethylene, and polypropylene products. This study will determine whether these materials are compatible with the leachate, based on experience at similar landfills and published literature.

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ACRONYMS

ASTM	American Society for Testing and Material
CCL	compacted clay liner
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CETCO	Colloid Environmental Technologies Company American
EDF	engineering design file
EPA	Environmental Protection Agency
GCL	geosynthetic clay liner
HDPE	high-density polyethylene
ICDF	INEEL CERCLA Disposal Facility
INEEL	Idaho National Engineering and Environmental Laboratory
LERF	Liquid Effluent Retention Facility
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
SBL	soil bentonite liner
TCE	trichloroethylene
TSCA	Toxic Substances Control Act
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WAC	Waste Acceptance Criteria

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Liner/Leachate Compatibility Study

1. INTRODUCTION

1.1 Purpose

The purpose of this study is to demonstrate that the liner materials proposed for the INEEL CERCLA Disposal Facility (ICDF) landfill and evaporation pond are chemically compatible with the leachate. Certain materials deteriorate over time when exposed to chemicals that may be contained in hazardous leachate. It is important to anticipate the type and quality of the leachate that the landfill will generate and select compatible liner materials. Data collected from other similar low-level radioactive mixed waste and hazardous waste sites was used to determine the allowable concentration of leachate constituents that could be in contact with the ICDF landfill and evaporation pond liner components.

1.2 ICDF Liner System

The ICDF landfill and evaporation pond liners are a double composite system compliant with the substantive requirements of the Resource Conservation and Recovery Act (RCRA) Subtitle C and the Toxic Substances Control Act (TSCA) polychlorinated biphenyl (PCB) landfill and surface impoundment design, consisting of leachate collection/detection systems, a 3-ft-thick soil bentonite liner (SBL) (landfill only), and flexible membrane liners. The specific liner materials are listed below:

- High-density polyethylene (HDPE) geomembranes
- Geosynthetic clay liner (GCL) consisting of a thin layer of bentonite sandwiched between two synthetic geotextiles
- Geocomposite consisting of a HDPE geonet and geotextile
- Compacted clay soil with a bentonite admix (soil bentonite layer [SBL]) to decrease permeability.

The evaporation pond liner also includes an additional sacrificial geomembrane for UV protection.

In general, the liner system consists of two types of materials. The geomembranes, geotextiles, and geonets are manufactured from polymeric materials made from synthetic polymers. HDPE products have a high crystallinity that increases the chemical resistance of the polymer. The second type of material is soil comprised mainly of clay-sized particles, also crystalline in nature. As part of this study, no information was found with respect to the degradation of the geotextile materials. It was determined that even if the geotextile materials used in the liner system degraded, that it would not negatively impact the containment qualities of the landfill. Therefore, the degradation of geotextile was not considered as part of this study.

1.3 Mechanisms of Liner System Deterioration

Specific mechanisms of deterioration of the liner system components that might be encountered based on the waste inventory are chemical, radioactive, and oxidation degradation. Degradation involves a change in the physical properties of the liner material that could increase the permeability of the material or reduce the material's strength or ductility.

Polymeric chain scission or bond breaking within the polymer structure of HDPE results in degradation. Chemical degradation for HDPE products is a concern for leachates containing high concentrations of organic solvents or other highly reactive chemicals. High radiation doses also have the potential to cause chain scission in polymers. Oxidation occurs when free radicals and oxygen are present and results in chain scission. Oxidation processes are slowed considerably in liquid environments and antioxidant formulations are added to most HDPE products (Koerner 1998). Oxidation is also significantly reduced when the liner system is buried. As discussed herein, these processes are not expected to occur based on the ICDF leachate quality.

HDPE geomembranes can deteriorate from contact with certain leachates, resulting in a decrease of elongation at failure, an increase in modulus of elasticity, a decrease in the stress at failure, and a loss of ductility. Similarly, the permeability of a SBL and GCL can increase or decrease due to certain constituents in the leachate. This study is intended to establish individual leachate constituent concentration limits that will not adversely impact the liner system components. A summary of the properties for the HDPE, SBL, and GCL liner materials and the effects that could result from exposure to an aggressive leachate are summarized in Table 1-1. Notably, aggressive leachate in the ICDF landfill or waste liquid in the evaporation pond are not anticipated during their service life.

Table 1-1. Potential effects of aggressive leachate on liner materials.

Liner Material	Property	Typical Value	Possible Effect of Leachate
60 mil Textured HDPE	Thickness	> 60 mils	Decrease
	Melt Index	< 1.0 g/10 min	Increase or Decrease
	Strength at yield	> 120 lb/in.	Increase or Decrease
	Strength at break	> 75 lb/in.	Increase or Decrease
	Elongation at yield	> 12%	Increase or Decrease
	Elongation at break	> 100%	Increase or Decrease
	Tear Resistance	> 42 lb	Increase or Decrease
	Puncture Resistance	> 80 lb	Increase or Decrease
	Environmental Stress Crack	> 200 hours	Increase or Decrease
SBL	Permeability	$< 10^{-7}$ cm/sec	Increase or Decrease
GCL	Permeability	$< 10^{-7}$ cm/sec	Increase or Decrease

Sodium bentonite is the primary clay mineral in SBLs and GCLs that results in a low permeability and high swell potential. Exposure of sodium bentonite to liquids containing concentrated salts (such as brines), or divalent cation concentrations (such as Ca++ and Mg++), reduces the swelling potential and increases its permeability. Concentrated organic solutions (such as hydrocarbons) and strong acids and bases can break down the soil, which also increases permeability. The physical mechanism that causes these changes is a reduction of the thickness or absorption capacity of the diffuse double layer of water molecules surrounding the clay minerals. This results in an effective decrease in the volume of the clay since the water molecules are not attracted to the clay particles.

1.4 ICDF Leachate Concentrations

Soluble contaminants leached from the waste will come in contact with the landfill and evaporation pond bottom liner system during the operation period (15 years) and minimum post closure period

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(30 years). The natural soil bentonite liner system may be in contact with soluble contaminants as long as contaminants are present in the landfill. The synthetic liner system components may be in contact with soluble contaminants until they naturally degrade or become ineffective. Leachate is generated from water added to the waste for dust control and compaction purposes. Natural precipitation events also contribute to leachate production. In reality, as the landfill nears the end of its operational life, concentrations of contaminants will decrease with time as the leachable waste mass is reduced. During the post-closure period, a robust landfill cover will significantly reduce infiltration, and the corresponding volume of leachate.

An inventory of constituents and associated site-specific concentrations anticipated in the waste are published in the INEEL CERCLA Disposal Facility Design Inventory (EDF-ER-264). The expected chemical make-up of the leachate was determined based on modeling described in the leachate/contaminant reduction time study (EDF-ER-274).

Two hydrogeologic models were used to simulate leachate generation during the operational period (15 years) and post-closure period (30 years) of the ICDF landfill and evaporation pond. The post-closure period includes the waste-filled landfill having a cover to reduce infiltration and the generation of leachate. The models applied partitioning coefficients to the waste design inventory mass to determine a liquid concentration for each constituent, and resulting leachate concentration.

In addition to the hydrogeologic models, a geochemical evaluation was performed for the operational period to evaluate natural geochemical reactions that could potentially generate constituents harmful to the liner system materials in the landfill or evaporation pond other than by the soluble waste constituents alone. It also was used to determine the general composition of the leachate including pH. The geochemical evaluation consisted of determining the chemistry make-up of the leachate based on the constituents in the waste soil and the geochemical reactions between the atmospheric gases (i.e., O_2, CO_2, etc.), infiltrating water, and natural occurring minerals in the soil.

The maximum and average leachate concentrations determined from the operational 15-year and post-closure 30-year hydrogeologic models were compared to determine the worst-case leachate concentrations due to the contaminants in the waste soil. Based on the comparison, the highest concentration of contaminates would occur during the operational period since contaminant transport tends to be dominated by drainage and diffusion, driven by the infiltration rate, which is expected to be small once the landfill is covered (EDF-ER-279).

Based on the geochemistry evaluation, the modeled leachate composition will be a brackish water with a pH of 8.0 (EDF-ER-274). Some of the constituents in the leachate had higher concentrations than determined by the hydrogeologic model due to the added effects of geochemical reactions. These mainly included sodium and sulfate having concentrations of approximately 8,000 and 20,000 mg/L, respectively. Brackish solutions containing high-concentration divalent cation concentrations such as calcium and magnesium can increase the permeability of the SBL and GCL liner materials as discussed in Section 1.3. The predicted divalent cation (calcium, magnesium, manganese, and barium) total concentration is approximately 400 mg/L. Higher concentrations are predicted from the 15-year hydrogeologic model of approximately 4,000 mg/L due to more conservative assumptions than the geochemical model. In either case, the divalent cation concentration is less than the maximum allowable concentration of 35,000 mg/L for the SBL and GCL described in Section 3.

Based on the 15-year hydrogeologic model, the maximum leachate concentration occurs during the first year of operation. The maximum and average concentrations for organics, inorganics, and radionuclides are provided in Table 1-2. These concentrations are considered conservative since they

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were determined assuming that the entire landfill is filled with waste instantaneously and has a constant moisture content of 6% by dry weight for all 15 years of operation.

Table 1-2. Maximum and average concentrations of leachate constituents by chemical category.

Chemical Category	Maximum Concentration	Average Concentration
Organics	70 mg/L	10 mg/L
Inorganics	18,400 mg/L	17,100 mg/L
Radionuclides	1 mg/L (0.00002 Ci/l)	1 mg/L (0.00001 Ci/l)

The resulting constituents determined from the leachate/contaminant reduction time study are provided in Appendix A. The organic constituents and expected concentrations are provided in Table A-1. The inorganic constituents and expected concentrations are provided in Table A-2. The expected radionuclides and activity concentrations are provided in Table A-3.

1.5 Absorbed Dose In Geomembrane

Studies performed on polymer materials like HDPE show that their properties begin to change after absorbing ionizing radiation between 1,000,000 to 10,000,000 rads (Koerner et al. 1990). The HDPE geomembrane lining the bottom of the landfill and evaporation pond will absorb ionizing radiation energy from the leachate generated in the landfill and combination of leachate and other waste liquids in the evaporation pond. Energy will be absorbed during the operational life of the landfill and evaporation pond as long as there are liquids with ionizing radionuclides in contact with the geomembranes.

The absorbed dose in the geomembrane was determined by multiplying the dose rate by an absorption duration. Conservatively, the absorption duration was assumed that the leachate was in contact continuously with the liner for the entire 15-year landfill operational life. In reality, leachate will be in contact with the landfill geomembrane intermittently depending on climatological and waste moisture content conditions. The absorption duration in the evaporation pond will be shortlived, due to evaporation and dilution from make-up water.

A design absorption rate was calculated for each of the radionuclides listed in Appendix A, Table A-3. Exceptions included Krypton (Kr-85 and Kr-81), which is a gaseous element, and radionuclides that are not in the leachate. The design absorption rate is dependent upon the physical properties of the absorbing material and how the energy from the source is deposited into the material. The physical properties of the HDPE geomembrane needed to determine the absorption rate are provided in Table 1-3.

Table 1-3. Physical properties of geomembranes.

Parameter	Value	Units
HDPE density	0.94	g/cm^3
Geomembrane thickness	1.5	mm
Unit surface area	1	cm^2

The amount of energy was based on the depth of leachate on the landfill liner and depth of liquids in the evaporation pond. The maximum depth of leachate was estimated as 4 cm across the floor of the landfill, assuming both Cell 1 and Cell 2 are in operation (EDF-ER-269). In the sump area of the landfill, the maximum leachate head would be approximately 30.5 cm. If the volume of leachate 4 cm deep over

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the area of the landfill (Cell 1 and Cell 2) was placed in the evaporation pond, the depth of leachate in the evaporation pond would be approximately 36 cm. Using these depths, the activity concentration, and the geomembrane proprieties, the design absorption rate was computed for each radionuclide. The computation is provided in Appendix B. The design absorption rates are listed in Table A-4, provided in Appendix A.

The design absorbed dose to the geomembrane is approximately 0.09 and 0.8 rads per hour, for the landfill and evaporation pond, respectively. Assuming the leachate concentration and composition remains constant, the total doses over the 15-year operation life are conservatively estimated to be 12,000 and 100,000 rads for the landfill and evaporation pond, respectively. The total dose for the landfill for 1000 years is estimated to be 800,000 rads. This assumes that all the energy from the leachate will be absorbed in the geomembranes. In reality, only small fractions of alpha and beta particles will penetrate the geomembrane material. Notably, the upper sacrificial geomembrane lining the evaporation ponds will absorb the majority of the ionizing radiation with little dose to the underlying primary geomembrane. Based on radiation absorbed dose, the mechanical properties of the HDPE liner are not expected to be degraded below acceptable levels.

2. EXISTING STUDIES OF LINER/LEACHATE COMPATIBILITY

2.1 EPA Method 9090

In 1992, EPA published Method 9090, 'Compatibility Tests for Wastes and Membrane Liners,' to set the standard that liners must meet to be protective of human health and the environment. This test has been used throughout the industry to demonstrate that liners are compatible with numerous leachate compositions from municipal and hazardous waste landfills, and surface impoundments. The results of these studies have been documented and are readily available. The manufacturers of the liners now supply limitations of the products based on these tests. The results are commonly accepted as reliable and complete. Since the ICDF leachate contains no unusual or excessive constituents, the industry results for these liners is sufficient to demonstrate compatibility.

The compatibility of GCL and SBL materials are usually demonstrated by permeating the material with leachate to determine its permeability. Method 9090 consists of immersing small sample specimens of a liner material in leachate and periodically measuring changes in the physical properties. The specimens are removed after 30, 60, 90, and 120 days, then tested to determine changes to the physical dimensions and mechanical properties. Acceptance criteria for defining compatibility tend to vary. Compatibility has been defined as geomembrane properties remaining above the minimum suggested property value or an allowable small percentage of change in properties (e.g., less than 15%) to maintain the integrity of the liner.

GCL and SBL are tested for compatibility by permeating the material with a leachate solution to determine effects on the hydraulic performance of the material. Typically, solutions with high concentrations of contaminants or pure products are allowed to permeate a sample under confining pressure to determine the saturated permeability of the material using ASTM methods such as ASTM D5084. A saturated permeability exceeding 1×10^{-7} cm/sec would indicate incompatibility.

The HDPE geomembrane and GCL materials planned for the ICDF are considered to be the most chemically inert liner materials commercially available for waste disposal facilities. Numerous studies using EPA Method 9090 and permeability tests, among other testing procedures, have been performed for waste disposal facilities and in the laboratory providing a good understanding of the compatibility behavior of these liner materials.

2.2 Published Studies

2.2.1 Comparison with Other Geomembrane 9090 Compatibility Studies

Relevant compatibility studies have been performed at DOE's Hanford facility near Richland, Washington. These projects include the Liquid Effluent Retention Facility (LERF), W-025 landfill, and the Grout Facility. Other relevant studies include the Kettleman Hills landfill located in northern California. The results of these published studies indicate that a HDPE geomembrane will function well as a liner beneath the landfill waste or liquid waste in the evaporation pond. The published geomembrane compatibility studies for the Hanford facility are listed in Section 6 Bibliography of this report.

A comparison between the anticipated ICDF landfill leachate and that used in compatibility tests for other facilities is summarized in Table 2-1.

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Table 2-1. EPA test method 9090 compatibility studies comparison.

Compatibility Study[a]	Type of Material Tested	General Composition of Leachate	9090[b] Test Concentrations or Radiation Exposure that Demonstrated Compatibility in Each Study	ICDF[c] Leachate Concentration/ Absorbed Radiation
Hanford LERF	60-mil smooth HDPE from four manufacturers	Organics	16.25 mg/L	70 mg/L
Hanford W-025 Landfill	60-mil smooth HDPE	Inorganics	204,210 mg/L	18,400[g] mg/L
		Organic Leachate and Radiation Exposure	50,000 rads	12,000 rads (landfill) 100,000 rads (evaporation pond)
		pH	9.2	8.0
Hanford Grout Facility	60-mil smooth HDPE	Inorganics	368,336 mg/L	18,400 mg/L
		Organic Leachate and Radiation[e] Exposure	37,000,000 rads	
		Organic Leachate and Radiation[f] Exposure	16,000,000 rads	12,000 rads (landfill) 100,000 rads (evaporation pond)
		pH	>14	8.0
Kettleman Hills Landfills	60-mil smooth HDPE	Organics	93,040 mg/L	70 mg/L
		Inorganics	250,000 mg/L	18,400 mg/L
		pH	>12	8.0
Unidentified Landfill Study	Textured HDPE	Organics	154 mg/L	70 mg/L

a. Detailed compatibility test information is provided in *Evaluation of Liner/Leachate Chemical Compatibility for the Environmental Restoration Disposal Facility report* (USACE 1995).

b. EPA Test Method 9090 "Compatibility Test for Wastes and Membrane Liners" (EPA 1992).

c. Values reported represent values at which the test was run, showing no unacceptable effects. They do not represent an allowable limit.

d. Values based on the "Leachate/Contaminate Reduction Time Study" (EDF-ER-274).

e. A slight reduction in strength and elasticity of the HDPE liner occurred at the highest doses used in the testing.

f. No measurable changes in the HDPE liner material properties were observed after the testing.

g. Reported as total inorganics.

HDPE is chemically resistant to inorganic salt solutions and can be incompatible with some organic solutions at high concentrations (i.e., pure products). Actual compatibility tests from other landfills show that HDPE is chemically resistant to much higher concentrations of organics in the leachate than what is expected in the ICDF leachate. The organic concentration in the Kettlemen Hills Landfill leachate is almost four orders of magnitude higher than what is expected in the ICDF landfill leachate. The use of general categories of chemicals rather than individual constituents has been accepted by the EPA for the Environmental Restoration Disposal Facility at Hanford and provide a worst-case scenario due to possible synergistic effects of mixed compounds.

The EPA Method 9090 tests performed on HDPE geomembrane liner planned for the Grout Facility included high temperatures and doses of large amounts of radiation. The leachate solution temperature was increased to 194°F, which is significantly above the standard test temperatures of 73° and 122°F required in Method 9090. Additionally, the samples were irradiated at doses up to 37,000,000 rads prior to the testing, significantly decreasing the strength and elasticity (i.e., greater than 25%) of the geomembrane specimens (USACE 1995). Geomembrane samples tested for the W-025 facility did not produce measurable changes in the HDPE liner properties when irradiated for 120 days with a total dose of 50,000 rads. HDPE geomembranes are manufactured with additives to improve ductility and durability such as carbon black and antioxidants. The literature also indicates that these additives allow higher doses than standard HDPE material alone (Kircher and Bowman 1964). The literature indicates that thin films (i.e., 0.002 in.) of different types of HDPE material alone can become brittle when irradiated at doses between 4,400,000 and 78,000,000 rads. Studies performed using polymer materials show that properties typically begin to change at a total radiation dose of between 1,000,000 and 10,000,000 rads (Koerner et al. 1990).

The landfill and evaporation pond HDPE geomembrane liners are expected to receive a dose from the leachate of 12,000 and 100,000 rads, respectively. This is a conservatively high dose since it assumes that concentrations of radionuclides are constant in the leachate over the 15-year operational life of the landfill. Even though conservatively high, the total dose is below the dose found in other studies (i.e., 1,000,000 rads) that may affect the properties of the geomembrane.

2.2.2 Geosynthetic Clay and Soil Bentonite Liners

Based on review of the published studies listed in Section 6 (Bibliography), SBL and GCL perform well unless exposed to high concentrations of divalent cations, very acidic or basic solutions, or solutions with a low dielectric constant (such as gasoline). The leachate expected at the ICDF will have a pH of 8, slightly above neutral. The studies further demonstrate that, when confined, as is the case in the ICDF landfill, or pre-hydrated, SBLs and GCLs will perform well when exposed to high divalent cation concentrations.

Several studies were found that evaluated the impact of SBL permeability with various organic and inorganic materials. The majority of them used very concentrated compounds, which is not the typical composition of landfill leachates and when compared with ICDF leachate exceeded concentrations by as much as an order of magnitude. One study was found that addressed the issue of when leachate constituent concentrations impact SBL permeability. For this study, four different types of organic compounds were used as permeants. They included methanol, acetic acid, heptane, and trichloroethylene (TCE). The results indicate that soil permeability was not affected by methanol until a concentration of 80% by volume was used. The acetic acid actually reduced the soil permeability due to dissolution and reprecipitation of the soil. Heptane and TCE had no effect on permeability when used up to their solubility limit in water. However, when used in pure form, they increased the soil permeability significantly (250 to 1,000 times). In addition to the concentration of the permeant used, changes in hydraulic permeability are also governed by the mineralogy of the soil (Borders 1986). Although only low concentrations of TCE are predicted in the ICDF leachate, the study demonstrates that high concentrations of organic constituents are required to affect permeability.

No studies were identified that considered the long-term effects of radiation on the physical properties of the SBL or GCL materials. Since long-term studies cannot be conducted, conservative radiation limitations have been employed. Low-permeability soils have been used at multiple DOE facilities containing radioactive waste. The only potential adverse reaction that could occur with the SBL or GCL would be high heat that could dry out these materials, however, it is anticipated that the radioactive material placed in the ICDF will not generate any thermal gradients across the liner system.

The concentration of organic material is expected to be approximately 70 mg/L. This is significantly below the concentration of a highly concentrated solution so it will not increase the permeability of the SBL and GCL. The amount of radioactivity will be low in the ICDF landfill waste and will not generate a significant amount of heat that can desiccate the compacted clay. Additionally, the operations layer will provide a 3-ft buffer between the liner system and waste.

2.3 Manufacturers' Data

2.3.1 HDPE Geomembrane

The manufacturers of the geosynthetic products proposed for the ICDF landfill have published maximum allowable concentrations of various chemical compounds that can contact the HDPE geomembrane without adversely affecting its performance. The most recent recommended maximum concentrations of chemicals were obtained from the manufacturer. A list of the manufacturers' maximum allowable concentrations for specific leachate constituents on HDPE material is provided in Appendix C. In addition, the effects of radiation exposure with respect to the geomembrane physical properties are also presented.

2.3.2 Geosynthetic Clay and SBLs

The GCL underlying the geomembrane in the ICDF landfill and evaporation pond liner consists of processed sodium bentonite clay sandwiched between two geotextile fabrics. The SBL underlying the geosynthetic liners also consists of 5% by weight of processed bentonite amendment. Sodium bentonite is an ore comprised mainly of the montmorillonite clay mineral with broad, flat, negatively charged platelets that attract water hydrating the bentonite. The swelling provides the ability to seal around penetrations, giving the GCL its self-healing properties. A GCL product with Volclay® type sodium bentonite manufactured by CETCO will be installed in the landfill and evaporation pond.

The GCL manufacturer allows the use of GCL with few restrictions on maximum chemical concentrations. The manufacturer does recommend that treated bentonite should be used when directly exposed to liquids with high concentration of salts (divalent cations) such as in seawater (CETCO 2001). The concentration of salts in typical seawater is on the order of 35,000 mg/L (USGS 1989). The ICDF total inorganic leachate concentration is on the order of 17,000 mg/L, approximately 2 times lower than that of seawater. The same compatibility limitation is found in the literature as described in Section 2.1.2. The bentonite added to the soil for the bentonite liner will have the same limitation, however, to a lesser extend since only a small percentage (i.e., 5%) is comprised of bentonite. Based on this assessment, the exposed salts in the brackish leachate will be compatible with the GCL and SBL underlying the geomembrane. Notably, this assumes that the overlying HDPE geomembranes must leak before leachate can come in contact with the GCL or SBL.

3. WASTE ACCEPTANCE CRITERIA

3.1 Landfill

Individual constituents in the ICDF landfill design inventory were evaluated to determine maximum allowable ICDF landfill waste concentrations, that if placed in the landfill would generate leachate compatible with the liner system. Many of the individual design inventory constituents have not been included in the composition of leachate used for published compatibility studies. However, the constituents used in the published studies are in similar chemical groups as the constituents in the ICDF design inventory and therefore, would react similarly with the liner materials. Moreover, the use of general chemical categories rather than individual constituents provide a worst-case scenario due to possible synergistic effects of mixed compounds.

Table 3-1 provides the recommended maximum concentration of chemical categories that, if in the landfill leachate, may be incompatible with the polymeric or earthen material comprised of the ICDF landfill and evaporation pond liner systems. These limits are based on review of the published liner compatibility studies and manufacturers' recommendations. The maximum allowable concentration for HDPE geomembrane, GCL, and SBL were compared to determine the highest acceptable value. The lowest of all three values was selected as the suggested maximum concentration. The concentrations based on the design inventory of waste constituents are also provided in Table 3-1. Where available, the recommended maximum allowable concentration with regard to liner compatibility for individual constituents is provided in Tables D-1, D-2, and D-3 in Appendix D for specific organic, inorganic, and radionuclide constituents, respectively.

Table 3-1. Maximum allowable concentrations in leachate by chemical category.

Chemical Category	Compatible Concentration for HDPE	Compatible Concentration for GCL and Clay	Suggested ICDF Maximum Concentration or Value	Design Inventory Concentration Dose or Value
Organics	500,000[a] mg/L	500,000[b] mg/L	500,000 mg/L	70 mg/L
Acids and Bases	750,000[a] mg/L	500,000[b] mg/L	500,000 mg/L	0[d] mg/L
Inorganic	500,000[a] mg/L	500,000[b] mg/L	500,000 mg/L	17,100 mg/L
Dissolved Salts	No Limit	35,000 mg/L	35,000 mg/L	8,000 mg/L[c]
Strong Oxidizers	1,000 mg/L	No limit	1,000 mg/L	0[d] mg/L
Radionuclides	1,000,000[b] rads	No limit	1,000,000 rads	12,000 rads (15 yr) 800,000 rads (1000 yr)
pH	0.5 - 13.0[a]	0.5 - 13.0	0.5 - 13.0	8.0

a. Based on the manufacturers' maximum concentration of the list of constituents tested by the manufacturers. The manufacturers' recommendations are provided in Appendix C.

b. Based on reported literature values.

c. Based on the maximum sodium concentration determined in the Geochemical Evaluation.

d. Strong acids, bases, or oxidizing compounds were not reported in the design inventory.

The concentration and exposure limits in Table 3-1 provide Waste Acceptance Criteria (WAC) for chemical categories. These values can be used as a general guide to determine WAC if individual constituents in the leachate are lower than the limits provided in Appendix D.

The maximum allowable activity concentration of individual radionuclides was determined based on a maximum allowable dose of 1,000,000 rads. The calculated values are provided in Table C-3 in Appendix C. Based on radiation absorbed dose, the mechanical properties of the HDPE liner are not expected to be degraded below acceptable levels.

3.2 Evaporation Pond

The evaporation pond liner system will be comprised of HDPE geomembrane and GCL similar to the landfill liner system underlying a sacrificial geomembrane. The evaporation pond will contain leachate from the landfill and waste liquids from other CERCLA investigations (i.e., well purge water) or remediation tasks. Organics and inorganics in the leachate compatible with the landfill liner will also be compatible with the evaporation pond liner materials since they will be comprised of the same material. Leachate in the evaporation pond from the landfill will also have less concentration of contaminants than when originally in the landfill due to added make-up water, and precipitation.

The maximum allowable concentration of an individual radionuclide and WAC design ratios for the evaporation pond liner is provided in Appendix E. The maximum concentration was developed in the same manner as the landfill maximum allowable concentration assuming a maximum absorption dose of 1,000,000 rads. The allowable concentrations are less than in the landfill due to a greater depth of liquid in the evaporation pond resulting in a higher dose rate.

Waste liquids from other sources in the evaporation pond should not exceed the maximum allowable concentrations of liquids by chemical category in Table 3-1. The recommended maximum allowable concentrations with regard to liner compatibility for individual constituents are provided in Table D-4 of Appendix D.

4. CONCLUSIONS

An extensive literature review was performed to evaluate the compatibility of the ICDF landfill and evaporation pond liner materials with the expected leachate composition. Compatibility tests performed at similar sites have shown that HDPE geomembranes can be exposed to high doses of radiation without damage and are compatible with leachate from hazardous waste landfills. Liner manufacturers have also performed compatibility tests using numerous organic and inorganic chemicals, usually in a pure solution, to determine maximum allowable limits. Based on review of literature, the expected leachate concentrations will have no effect on the performance of the ICDF liner system based on the available literature.

The maximum recommended concentration of chemical categories was provided to supply the WACs regarding liner compatibility. General chemical categories rather than individual constituents provide a worst-case scenario due to possible synergistic effects of mixed compounds. However, to provide numerical WAC, individual constituents in the ICDF design inventory were evaluated to determine maximum allowable ICDF landfill waste soil concentrations with regard to liner compatibility. The maximum allowable ICDF landfill waste concentrations are provided in Appendix D.

Samples of 60-mil-thick HDPE geomembrane were irradiated with a total radiation dose of 16,000,000 and 37,000,000 rads for the Hanford Grout facility. The dose rate was 740,000 rads per hour for a total time of 50 hours. These doses showed decreases in the liner's break strength and break elongation due to radiation-induced cross-linking for the polymer chains, decreasing the plasticity of the liner. At the Hanford project W-025 landfill, the HDPE liner showed only a slight reduction in mechanical properties including tensile strength and elasticity after it was irradiated to 50,000 rads for 120 days while submerged in leachate. The literature indicates that the mechanical properties of polymeric materials begin to change at approximately 1,000,000 rads. The geomembrane can accommodate a slight reduction in its strength properties without creating defects that result in leaks since the actual properties are more robust than the design properties (i.e., thickness). Therefore, a maximum radiation dose of 1,000,000 rads for the landfill and evaporation pond liner system during their respective service life is recommended.

The manufacturer for the ICDF geomembrane recommends that leachate have a pH between 0.5 and 13 pH units. Recommended manufacturers' limits for strong oxidizers are 1,000 to 500,000 mg/L and metals, salts, and nutrients of 500,000 mg/L. The permeability of the bentonite used in the GCL and SBL may increase if permeated with leachate having a salt ion concentration. Therefore, a maximum inorganic salt concentration of 35,000 mg/L is recommended as a conservative upper limit. These limits are far above the concentrations expected in the leachate from the ICDF landfill and waste liquids in the evaporation pond. They will be used to determine the maximum allowable concentrations in the waste soil and liquids that if placed in the ICDF landfill or evaporation would not cause significant degradation of the liner system.

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GSI Job No. G-3379
Issued: 31 December 2009

ATTACHMENT V.8
ENGINEERING REPORT FOR
NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.8.4

Settlement Analysis

Issued: 31 December 2009

GSI ENVIRONMENTAL

APPENDIX V.8.4
SETTLEMENT ANALYSIS
PERMIT UNIT 16 LANDFILL
CHOCOLATE BAYOU FACILITY
BRAZORIA COUNTY, TEXAS

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

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INTENDED FOR PERMITTING PURPOSES ONLY

OBJECTIVE

Estimate the amount of total settlement and post-settlement floor grades, and evaluate its impact on leachate flow and the liner system for the proposed Permit Unit 16 cells.

PROPOSED DESIGN

Based on a review of the design grades, the most critical section was assumed to be along the primary leachate collection pipe path. For the purposes of this analysis, a conservative generalized subsurface stratigraphy has been developed based on available laboratory test data and field data from boring logs. The subsurface stratigraphy was grouped in five strata, as shown in Table 1.

Table 1. Subsurface Stratigraphy Interpretation

Stratum	Description
I	Clay/Silty Clay (CH/CL)
II	Silty, fine Sand (SM)
III	Silty Clay (CL)
IV	Silty, fine Sand(SM)
V	Grey Clay (CH)

DESIGN METHOD AND PARAMETERS

Based on the composition of the subsurface soils, the estimated total settlement includes consolidation settlement for the clay layer (stratum I, III, and V), and elastic settlement for the silty/fine sand layers (stratum II and IV).

Silty Sand Settlement:

Immediate Settlement of Silty Sand Layers

The following equation is used for calculating the immediate (elastic) settlement, S_e, of the in-situ sands (see Reference 4):

$$S_e = \Delta P\left(\frac{H}{D}\right) \qquad (3)$$

Where S_e = Immediate (elastic) settlement
ΔP = Pressure increase due to overburden and decrease due to subgrade excavation,
H = Layer thickness,
D = Constrained modulus,

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$$D = \frac{E(1-\upsilon)}{(1+\upsilon)(1-2\upsilon)}$$

E = Elastic (Young's modulus), and
υ = Poisson's ratio

Clay Settlement:

The following equation is used for calculating the settlement due to primary consolidation, S_c, of the in-situ overconsolidated clay below the groundwater level (see References 1, 2 and 3 for derivations):

If $P_0 + \Delta P \leq P_c$:

$$S_c = C_{r\varepsilon} H \log\left(\frac{P_0 + \Delta P}{P_0}\right) \tag{4}$$

Where
P_0 = Initial average effective overburden pressure for the layer of concern
ΔP = Pressure increase due to overburden
P_c = Preconsolidation pressure
$C_{r\varepsilon}$ = Modified Recompression index
H = Layer thickness

Soil Parameters:

Table 2. Soil Parameters

	Thickness (ft)	Unit Weight (pcf)
Final Cover System	-	-
Protective cover soil	1.5	110*
Compacted Clay liner	2	125*
Base Liner System	-	-
Drainage layer	1	115*
Compacted clay base liner	3	125*
Subsurface	-	-
Stratum I_Clay/Silty Clay	50	118**
Stratum II_Silty Sand	40	120**
Stratum III_Silty Clay	8	124**
Stratum IV_Silty Sand	36	120**
Stratum V_Grey Clay	100	124*

Note: (*) Estimated/ (**) Average values based on Reference 4.

Waste Parameters:

Unit Weight:

γ_{waste} = 65 pcf (estimated)

Primary Consolidation Settlement Parameters (see Reference 5) :

Table 3. Consolidation Settlement Parameters

Layer	Modified Recompression Index	Reference
Stratum I_Clay/Silty Clay	0.013	Golder Lab.
Stratum III_Silty Clay	0.013	Estimate
Stratum V_Grey Clay	0.026	Estimate

Subgrade Elastic Parameters (see Reference 2):

Table 4. Elastic Parameters*

Layer	Modulus of Elasticity, Es (psi)	Poisson's Ratio, υ
Stratum II _Silty Sand	10,000	0.15
Stratum IV _Silty Sand	10,000	0.15

- Estimated from Ref. 2, Table 3.9.

Settlement Considerations:

- For the settlement calculation, it is assumed that the entire block of waste is instantaneously applied above the liner. This assumption is conservative, as it will induce greater settlement and potentially greater strain on the liner system. In reality, however, load would be applied incrementally as waste is placed gradually during the active life of the landfill. In addition, the analysis assumes one-dimensional loading. This assumption is conservative and may overestimate settlement in the deeper soil layers.
- The static water level elevation was conservatively assumed to be at elevation 5.5 ft. msl, based on a potentiometric surface contour map generated from data collected on 1/17/2000. Potentiometric surfaces contour maps were developed by Groundwater Services, Inc. (drawing issued on 2/20/2001).
- Secondary compression begins at the end of primary consolidation (i.e., after the complete dissipation of excess pore water pressure). For inorganic clays, settlement due to secondary compression is typically very small, thus of less engineering significance (Ref 4). Since conservative assumptions regarding soil parameters and loading conditions are used in the

analysis, secondary compression will be ignored in this analysis.

CALCULATIONS AND RESULTS

A spreadsheet program was used for the settlement calculations. Three points were selected along the leachate trench centerline. Point A is located at the upslope end of the centerline pipe (toe of the sideslope), point B is located at the middle of the centerline pipe length and point C is located at the edge of the sump crest. The settlement results and liner grade changes due to differential settlement are summarized in Table 5 and depicted in Figure 1.

Table 5. Settlement Summary

	Along leachate trench centerline			
Elevations and Distance	Point A to Point B		Point B to Point C	
Proposed Top of Waste Contour (ft)=	20.9	20.9	20.9	20.9
Proposed Top of Liner (ft)=	0.2	-0.4	-0.4	-1.0
Proposed Excavation (ft) =	-2.8	-3.4	-3.4	-4.0
Length (ft)=	60.1		60.1	
Distance from Point A (ft) =	0.0	60.1	60.1	120.1
Pressure increased after final cover completion				
ΔP (psf) =	2,154	2,193	2,193	2,232
ΔP (psi) =	15.0	15.2	15.2	15.5
I -Clay/Silty clay Layer				
Effective pressure for the clay layer, Po (psf) =	1,788	1,788	1,788	1,788
Primary Settlement (ft) =	0.22	0.23	0.23	0.23
II - Silty Sand Layer (Elastic Settlement Results)				
Stratum II -Silty Sand (ft) =	0.06	0.06	0.06	0.06
III -Silty clay Layer				
Effective pressure for the clay layer, Po (psf) =	5,721	5,721	5,721	5,721
Primary Settlement (ft) =	0.01	0.01	0.01	0.01
IV - Silty Sand Layer (Elastic Settlement Results)				
Stratum IV- Silty Sand (ft) =	0.05	0.05	0.05	0.05
v -Grey clay Layer				
Effective pressure for the clay layer, Po (psf) =	11,121	11,121	11,121	11,121
Primary Settlement (ft) =	0.20	0.20	0.20	0.21
Total settlement (ft) =	0.55	0.55	0.55	0.56
Liner Slopes	Point A to Point B		Point B to Point C	
designed liner slope =	1.00%		1.00%	
post-settlement of liner slope =	1.01%		1.01%	

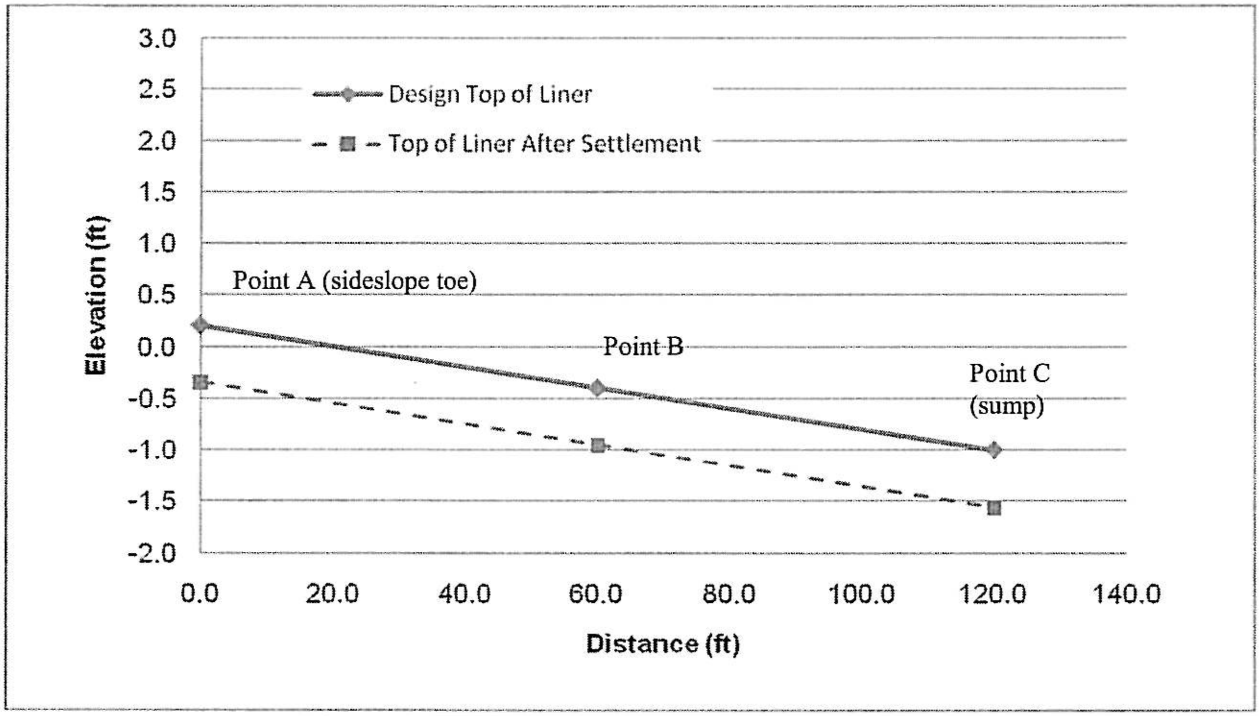

Figure 1. Pre and Post-Settlement Liner Profile

CONCLUSIONS

Review of the settlement results show that the maximum settlement is 0.56 ft. The post-settlement slope along the leachate collection pipe line is 1.01%. Both the total settlement and differential settlement are considered acceptable based on TCEQ handbook and engineering judgment.

REFERENCE

1. Xuede Qian, Robert Koerner, and Donald H. Gray, *Geotechnical Aspects of Landfill Design and Construction*, Prentice Hall, 2001.
2. Das, *Principles of Geotechnical Engineering*, 4th Ed., PWS Publishing Co. 1998.
3. Robert Holtz, William Kovacs, *An Introduction to Geotechnical Engineering*, Prentice Hall, 1981.
4. Bowles, (1988) *Foundation Analysis and Design*, McGraw-Hill, Inc.
5. Geology Report for Monsanto Chocolate Bayou Proposed Landfill Area, RCRA Part 3 Permit Application prepared by S&B Engineers, Inc. dated 1985.

GSI Job No. G-3379
Issued: 31 December 2009

ATTACHMENT V.8
ENGINEERING REPORT FOR
NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.8.5

Stability Analysis

Issued: 31 December 2009

GSI ENVIRONMENTAL

APPENDIX V.8.5
STABILITY ANALYSES
PERMIT UNIT 16 LANDFILL
CHOCOLATE BAYOU FACILITY
BRAZORIA COUNTY, TEXAS

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

Prepared by:

Golder Associates

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Texas Registration Number: F-2578

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APPENDIX V.8.5
STABILITY ANALYSES
PERMIT UNIT 16 LANDFILL
CHOCOLATE BAYOU FACILITY
BRAZORIA COUNTY, TEXAS

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

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ATTACHMENT A
EXCAVATION STABILITY

Golder Associates	Subject: EXCAVATION STABILITY		
	Job No.: 083-94322 Ref: Proposed Permit Unit 6, Alvin, TX	Made by: LFG Checked: PCM Reviewed: JJF	Date: 9/8/2009 Sheet: 1 of 5

OBJECTIVE: Evaluate the factor of safety against failure of the excavated slopes.

GIVEN: Based on a review of the design grades, the most critical proposed excavation cross-section consists of a 2.5H:1V slope from approximate elevation 21 ft to the toe with approximate elevation of -5 ft (sump area).

SOIL CONDITIONS

For the purposes of this analysis, a conservatively generalized subsurface stratigraphy has been developed based on available laboratory test data and field data from borings logs. The subsurface stratigraphy was grouped in five strata, as shown in Table 1.

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Table 1 - Subsurface Stratigraphy Interpretation

Stratum	Description
I	Clay/ Silty Clay
II	Silty Sand
III	Silty Clay
IV	Silty Sand
V	Grey Clay

Based on a review of available geotechnical data for the site soils, the Clay/ Silty Clay layers (Stratum I, III and V) were conservatively assumed to have a cohesion of 1,000 psf and the silty sand layers (stratum II and IV) were conservatively assumed to have a friction angle of 25 degrees and zero cohesion.

Static water level was conservatively assumed at elevation 5.5 ft. msl, based on potentiometric surface contour map generated from data collected on 1/17/2000. The potentiometric surfaces contour maps were developed by Groundwater Services, Inc. (drawing issued on 2/20/2001).

METHOD: Use SLIDE v.5.021 to analyze excavation stability.

RESULTS: SLIDE output files attached as Pages 2-6.

The factor of safety against instability for the slope analyzed is 1.93. This value is considered acceptable.

CONCLUSION: Using a generalized cross-section, shear strength parameters conservatively estimated, and correlations to field data, the analysis indicates that the excavated slopes will be stable.

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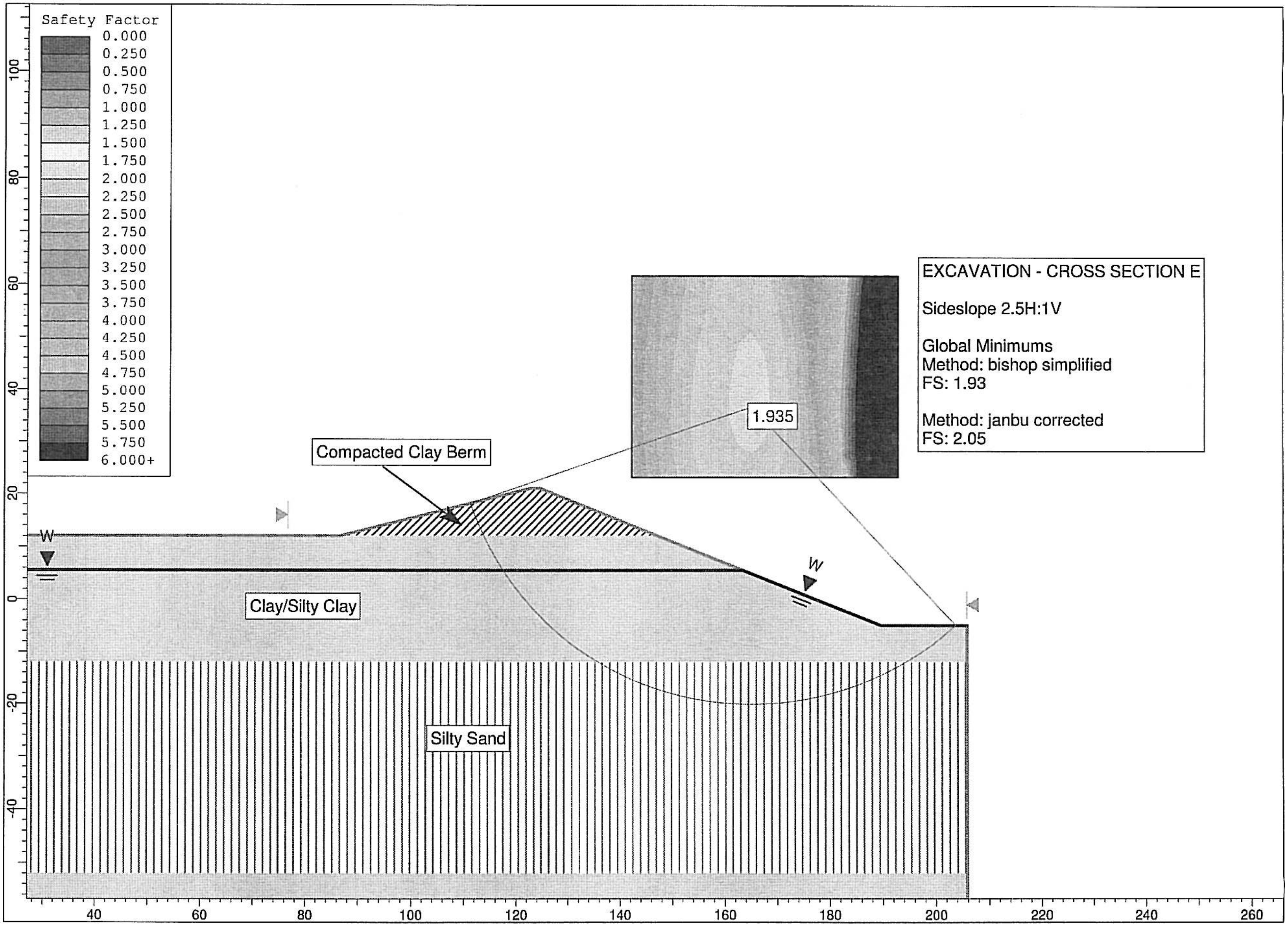

Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
EXCAVATION - CROSS SECTION E
Sideslope 2.5H:1V
Global Minimums
Method: bishop simplified
FS: 1.93
Method: janbu corrected
FS: 2.05
1.935
Compacted Clay Berm
Clay/Silty Clay
Silty Sand
W
W

2/5

Slide Analysis Information

Document Name

File Name: Excavation_Section E_North to South_C.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu corrected

Number of slices: 50
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Compacted Clay Berm
Strength Type: Undrained
Unit Weight: 125 lb/ft3
Cohesion Type: Constant
Cohesion: 1000 psf
Water Surface: None

Material: Clay/Silty Clay
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 87 lb/ft3
Saturated Unit Weight: 118 lb/ft3
Cohesion: 1000 psf
Friction Angle: 0 degrees

Water Surface: Water Table
Hu value: automatically calculated

Material: Silty Sand
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 120 lb/ft3
Saturated Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Hu value: automatically calculated

Global Minimums

Method: bishop simplified
FS: 1.935140
Center: 164.996, 36.586
Radius: 56.785
Left Slip Surface Endpoint: 111.285, 18.155
Right Slip Surface Endpoint: 203.663, -5.000
Resisting Moment=5.191e+006 lb-ft
Driving Moment=2.68249e+006 lb-ft

Method: janbu corrected
FS: 2.048170
Center: 164.996, 42.356
Radius: 61.093
Left Slip Surface Endpoint: 109.136, 17.617
Right Slip Surface Endpoint: 203.592, -5.000
Resisting Horizontal Force=79311.9 lb
Driving Horizontal Force=38723.3 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 4851
Number of Invalid Surfaces: 0

Method: janbu corrected
Number of Valid Surfaces: 4425
Number of Invalid Surfaces: 426
Error Codes:
Error Code -108 reported for 272 surfaces
Error Code -111 reported for 154 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment
or total driving force < 0.1. This is to
limit the calculation of extremely high safety
factors if the driving force is very small
(0.1 is an arbitrary number).

-111 = safety factor equation did not converge

List of All Coordinates

Search Grid

142.243	23.122
192.805	23.122
192.805	61.591
142.243	61.591

Material Boundary

0.000	-12.000
205.745	-12.000

Material Boundary

0.000	-52.000
205.745	-52.000

Material Boundary

0.000	-60.000
205.745	-60.000

Material Boundary

0.000	-96.000
205.745	-96.000

Material Boundary

86.667	12.000
147.089	12.000

External Boundary

205.745	-5.000
189.589	-5.000
179.575	-0.994
147.089	12.000
124.589	21.000
122.667	21.000
86.667	12.000
0.000	12.000
0.000	-12.000
0.000	-52.000
0.000	-60.000
0.000	-96.000
-0.000	-113.000
205.745	-113.000
205.745	-96.000
205.745	-60.000
205.745	-52.000
205.745	-12.000

Water Table

0.000	5.500
163.339	5.500
189.589	-5.000
205.745	-5.000

ATTACHMENT B
FINAL COVER STABILITY

Golder Associates	Subject: Final Cover Stability		
	Job No.: 083-94322 Ref: Proposed Permit Unit 6, Alvin, TX	Made by: LFG Checked: PCM Reviewed: JBF	Date: 9/1/2009 Sheet: 1 of 2

OBJECTIVE: To investigate the stability of the final cover lining system.

GIVEN: 1.) Maximum final cover slopes are at 20H:1V (S= 5%).

2.) Length of maximum slope is conservatively assumed to be 69 ft.

ASSUMPTIONS: Proposed final cover liner system consists of (from top to bottom):

18-inch thick soil cover
Double-sided geocomposite
40-mil LLDPE textured geomembrane
24-inch thick compacted clay cap liner (CCL)

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The geocomposite drainage layer is adequate to prevent the buildup of excess pore water pressures at the soil/geocomposite/geomembrane interface (see Lateral Drainage Analysis for Final Cover calculation).

Based on a review of available data, the following parameters were assigned to the materials.

	Strength Parameters		Unit Weight (pcf)		
Material	ϕ	c	Moist	Saturated	Reference
Soil cover	28	0	115	132	Estimate--conservative
Soil cover/Geocomposite	28	0	N/A	N/A	Golder*
Geocomposite/Textured Geomembrane	21	0	N/A	N/A	Golder*
Textured Geomembrane/CCL	24	0	N/A	N/A	Golder*

* Based on unpublished testing data for similar materials

Based on the shear strength parameters, the critical interface occurs along the geocomposite/texture geomembrane interface, with a friction angle of 21 degrees.

METHOD: A model was created representing the final cover slopes. A limit equilibrium analysis was performed to determine the minimum factor of safety against a sliding block failure along the critical interface.

RESULTS: Using the Golder Associates interface friction angle database, the critical angle of internal friction was determined to be 21 degrees. The resulting minimum factor of safety was calculated to be 10.7.

CONCLUSION: The final cover slope is found to be stable under the conditions analyzed.

REFERENCES:
Te-Yang Soong and Robert M. Koerner, "Cover Soil Slope Stability Involving Geosynthetic Interfaces," GRI Report #18, Geosynthetic Research Institute, Drexel University, Philadelphia, PA, December 1996.

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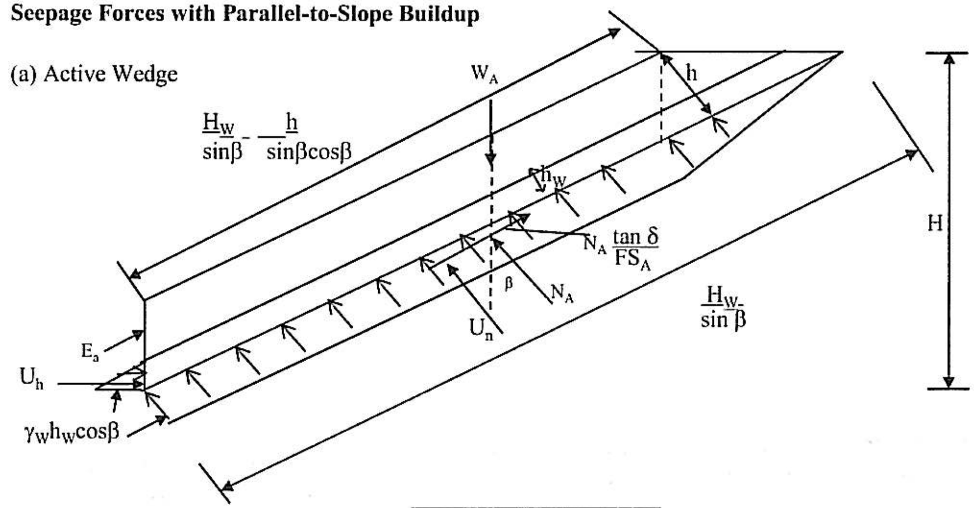
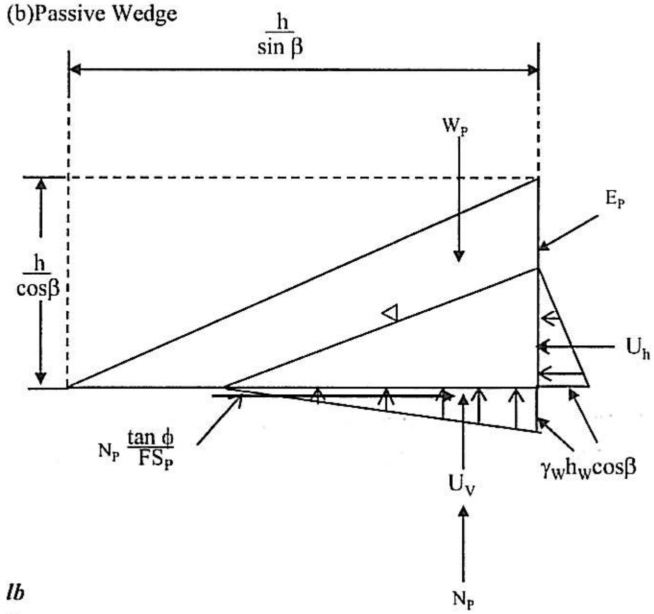
SOIL SLOPE STABILITY ANALYSIS

Seepage Forces with Parallel-to-Slope Buildup

(a) Active Wedge



(b)Passive Wedge



thickness of cover soil =	h =	1.5	ft
cover soil slope angle beneath the geomembrane =	β =	2.9	°
length of slope measured along the geomembrane =	L =	69	ft
vertical height of slope measured from toe =	***H =***	***3.4***	***ft***
depth of water over geomembrane =	hw =	0.00	ft
parallel submergence ratio =	***PSR =***	***0.0***	
dry unit wt. of cover soil =	γ_d =	115	pcf
saturated unit wt. of cover soil =	γ_{sat} =	132	pcf
unit wt. of water =	γ_w =	62.4	pcf
friction angle of cover soil =	φ =	28	°
interface friction at critical interface =	δ =	21	°

Note: numbers in boxes are input values

numbers in italic and bold are calculated

Active Wedge:

W_A	***9308.53***	***lb***
Un	***0.00***	***lb***
Uh	***0.00***	***lb***
N_A	***9296.92***	***lb***

Passive Wedge:

W_p	***2593.97***	***lb***
Uv	***0.00***	***lb***

$$\boxed{FS = \frac{-b+\sqrt{b^2-4ac}}{2a}}$$

FS	***10.7***

a	***464.27***
b	***-4955.88***
c	***94.76***

ATTACHMENT C

DIKE STABILITY

Golder Associates	Subject: Dike Stability		
	Job No.: 083-94322 Ref: Proposed Permit Unit 6, Alvin, TX	Made by: PCM Checked: JBT Reviewed: PCM	Date: 9/1/2009 Sheet: 1 of 8

OBJECTIVE: Evaluate the stability for the perimeter dike.

GIVEN: 1.) The perimeter dike has 4H:1V exterior sideslopes. The toe elevation is approximately 12 ft-msl and the crest elevation is 21 ft-msl;therefore, the maximum dike height is 9 ft.

2.) The following parameters were assigned to the materials based on a review of available geotechnical data for the site soils.

Material	Strength Parameters		Unit Weight (pcf)		Reference
	ϕ (degrees)	c (psf)	Moist	Saturated	
Soils					
Compacted Clay Berm	-	1000	125	N/A	Estimate--Conservative
Stratum I - Silty clay/Clay	-	1000	N/A	120	Estimate--Conservative
Stratum II - Silty sand	25	0	N/A	120	Estimate--Conservative
Stratum III- Silty clay/Clay	-	1000	N/A	120	Estimate--Conservative
Stratum IV - Silty sand	25	0	N/A	120	Estimate--Conservative
Stratum V - Clay	-	1000	N/A	120	Estimate--Conservative

ASSUMPTIONS: 1- Static water level elevation was assumed at elevation 5.5 ft. msl, based on potentiometric surface contour map generated from data collected on 1/17/2000. Potentiometric surfaces contour maps were developed by Groundwater Services, Inc. (drawing issued on 2/20/2001).

METHOD: Limit equilibrium slope stability methods to determine the minimum factor of safety against slope failure. Use SLIDE v.5.021 (Rocscience Inc., Toronto, Canada) to aid analysis.

RESULTS: Circular Failure F.S. = 6.6

ADDITIONAL INFORMATION: <u>Hydrostatic and Hydrodynamic Considerations</u>

The landfill is located within the 100 year floodplain as designated by the Federal Emergency Management Agency. The floodplain elevation is 15.0 ft-msl. The crest elevation of the perimeter dike is 21.0 ft-msl; therefore, the dike crest is at a sufficient elevation to adequately protect the landfill cells from flood waters. Based on floodplain maps and area drainage, the perimeter dike will not be subjected to fast-moving flood waters that would cause scouring of the perimeter dike. Dissipation of the flood waters will be rapid and will not have time to saturate the dike or cause a rapid drawdown failure.

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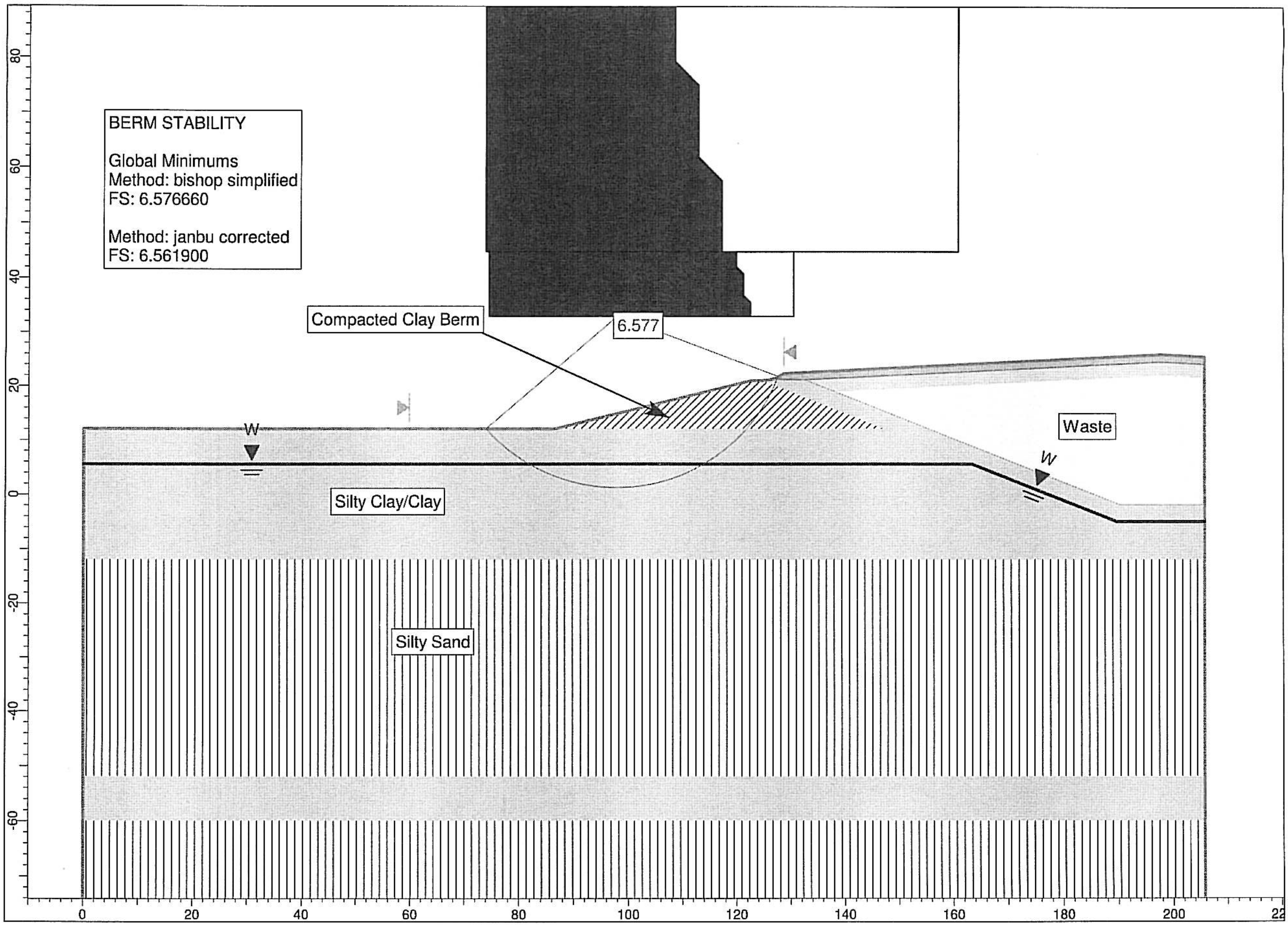
Internal Piping

In order for soil piping to occur within the dike, a hydraulic head is required that can overcome the cohesiveness of the dike soil. It is very unlikely that such a head could develop in the landfill cell; it would require failure of the double liner system and significant leachate levels within the waste. Therefore, piping is not a concern.

Erosion

Erosion of the perimeter dike is not expected to be an issue. Based on the USDA NRCS Web Soil Survey for Brazoria County, Texas, the landfill site consists of Bacliff Clay soils, which are rated to have a very low potential for erosion. In addition, the perimeter dikes will have exterior slopes of 4H:1V. These slopes are flatter than the 3H:1V dike slopes used for Landfill Unit 2 that have not experienced problems with erosion. Exterior dike slopes will also be vegetated to further reduce the potential for erosion. Based on this information, significant erosion of the perimeter dike is not expected.

CONCLUSION: Using parameters that are conservatively estimated or based on test results for site soils, the analysis indicates that the perimeter dike will be stable.


BERM STABILITY
Global Minimums
Method: bishop simplified
FS: 6.576660
Method: janbu corrected
FS: 6.561900
Compacted Clay Berm
6.577
Waste
W
W
Silty Clay/Clay
Silty Sand
80
60
40
20
0
-20
-40
-60
0
20
40
60
80
100
120
140
160
180
200
22

3/8

Slide Analysis Information

Document Name

File Name: Berm Stability.sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Right to Left
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified
Janbu corrected

Number of slices: 30
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Waste
Strength Type: Shear Normal function
Unit Weight: 65 lb/ft3
Water Surface: None

Material: GCL/GC
Strength Type: Mohr-Coulomb
Unit Weight: 0.1 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees
Water Surface: None

Material: Compacted Clay Berm

Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 1000 psf
Friction Angle: 0 degrees
Water Surface: None

Material: Silty Clay/Clay
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 1000 psf
Friction Angle: 0 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Silty Sand
Strength Type: Mohr-Coulomb
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Hu value: automatically calculated

Material: Compacted Clay Liner
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 1000 psf
Friction Angle: 0 degrees
Water Surface: None

Material: GC/TGM- Final Cover
Strength Type: Mohr-Coulomb
Unit Weight: 0.1 lb/ft3
Cohesion: 0 psf
Friction Angle: 21 degrees
Water Surface: None

Material: Soil Cover - Final Cover
Strength Type: Mohr-Coulomb
Unsaturated Unit Weight: 115 lb/ft3
Saturated Unit Weight: 132 lb/ft3
Cohesion: 0 psf
Friction Angle: 28 degrees
Water Surface: None

Global Minimums

Method: bishop simplified
FS: 6.576660
Center: 97.966, 32.829
Radius: 31.706
Left Slip Surface Endpoint: 74.062, 12.000
Right Slip Surface Endpoint: 127.662, 21.719
Resisting Moment=2.05561e+006 lb-ft
Driving Moment=312562 lb-ft

Method: janbu corrected
FS: 6.561900

Center: 96.669, 32.829
Radius: 32.890
Left Slip Surface Endpoint: 71.215, 12.000
Right Slip Surface Endpoint: 127.616, 21.692
Resisting Horizontal Force=61021.2 lb
Driving Horizontal Force=9299.32 lb

Valid / Invalid Surfaces

Method: bishop simplified
Number of Valid Surfaces: 5752
Number of Invalid Surfaces: 3939
Error Codes:
Error Code -106 reported for 90 surfaces
Error Code -108 reported for 329 surfaces
Error Code -1000 reported for 3520 surfaces

Method: janbu corrected
Number of Valid Surfaces: 5541
Number of Invalid Surfaces: 4150
Error Codes:
Error Code -106 reported for 90 surfaces
Error Code -108 reported for 540 surfaces
Error Code -1000 reported for 3520 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than
0.0001 * (maximum horizontal extent of soil region).
This limitation is imposed to avoid numerical errors
which may result from too many slices, or too
small a slip region.

-108 = Total driving moment
or total driving force < 0.1. This is to
limit the calculation of extremely high safety
factors if the driving force is very small
(0.1 is an arbitrary number).

-1000 = No valid slip surfaces are generated
at a grid center. Unable to draw a surface.

List of All Coordinates

Search Grid

74.048	44.678
160.755	44.678
160.755	131.385
74.048	131.385

Search Grid

74.610	32.829
130.406	32.829

130.406	44.678
74.610	44.678

Material Boundary

197.667	21.876
205.745	21.472

Material Boundary

137.942	18.890
138.181	18.902
197.667	21.876

Material Boundary

0.000	-12.000
205.745	-12.000

Material Boundary

0.000	-52.000
205.745	-52.000

Material Boundary

0.000	-60.000
205.745	-60.000

Material Boundary

0.000	-96.000
205.745	-96.000

Material Boundary

86.667	12.000
147.089	12.000

Material Boundary

127.088	21.386
132.657	21.200
197.667	24.450
205.745	24.046

Material Boundary

126.049	21.100
132.667	21.000
132.906	21.012
197.667	24.250
205.745	23.846

Material Boundary

124.589	21.000
147.089	12.000
163.339	5.500
189.589	-5.000
205.745	-5.000

Material Boundary

132.667	21.000
137.942	18.890
182.667	1.000

190.167	-2.000
205.167	-2.000
205.745	-1.769

Material Boundary

126.049	21.100
132.686	21.100
132.906	21.012
138.181	18.902
182.704	1.093
190.186	-1.900
205.148	-1.900
205.745	-1.661

External Boundary

205.745	-113.000
205.745	-96.000
205.745	-60.000
205.745	-52.000
205.745	-12.000
205.745	-5.000
205.745	-1.769
205.745	-1.661
205.745	21.472
205.745	23.846
205.745	24.046
205.745	25.348
197.667	25.752
128.667	22.302
127.088	21.386
126.049	21.100
124.607	21.000
124.589	21.000
122.667	21.000
86.667	12.000
0.000	12.000
0.000	-12.000
0.000	-52.000
0.000	-60.000
0.000	-96.000
-0.000	-113.000

Water Table

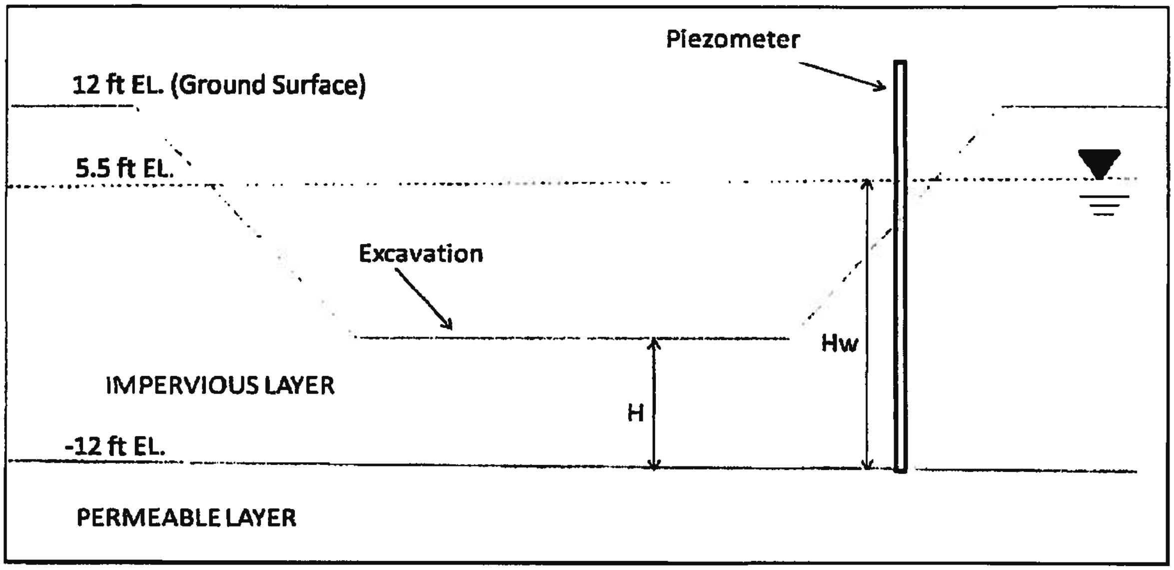
0.000	5.500
163.339	5.500
189.589	-5.000
205.745	-5.000

ATTACHMENT D
LINER UPLIFT ANALYSIS

Golder Associates	SUBJECT:	Liner Uplift Analysis		
	Job No. 083-94322	Made By LFG	Date 9/24/2009	
	Ref. Proposed Permit Unit 16, Alvin, TX	Checked PCM	Sheet 1 of 3	
		Reviewed JBE		

OBJECTIVE: Evaluate the factor safety against uplift for the liner system at any time during construction and filling.

GEOMETRY:



GIVEN: The worst-case location is where the difference between potentiometric elevation and the design excavation grade is the greatest. Based on a review of the design grades, the worst-case location is considered to be at the bottom of the sump. Additionally, the floor of the cell was evaluated.

SOIL CONDITIONS

For the purposes of this analysis, a conservatively generalized subsurface stratigraphy has been developed based on available laboratory test data and field data from borings logs. The subsurface stratigraphy was grouped in five strata, as shown in Table 1.

STATE OF TEXAS
12/30/09
P. CHRIS MARSHALL
91893
LICENSED
PROFESSIONAL ENGINEER
P. Chris Marshall
Sheets 1-3
GOLDER ASSOCIATES INC.
F-2578

Table 1 - Subsurface Stratigraphy Interpretation

Stratum	Description	
I	Clay/ Silty Clay	(Impervious layer)
II	Silty Sand	(Permeable layer)
III	Silty Clay	
IV	Silty Sand	
V	Grey Clay	

ASSUMPTIONS: 1) The Clay/Silty Clay layer (Stratum I) acts as an impervious layer and limits the flow of water up from the Silty Sand layer (Stratum II) below it.

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SUBJECT:	**Liner Uplift Analysis**				
Job No.	083-94322	Made By	LFG	Date	9/24/2009
Ref.	Proposed Permit Unit 16, Alvin, TX	Checked	PCM	Sheet	2 of 3
		Reviewed	JBF		

ASSUMPTIONS Cont.:

2) Soil Parameters

	Short-term Condition Thickness (ft)	Long-term Condition Thickness (ft)	Unit Weight (pcf)	Unit Weight References
Final Cover	0	3.5	110	Conservatively Estimated
Waste	0	18	65	Conservatively Estimated
Drainage layer	0	1	115	Conservatively Estimated
Compacted Clay Liner	0	3	125	Conservatively Estimated
Stratum I (1) at the sump	7	7	118	Average values based on ref. 2
Stratum I (2) at the floor	10	10		

Notes: (1) - Stratum I information was conservatively based on boring log SB12 (see reference 2). The thickness of the layer is 24 ft, however after excavation is completed the thickness will be 7ft. Ground surface elevation is at approximate 12 ft.

(2) - The floor was conservatively assumed to be entirely at elevation -2 ft.

3) Based on potentiometric surface contour maps for 2000, the seasonal highest water table was assumed at elevation 5.5 ft msl. (see reference 3). The contour map was generated from data collected on 1/17/2000.

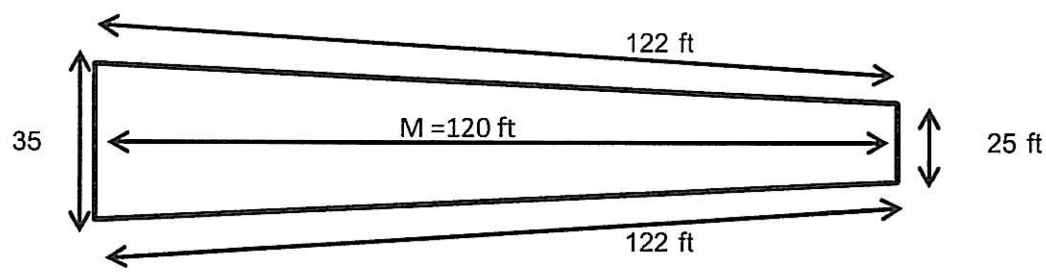
Piezometric head, H_w (ft) = 17.50

4) γ_w = 62.4 pcf

5) Stratum I (Clay/Silty Clay) cohesion = 1000 pcf, value conservatively estimated.

6) Base of Sump dimensions: Length (ft) = 11 Width (ft) = 15

7) Floor Dimensions:



Golder Associates	SUBJECT:		Liner Uplift Analysis			
	Job No.	083-94322	Made By	LFG	Date	9/24/2009
	Ref.	Proposed Permit Unit 16, Alvin, TX	Checked	PCM	Sheet	3 of 3
			Reviewed	JBF		

CALCULATIONS:

$$\text{Factor Safety} = \frac{\gamma * H * A + S}{\gamma_w * H_w * A}$$

Where : γ = Unit weight of soil acting against uplift pressure, pcf

H = Thickness of soil acting against uplift pressure, ft

A = Area of the sump base, ft^2

S = Shear force on the sides of the soil, lbf

S = c * failure surface area

c = Cohesion, pcf

γ_w = Unit weight of water, pcf

H_w = Water height, ft

SUMP LOCATION

Short Term Condition F.S. = 2.8

Long Term Condition F.S. = 4.6

FLOOR OF THE CELL

Short Term Condition F.S. = 1.6

Long Term Condition F.S. = 3.4

CONCLUSION: Factor safety for short-term and long-term conditions are considered acceptable based TCEQ Handbook and engineering judgment.

REFERENCES:

1) Holtz, R. D. and Kovacs, W.D., An Introduction to Geotechnical Engineering, Person Education Taiwan,
2003.

2) Geology Report for Monsanto Chocolate Bayou Proposed Landfill Area, RCRA Part 3 Permit Application, prepared by S&B Engineers, Inc. dated 1985.

3) Potentiometric surfaces contour maps, prepared by Groundwater Services, Inc. issued on 2/20/2001.

GSI Job No. G-3379
Issued: 31 December 2009

ATTACHMENT V.8
ENGINEERING REPORT FOR
NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.8.6

Leachate Collection System Calculations

Issued: 31 December 2009

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APPENDIX V.8.6
LEACHATE COLLECTION SYSTEM CALCULATIONS
PERMIT UNIT 16 LANDFILL
CHOCOLATE BAYOU FACILITY
BRAZORIA COUNTY, TEXAS

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

Prepared by:

Golder Associates

Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, Texas 77073

Texas Registration Number: F-2578

12/30/09

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PHILLIP REID MATTHEWS II
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APPENDIX V.8.6
LEACHATE COLLECTION SYSTEM CALCULATIONS
PERMIT UNIT 16 LANDFILL
CHOCOLATE BAYOU FACILITY
BRAZORIA COUNTY, TEXAS

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

LIST OF ATTACHMENTS

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Golder Associates	Subject: Leachate Collection System Calculations		
	Job No 083-94322	Made by PCM	Date 09/01/09
	Ref: Proposed Permit Unit 16	Checked by JBF	Sheet No 1 of 1
	Alvin, TX	Reviewed by PRM	

Attachments 1 through 8 contain engineering calculations related to the design and/or performance of the leachate collection system for the proposed Permit Unit 16 landfill cells.

Attachment 1 provides an estimate of leachate generation based on the leachate volumes collected from the Permit Unit 2 landfill cells; this estimate is used as a design input for Attachments 3 through 8. However, leachate generation volumes for Permit Unit 16 should be lower due to the liner system design. Active landfill cells will be covered by a roof during operation, so rainfall will not contribute to leachate generation and the waste should contribute minimal quantities of liquid. Once the cell is closed, the HELP model evaluation presented in Attachment 2 shows that leachate generation should be negligible.

Attachment 3 provides calculations to estimate the maximum head within the proposed leachate collection system. Results show that the maximum anticipated head will be maintained within the thickness of the drainage layer.

Attachment 4 includes calculations determining the required permeability of geotextile filter layers within the leachate collection system. Attachment 5 evaluates the adequacy of the perforations in the leachate collection pipe. Attachment 6 includes leachate pipe size calculations. Attachment 7 includes leachate pipe structural design calculations. Attachment 8 calculates the capacity of the primary and secondary sumps.

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ATTACHMENT A

LEACHATE GENERATION RATE

Golder Associates	Subject: Leachate Generation Rate		
	Job No.: 083-94322 Ref: Proposed Permit Unit 16, Alvin, TX	Made by: LFG Checked: PCM Reviewed: JBF	Date: 9/3/2009 Sheet: 1 of 5

OBJECTIVE: Estimate the maximum leachate generation rate anticipated for the active life of the proposed Permit Unit 16 landfill cells.

GIVEN/ ASSUMPTIONS:

1.) The proposed Permit Unit 16 cells are designed to have a roof cover during operation. Therefore, rainfall will not contribute to leachate generation during the active phase of the landfill cell. The anticipated maximum leachate generation rate was estimated based on 2008 site leachate collection volumes from the primary and secondary leachate collection systems (LCS) for the existing Permit Unit 2 cells.

2.) Evaluation of the site data shows that the maximum daily leachate volume (leachate volume collected from the primary + secondary LCS) is 733 gal/day from Cell U2C2 on January 22, 2008 (see attached summary tables).

3.) The Unit 2 permitted cells U2C1, U2C2, U2C3 and U2C4 are about the same size, approximately 0.746 acres.

METHOD: The leachate generation rate is derived by dividing the maximum daily leachate volume by the cell area where the leachate was collected from.

CALCULATION: The maximum daily leachate volume is 733 gallons per day.

Maximum daily leachate volume =	733 gallons per day
Permitted Cell Area =	0.746 acres
Maximum Daily Leachate Generation Rate =	983 gal/acre/day
conversion =	131 ft^3/acre/day

CONCLUSION: The maximum anticipated leachate production rate at the site is approximately 131 ft^3 per acre per day.

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Pgs 1-5
For Permitting Purposes

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ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PROPOSED PERMIT UNIT 16
2008 SITE RECORDS OF LEACHATE VOLUME - SUMMARY TABLE

Cell - U2C1

		PRIMARY LCS	SECONDARY LCS		
Collection Date	No. of days since the last collection	Leachate Collected from the Primary LCS (gallons)	Leachate Collected from the Secondary LCS (gallons)	Total Leachate Volume = Primary + Secondary (gallons)	Total Leachate Volume in gallons per day (1)
01/01/08	-	184.65	434.05	618.71	-
01/18/08	17	203.84	n.a.	203.84	12
01/20/08	19	n.a.	661.87	661.87	35
01/22/08	2	43.17	616.31	659.47	330
01/30/08	8	76.74	470.02	546.76	68
02/05/08	6	35.97	261.39	297.36	50
02/12/08	7	151.08	n.a.	151.08	22
02/13/08	8	n.a.	388.49	388.49	49
02/20/08	7	38.37	570.74	609.11	87
02/26/08	6	515.59	702.64	1,218.23	203
03/06/08	9	74.34	n.a.	74.34	8
03/09/08	12	n.a.	211.03	211.03	18
03/12/08	6	23.98	n.a.	23.98	4
03/13/08	4	n.a.	486.81	486.81	122
03/18/08	5	21.58	136.69	158.27	32
03/25/08	7	33.57	215.83	249.40	36
04/01/08	7	33.57	14.39	47.96	7
04/09/08	8	4.80	n.a.	4.80	1
04/16/08	7	9.59	115.11	124.70	18
04/22/08	6	31.18	124.70	155.88	26
04/29/08	7	31.18	275.78	306.95	44
05/06/08	7	26.38	187.05	213.43	30
05/15/08	9	2.40	n.a.	2.40	0
05/26/08	11	163.07	338.13	501.20	46
06/17/08	22	64.75	294.96	359.71	16
06/19/08	2	n.a.	282.97	282.97	141
06/24/08	5	50.36	19.18	69.54	14
07/02/08	8	33.57	223.02	256.59	32
07/22/08	20	642.69	515.59	1,158.27	58
07/29/08	7	124.70	422.06	546.76	78
08/06/08	8	55.16	393.29	448.44	56
08/12/08	6	127.10	230.22	357.31	60
08/20/08	8	110.31	230.22	340.53	43
08/26/08	6	153.48	347.72	501.20	84
09/03/08	8	182.25	294.96	477.22	60
09/09/08	6	273.38	479.62	753.00	125
09/26/08	17	239.81	575.54	815.35	48

Note: n.a. = data not available, therefore assumed that leachate was not collected this date.
(1) The total volume of leachate in gallons per day is estimated by dividing the total amount of leachate collected from the primary and secondary sumps by the number of days since the last collection.

Max. Leachate Volume Collected from Cell U2C1 =	330	gallons per day

Source: Unpublished leachate volume data from January 2008 through September 2008, received from Ascend Performance Materials LLC., Alvin, Texas.

ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PROPOSED PERMIT UNIT 16
2008 SITE RECORDS OF LEACHATE VOLUME - SUMMARY TABLE

Cell - U2C2

		PRIMARY LCS	SECONDARY LCS		
Date	No. of days since the last collection	Leachate Collected from the Primary LCS (gallons)	Leachate Collected from the Secondary LCS (gallons)	Total Leachate Volume = Primary + Secondary (gallons)	Total Leachate Volume in gallons per day
01/02/08	-	107.91	330.94	438.85	-
01/20/08	18	666.67	810.55	1,477.22	82
01/22/08	2	844.12	621.10	1,465.23	733
01/30/08	8	453.24	541.97	995.20	124
02/07/08	8	256.59	378.90	635.49	79
02/13/08	6	390.89	513.19	904.08	151
02/20/08	13	565.95	661.87	1,227.82	94
02/28/08	8	9.59	136.69	146.28	18
03/13/08	14	486.81	812.95	1,299.76	93
03/18/08	5	129.50	n.a.	129.50	26
03/19/08	6	n.a.	127.10	4.80	1
03/25/08	6	4.80	n.a.	136.69	23
03/26/08	7	n.a.	136.69	136.69	20
04/02/08	7	16.79	170.26	187.05	27
04/09/08	7	244.60	273.38	517.99	74
04/16/08	7	0.72	2.40	3.12	0
04/22/08	6	163.07	107.91	270.98	45
04/29/08	7	7.19	103.12	110.31	16
05/06/08	7	4.80	n.a.	4.80	1
05/07/08	8	n.a.	4.80	4.80	1
05/15/08	8	7.19	n.a.	7.19	1
05/26/08	11	31.18	26.38	57.55	5
06/17/08	22	2.40	115.11	117.51	5
06/19/08	2	9.59	158.27	167.87	84
06/24/08	5	47.96	71.94	119.90	24
07/02/08	8	261.39	93.53	354.92	44
07/22/08	20	2.40	n.a.	2.40	0
07/23/08	21	n.a.	601.92	601.92	29
07/29/08	6	n.a.	47.96	47.96	8
08/06/08	8	2.40	131.89	134.29	17
08/12/08	6	n.a.	57.55	57.55	10
08/20/08	8	2.40	122.30	124.70	16
08/26/08	6	2.40	74.34	76.74	13
09/03/08	8	n.a.	91.13	91.13	11
09/09/08	6	103.12	105.52	208.63	35
09/26/08	17	n.a.	74.34	74.34	4

Note: n.a. = data not available, therefore assumed that leachate was not collected this date.
(1) The total volume of leachate in gallons per day is estimated by dividing the total amount of leachate collected from the primary and secondary sumps by the number of days since the last collection.

Max. Leachate Volume Collected from Cell U2C2 =	733	gallons per day

Source: Unpublished leachate volume data from January 2008 through September 2008, received from Ascend Performance Materials LLC., Alvin, Texas.

ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PROPOSED PERMIT UNIT 16
2008 SITE RECORDS OF LEACHATE VOLUME - SUMMARY TABLE

Cell - U2C3

		PRIMARY LCS	SECONDARY LCS		
Date	No. of days since the last collection	Leachate Collected from the Primary LCS (gallons)	Leachate Collected from the Secondary LCS (gallons)	Total Leachate Volume = Primary + Secondary (gallons)	Total Leachate Volume in gallons per day
01/02/08	-	784.17	776.98	1,561.15	-
01/20/08	18	1,304.56	1,309.35	2,613.91	145
01/22/08	2	1,318.94	n.a.	1,318.94	659
01/23/08	3	n.a.	374.10	374.10	125
01/31/08	8	232.61	479.62	712.23	89
02/07/08	7	208.63	599.52	808.15	115
02/13/08	6	901.68	896.88	1,798.56	300
02/20/08	13	980.82	n.a.	980.82	75
02/21/08	8	n.a.	33.57	33.57	4
02/28/08	8	426.86	n.a.	426.86	53
03/01/08	9	n.a.	426.86	426.86	47
03/13/08	14	88.73	n.a.	88.73	6
03/14/08	1	n.a.	9.59	9.59	10
03/19/08	5	654.68	659.47	1,314.15	263
03/26/08	7	633.09	31.18	664.27	95
04/02/08	7	342.93	19.18	362.11	52
04/09/08	7	2.40	n.a.	2.40	0
04/16/08	7	52.76	n.a.	52.76	8
04/17/08	15	n.a.	2.40	2.40	0
04/22/08	5	n.a.	139.09	139.09	28
04/23/08	1	2.40	n.a.	2.40	2
04/30/08	7	79.14	n.a.	79.14	11
05/07/08	7	443.65	220.00	663.65	95
05/15/08	8	11.99	n.a.	11.99	1
06/20/08	44	n.a.	1,731.41	1,731.41	39
06/24/08	4	n.a.	1,721.82	1,721.82	430
07/02/08	8	40.77	4.80	45.56	6
07/23/08	21	2.40	654.68	657.07	31
07/30/08	7	n.a.	1,124.70	1,124.70	161
08/07/08	8	11.99	896.88	908.87	114
08/13/08	6	n.a.	1,247.00	1,247.00	208
08/21/08	8	4.80	812.95	817.75	102
08/27/08	6	4.80	1,191.85	1,196.64	199
09/04/08	8	359.71	1,043.17	1,402.88	175
09/09/08	5	669.06	n.a.	669.06	134
09/27/08	18	14.39	1,350.12	1,364.51	76

Note: n.a. = data not available, therefore assumed that leachate was not collected this date.
(1) The total volume of leachate in gallons per day is estimated by dividing the total amount of leachate collected from the primary and secondary sumps by the number of days since the last collection.

Max. Leachate Volume Collected from Cell U2C3 =	659	gallons per day

Source: Unpublished leachate volume data from January 2008 through September 2008, received from Ascend Performance Materials LLC., Alvin, Texas.

ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PROPOSED PERMIT UNIT 16
2008 SITE RECORDS OF LEACHATE VOLUME - SUMMARY TABLE

Cell - U2C4

		PRIMARY LCS	SECONDARY LCS		
Date	No. of days since the last collection	Leachate Collected from the Primary LCS (gallons)	Leachate Collected from the Secondary LCS (gallons)	Total Leachate Volume = Primary + Secondary (gallons)	Total Leachate Volume in gallons per day
01/03/08	-	551.56	532.37	1,083.93	-
01/24/08	21	287.77	1,050.36	1,338.13	64
01/31/08	7	263.79	477.22	741.01	106
02/08/08	8	443.65	1,410.07	1,853.72	232
02/14/08	6	388.49	386.09	774.58	129
02/21/08	13	45.56	55.16	100.72	8
03/01/08	9	436.45	436.45	872.90	97
03/14/08	13	474.82	2.40	477.22	37
03/19/08	5	669.06	n.a.	669.06	134
03/20/08	6	n.a.	769.78	769.78	128
03/26/08	7	347.72	n.a.	347.72	50
04/03/08	8	580.34	n.a.	580.34	73
04/09/08	20	n.a.	9.59	9.59	0
04/17/08	8	9.59	4.80	14.39	2
04/23/08	6	767.39	800.96	1,568.35	261
05/01/08	8	9.59	80.00	89.59	11
05/07/08	6	388.49	n.a.	388.49	65
05/08/08	7	n.a.	240.00	240.00	34
06/20/08	43	328.54	140.00	468.54	11
06/21/08	1	n.a.	580.00	580.00	580
06/24/08	4	103.12	n.a.	103.12	26
07/03/08	9	n.a.	1,630.70	1,630.70	181
07/23/08	20	458.03	116.31	574.34	29
07/30/08	7	494.00	n.a.	494.00	71
08/07/08	8	450.84	n.a.	450.84	56
08/13/08	6	755.40	n.a.	755.40	126
08/15/08	23	n.a.	21.58	21.58	1
08/21/08	8	479.62	n.a.	479.62	60
08/22/08	7	n.a.	62.35	62.35	9
08/27/08	5	537.17	n.a.	537.17	107
08/28/08	6	n.a.	83.93	83.93	14
09/04/08	8	482.01	n.a.	482.01	60
09/27/08	23	489.21	297.36	786.57	34

Note: n.a. = data not available, therefore assumed that leachate was not collected this date.
(1) The total volume of leachate in gallons per day is estimated by dividing the total amount of leachate collected from the primary and secondary sumps by the number of days since the last collection.

Max. Leachate Volume Collected from Cell U2C4 =	580	gallons per day

Source: Unpublished leachate volume data from January 2008 through September 2008, received from Ascend Performance Materials LLC., Alvin, Texas.

ATTACHMENT B

HELP MODEL EVALUATION

Golder Associates	Subject: HELP Model Evaluation		
	Job No.: 083-94322 Ref: Proposed Permit Unit 16, Alvin, TX	Made by: LFG Checked: PCM Reviewed: JBF	Date: 8/24/2009 Sheet: 1 of 10

OBJECTIVE: Estimate the leachate generation rate after the final cover has been placed at the proposed permit Unit 16, in Alvin, Texas.

METHOD: Use the Hydrologic Evaluation of Landfill Performance (HELP) Model (Ref. 1) with layers simulating the proposed liner, waste, and cover materials, along with climatic data and evapotranspiration parameters consistent with final cover conditions (FC).

GIVEN: **General:**

Climate data synthetically generated using default coefficients for Houston, TX, and historic temperature and rainfall data for Alvin, TX (see Ref. 2).

Slope of landfill floor is 1.41% along the leachate flow path (1.0% sloped cell floor toward the centerline drain and 1.0% sloped centerline leachate collection pipe toward the sump).

The final cover slope is 5% (20H:1V) at the sideslopes.

Base Liner System (from top to bottom):
Nonwoven geotextile
12-inches of drainage layer (default material texture No. 01-Sand, $K=1 \times 10^{-2}$ cm/s).
Nonwoven geotextile
80-mil HDPE texture geomembrane
240-mil GCL as barrier soil liner (default material texture No. 17, $k = 3.0 \times 10^{-9}$ cm/s)
200-mil Geocomposite drainage layer
80-mil HDPE texture geomembrane
36-inch Compacted clay as barrier soil liner (default material texture No. 16, $k=1.0 \times 10^{-7}$ cm/sec)

69-ft maximum leachate drainage length (longest flow path including sideslope and floor).

Final Cover System (from top to bottom):
18-inches of protective cover soil ($k = 1 \times 10^{-5}$ cm/s)
200-mil Geocomposite drainage layer
40-mil LLDPE geomembrane
24-inch Compacted clay as barrier soil liner liner (default material texture No. 16, $k=1.0 \times 10^{-7}$ cm/sec)
6-inches of intermediate cover (default material texture No. 10, $k = 1 \times 10^{-4}$ cm/sec)

69-ft maximum drainage length (longest flow path for surface water)

For permitting purposes only

STATE OF TEXAS
PHILLIP REID MATTHEWS II
83554
LICENSED
PROFESSIONAL ENGINEER

12/30/09

Golder Associates Inc.
F-2578

Golder Associates	Subject: HELP Model Evaluation		
	Job No.: 083-94322 Ref: Proposed Permit Unit 16, Alvin, TX	Made by: LFG Checked: PCM Reviewed: JBF	Date: 8/24/2009 Sheet: 2 of 10

ASSUMPTIONS: 1.) Bottom liner geomembrane modeled as having 1 pinhole/acre, 1 installation defect/acre, good

2.) Initial soil and waste moisture contents calculated by model assuming a steady-state condition.

3.) Geocomposite drainage layer permeability:

Base Liner System

Assuming a standard 200-mil geocomposite with transmissivity of $1x10^{-4} m^3/s\text{-}m$, the permeability can be estimated with the following equation:

$\Theta = k*t$

where,
Θ = Transmissivity ($m^3/s\text{-}m$)
k = Permeability (cm/s)
t = Thickness (cm)

Θ =	1.00E-04	$m^3/s\text{-}m$
t =	200	mil
k =	1.969	cm/s

Applying a reduction factor using the procedures presented in the Geosynthetic Research Institute GC8- "Determination of the Allowable Flow Rate in a Drainage Geocomposite" (Ref. 3).

RF=RFcr X RFcc X RFbc = 5.21

where:

RFcr =	1.7	Reduction Factor for Creep
RFcc =	1.75	Reduction Factor for Chemical Clogging
RFbc =	1.75	Reduction Factor for Biological Clogging

k = 0.378 cm/sec (effective permeability)

Final Cover System

Based on stability analysis (see Lateral Drainage Analysis for Final Cover Calculation), the required transmissivity for the geocomposite is $1.1x10^{-4} m^3/s\text{-}m$.

Assuming a 200 mil geocomposite, the permeability can be estimated as:

Θ =	1.10E-04	$m^3/s.m$	
t =	200	mil	
k =	2.165	cm/s	(effective permeability)

4.) **Final Cover Condition - Methodology/Assumptions**

18-inches of protective cover soil ($k = 1 \times 10^{-5}$ cm/s)
19 ft of waste with $k = 1 \times 10^{-3}$ cm/s (estimated)
Fair grass
Leaf area index = 2
Evaporative zone depth = 18 in (see note 1)
100% of area allowed to have runoff
30-yr simulation period

Note 1: HELP model default value for evaporative zone depth is 22 in, based on the selected location and a thick layer of loamy soil with a grassy form of vegetation. Since, the final cover system has a liner, the evaporative depth will not exceed the depth to the top of the topmost liner. Therefore, a evaporative zone depth of 18 inches was assumed.

RESULTS: See attached summary table and HELP output files.

CONCLUSION: Review of the HELP results indicates that the maximum peak daily leachate generation rate after the final cover has been placed is approximately zero gal/acre /day.

REFERENCES:

1.) *Hydrologic Evaluation of Landfill Performance (HELP) Model, Version 3.07*, U.S. EPA and U.S. Army Engineering Waterways Experiment Station, Corps of Engineers, Vicksburg, MS, November 1997.

2.) NOAA Southern Regional Climate Center, Record Monthly Climate Summary data for Alvin, Texas from 1971 to 2000, weather station ID 410204.

3.) GRI Standard GC8 - Determination of the Allowable Flow Rate of a Drainage Geocomposite, Geosynthetic Institute, April 17, 2001.

Golder Associates

ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PROPOSED PERMIT UNIT 16
HELP MODEL - SUMMARY TABLE

PN: 083-94322
Made by: LFG
Checked:
Reviewed:

Scenario	Material	Thickness	Material No.	Porosity	Field Capacity	Wilting Point	Initial Soil Water Content	Hydraulic Conductivity	Drainage Length	Slope	Base Liner Maximum Head	LEACHATE GENERATION: Peak Daily Leachate Generation	
		(inches)		(vol. /vol.)	(vol. /vol.)	(vol. /vol.)	(vol. /vol.)	k (cm/sec)	ft	(%)	(in)	ft^3/acre/day	gal/acre/day
FINAL COVER CONDITION	Protective/Top Soil Cover	18	user defined	0.398	0.244	0.136	0.3222	1.00E-05	n.a.	n.a.	0.0	0.00	0
	GC	0.2	user defined	0.85	0.01	0.005	0.01	2.165	69	5			
	40 mil LLDPE GM	0.04	36	0	0	0	0	3.90E-13	n.a.	n.a.			
	Compacted Clay liner	24	16	0.427	0.418	0.367	0.427	1.00E-07	n.a.	n.a.			
	Intermediate Cover	6	10	0.398	0.244	0.136	0.244	1.19E-04	n.a.	n.a.			
	Waste - 19 ft	228	18	0.671	0.292	0.077	0.292	1.00E-03	n.a.	n.a.			
	Drainage layer	12	1	0.417	0.045	0.018	0.045	1.00E-02	69	1.41			
	80 mil HDPE GM	0.08	35	0	0	0	0	2.00E-13	n.a.	n.a.			
	GCL	0.24	17	0.75	0.747	0.4	0.75	3.00E-09	n.a.	n.a.			
	GC	0.2	user defined	0.85	0.01	0.005	0.01	0.378	69	1.41			
	80 mil HDPE GM	0.08	35	0	0	0	0	2.00E-13	n.a.	n.a.			
	Compacted Clay liner	24	16	0.427	0.418	0.367	0.427	1.00E-07	n.a.	n.a.			

Note: n.a. = Not aplicable
GC = Geocomposite Drainage Layer

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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             **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      C:\HELP3\solutia\FC.D4
TEMPERATURE DATA FILE:        C:\HELP3\solutia\FC.D7
SOLAR RADIATION DATA FILE:    C:\HELP3\solutia\FC.D13
EVAPOTRANSPIRATION DATA:      C:\HELP3\solutia\FC.D11
SOIL AND DESIGN DATA FILE:    C:\HELP3\solutia\FC.D10
OUTPUT DATA FILE:             C:\HELP3\solutia\fc.OUT


TIME:  17:42     DATE:   9/ 3/2009


******************************************************************************

     TITLE:  FINAL COVER CONDITION

******************************************************************************


     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   0
           THICKNESS                 =    18.00    INCHES
           POROSITY                  =     0.3980 VOL/VOL
           FIELD CAPACITY            =     0.2440 VOL/VOL
```


ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PROPOSED PERMIT UNIT 16
HELP Model Evaluation – FINAL COVER CONDITION

```
           WILTING POINT             =     0.1360 VOL/VOL
           INITIAL SOIL WATER CONTENT =    0.3222 VOL/VOL
           EFFECTIVE SAT. HYD. COND. =  0.999999975000E-05 CM/SEC


                                  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 =    0.0100 VOL/VOL
           EFFECTIVE SAT. HYD. COND. =   2.16499996000     CM/SEC
           SLOPE                     =     5.00    PERCENT
           DRAINAGE LENGTH           =    69.0     FEET


                                  LAYER  3
                                  --------

                     TYPE 4 - FLEXIBLE MEMBRANE LINER
                         MATERIAL TEXTURE NUMBER  36
           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. =  0.399999993000E-12 CM/SEC
           FML PINHOLE DENSITY       =     1.00    HOLES/ACRE
           FML INSTALLATION DEFECTS  =     1.00    HOLES/ACRE
           FML PLACEMENT QUALITY     =  3 - GOOD


                                  LAYER  4
                                  --------

                     TYPE 3 - BARRIER SOIL LINER
                         MATERIAL TEXTURE NUMBER  16
           THICKNESS                 =    24.00    INCHES
           POROSITY                  =     0.4270 VOL/VOL
           FIELD CAPACITY            =     0.4180 VOL/VOL
           WILTING POINT             =     0.3670 VOL/VOL
```

```
INITIAL SOIL WATER CONTENT  =      0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000001000E-06 CM/SEC


                 LAYER  5
                 --------

        TYPE 1 - VERTICAL PERCOLATION LAYER
          MATERIAL TEXTURE NUMBER  10
THICKNESS                   =      6.00   INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                 LAYER  6
                 --------

        TYPE I - VERTICAL PERCOLATION LAYER
          MATERIAL TEXTURE NUMBER  18
THICKNESS                   =    228.00   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.   =  0.100000005000E-02 CM/SEC


                 LAYER  7
                 --------

          TYPE 2 - LATERAL DRAINAGE LAYER
          MATERIAL TEXTURE NUMBER   1
THICKNESS                   =     12.00   INCHES
POROSITY                    =      0.4170 VOL/VOL
FIELD CAPACITY              =      0.0450 VOL/VOL
WILTING POINT               =      0.0180 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0450 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999978000E-02 CM/SEC
SLOPE                       =      1.41   PERCENT
DRAINAGE LENGTH             =     69.0    FEET
```


ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PROPOSED PERMIT UNIT 16
HELP Model Evaluation – FINAL COVER CONDITION

```
                 LAYER  8
                 --------

        TYPE 4 - FLEXIBLE MEMBRANE LINER
          MATERIAL TEXTURE NUMBER  35
THICKNESS                   =      0.08   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       =  4 - POOR


                 LAYER  9
                 --------

          TYPE 3 - BARRIER SOIL LINER
          MATERIAL TEXTURE NUMBER  17
THICKNESS                   =      0.24   INCHES
POROSITY                    =      0.7500 VOL/VOL
FIELD CAPACITY              =      0.7470 VOL/VOL
WILTING POINT               =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.7500 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.300000003000E-08 CM/SEC


                 LAYER 10
                 --------

          TYPE 2 - LATERAL DRAINAGE LAYER
          MATERIAL TEXTURE NUMBER  61
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  =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.377999991000      CM/SEC
SLOPE                       =      1.41   PERCENT
DRAINAGE LENGTH             =     69.0    FEET
```


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```
                    LAYER 11
                    --------

          TYPE 4 - FLEXIBLE MEMBRANE LINER
            MATERIAL TEXTURE NUMBER 35
THICKNESS                     =     0.08    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           =     1.00    HOLES/ACRE
FML INSTALLATION DEFECTS      =     1.00    HOLES/ACRE
FML PLACEMENT QUALITY         = 3 - GOOD


                    LAYER 12
                    --------

            TYPE 3 - BARRIER SOIL LINER
            MATERIAL TEXTURE NUMBER 16
THICKNESS                     =    36.00    INCHES
POROSITY                      =     0.4270 VOL/VOL
FIELD CAPACITY                =     0.4180 VOL/VOL
WILTING POINT                 =     0.3670 VOL/VOL
INITIAL SOIL WATER CONTENT    =     0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND.     = 0.100000001000E-06 CM/SEC


       GENERAL DESIGN AND EVAPORATIVE ZONE DATA
       ----------------------------------------

NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
       SOIL DATA BASE USING SOIL TEXTURE # 6 WITH BARE
       GROUND CONDITIONS, A SURFACE SLOPE OF  5.% AND
       A SLOPE LENGTH OF   95. FEET.

SCS RUNOFF CURVE NUMBER              =    86.90
FRACTION OF AREA ALLOWING RUNOFF     =   100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE   =     1.000  ACRES
EVAPORATIVE ZONE DEPTH               =    18.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE    =     5.800  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE   =     7.164  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE   =     2.448  INCHES
INITIAL SNOW WATER                   =     0.000  INCHES
INITIAL WATER IN LAYER MATERIALS     =   100.184  INCHES
TOTAL INITIAL WATER                  =   100.184  INCHES
TOTAL SUBSURFACE INFLOW              =     0.00   INCHES/YEAR
```


ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PROPOSED PERMIT UNIT 16
HELP Model Evaluation – FINAL COVER CONDITION

```
          EVAPOTRANSPIRATION AND WEATHER DATA
          -----------------------------------

NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
         HOUSTON             TEXAS

     STATION LATITUDE                         =  29.39 DEGREES
     MAXIMUM LEAF AREA INDEX                  =   2.00
     START OF GROWING SEASON (JULIAN DATE)    =    31
     END OF GROWING SEASON (JULIAN DATE)      =   362
     EVAPORATIVE ZONE DEPTH                   =  18.0  INCHES
     AVERAGE ANNUAL WIND SPEED                =   7.80 MPH
     AVERAGE 1ST QUARTER RELATIVE HUMIDITY    =  74.00 %
     AVERAGE 2ND QUARTER RELATIVE HUMIDITY    =  76.00 %
     AVERAGE 3RD QUARTER RELATIVE HUMIDITY    =  77.00 %
     AVERAGE 4TH QUARTER RELATIVE HUMIDITY    =  77.00 %


NOTE:  PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
         COEFFICIENTS FOR     HOUSTON              TEXAS
             AND HISTORIC DATA FOR ALVIN       TEXAS

         NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
-------     -------     -------     -------     -------     -------
  4.76        2.91        3.11        3.22        4.92        5.35
  4.78        3.84        7.12        3.93        4.43        3.36


NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
         COEFFICIENTS FOR     HOUSTON              TEXAS
             AND HISTORIC DATA FOR ALVIN       TEXAS

     NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
-------     -------     -------     -------     -------     -------
 52.70       55.90       62.50       68.50       75.50       80.70
 82.70       82.70       78.70       70.60       62.20       54.90


NOTE:  SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
         COEFFICIENTS FOR     ALVIN              TEXAS
           AND STATION LATITUDE  =  29.37 DEGREES
```


7110

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	50.51	(7.332)	183335.6	100.00
RUNOFF	25.109	(5.4835)	91145.29	49.715
EVAPOTRANSPIRATION	23.928	(2.3944)	86857.82	47.376
LATERAL DRAINAGE COLLECTED FROM LAYER 2	1.48770	(1.20549)	5400.357	2.94561
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00000	(0.00000)	0.005	0.00000
AVERAGE HEAD ON TOP OF LAYER 3	0.000	(0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 7	0.00000	(0.00000)	0.002	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.00000	(0.00000)	0.003	0.00000
AVERAGE HEAD ON TOP OF LAYER 8	0.000	(0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 10	0.00000	(0.00000)	0.000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.00000	(0.00000)	0.003	0.00000
AVERAGE HEAD ON TOP OF LAYER 11	0.000	(0.000)		
CHANGE IN WATER STORAGE	-0.019	(1.1179)	-67.90	-0.037

ASCEND PERFORMANCE MATERIALS LLC.
CHOCOLATE BAYOU PLANT
PROPOSED PERMIT UNIT 16
HELP Model Evaluation – **FINAL COVER CONDITION**

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	5.80	21054.000
RUNOFF	5.263	19106.3105
DRAINAGE COLLECTED FROM LAYER 2	0.26016	944.38727
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000000	0.00019
AVERAGE HEAD ON TOP OF LAYER 3	0.029	
MAXIMUM HEAD ON TOP OF LAYER 3	0.058	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	0.3 FEET	
DRAINAGE COLLECTED FROM LAYER 7	0.00000	0.00005
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000000	0.00002
AVERAGE HEAD ON TOP OF LAYER 8	0.000	
MAXIMUM HEAD ON TOP OF LAYER 8	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 7 (DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 10	0.00000	0.00000
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000000	0.00002
AVERAGE HEAD ON TOP OF LAYER 11	0.000	
MAXIMUM HEAD ON TOP OF LAYER 11	0.002	
LOCATION OF MAXIMUM HEAD IN LAYER 10 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.75	2723.6431

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3868
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1360

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*** 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.

****

****

FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	5.2383	0.2910
2	0.0025	0.0127
3	0.0000	0.0000
4	10.2480	0.4270
5	1.4640	0.2440
6	66.5760	0.2920
7	0.5400	0.0450
8	0.0000	0.0000
9	0.1800	0.7500
10	0.0020	0.0100
11	0.0000	0.0000
12	15.3720	0.4270
SNOW WATER	0.000	

****
****

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NOAA Southern Regional Climate Center

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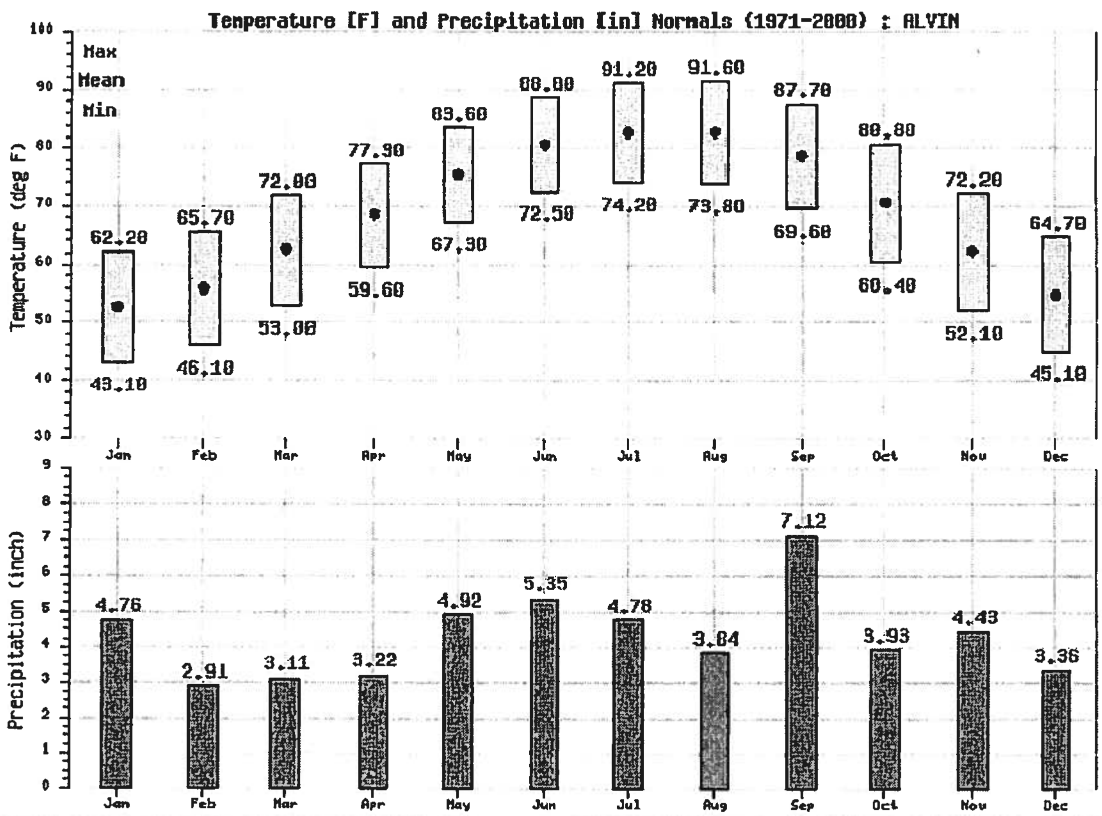
Observation Stations

Return to Station Search   station ID: 410204

Station Information Annual Plots Monthly Summaries Climate Normals < >

Print Graph



Search Results for Alvin, tx

Station ID	Network	Name	Lat	Lon	Begin	End	D
410204	coop	ALVIN	29.37	-95.23	1956/6/1	Current	
414333	coop	HOUSTON NWSO	29.47	-95.08	1990/12/1	2009/4/30	
414307	coop	HOUSTON HOBBY AP	29.64	-95.28	1946/11/1	Current	

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ATTACHMENT C
LEACHATE HEAD CALCULATIONS

Golder Associates	SUBJECT		LEACHATE HEAD CALCULATIONS			
	Job No.	083-94322	Made By	LFG	Date	9/3/2009
	Ref.	Proposed	Checked	PCM	Sheet	1 of 6
		Permit Unit 16, Alvin, TX	Reviewed	JBF		

OBJECTIVE:

To estimate the maximum leachate head within the proposed leachate collection system (LCS).

GIVEN / ASSUMPTIONS:

1) The pipe will serve as a conduit to transfer liquid from the drainage layer to the sump and have a flow capacity large enough to maintain the head on the primary liner below 1 foot as per the TCEQ regulations.

2) The leachate collection system consists of :
   - 12-inches of sand drainage layer on the floor and 200-mil geocomposite drainage layer on the sideslopes as a primary leachate collection system, and
   - 200-mil geocomposite drainage layer on the floor and sideslopes as a secondary leachate collection svstem.

3) The depth of the leachate head at any point will be designed to be less than the thickness of the drainage media.

4) The percolation rate was derived from the largest peak daily infiltration rate estimated based on 2008 site records of leachate generation volumes for Unit 2 permitted cells (see Leachate Generation Rate Calculation).

5) Use the manufacturer material that exhibits the lowest permeability and thinnest thickness to meet transmissivity requirements.

METHODS:

1) Two mounding methods will be used to calculate the head on the liner, Giround 2000 (Ref 3 and 4) and McEnroe's 93 (Ref. 5), using the greatest peak daily leachate volume of 983 gallons per acre per day.

Giroud 2000 (from Ref.4)

Eq. 1

$$t_{max} = j\frac{\sqrt{\tan^2\beta + 4q_h/k} - \tan\beta}{2\cos\beta}L$$

(Max. leachate head equation)

Where:
- j = correction factor
- β= percolation rate
- k = permeability of the drainage media
- L = slope length
- q_h = percolation rate per unit area

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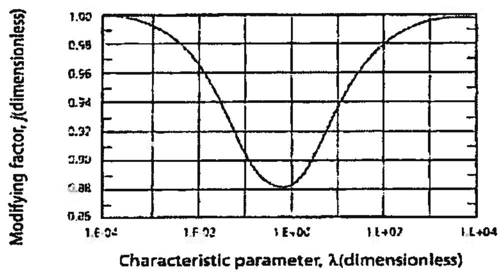
Golder Associates	SUBJECT		LEACHATE HEAD CALCULATIONS				
	Job No.	083-94322	Made By	LFG	Date	9/3/2009	
	Ref.	Proposed	Checked	PCM	Sheet	2	of 6
	Permit Unit 16, Alvin, TX		Reviewed	JBF			

METHODS Cont.:

Giroud 2000 (from Ref.4)

The correction factor *j* is estimated from Figure 1.

Figure 1: **Value of the modifying factor, *j*, as a function of the characteristic parameter, λ.**



Eq. 2

$$\lambda = \frac{q_h}{k \tan^2\beta}$$

Note from reference 4: It should be noted that the correction factor j is close to 1. therefore, a conservative approximation of Equation 1 is obtained by replacing the correction factor j with 1.

For geonets/geocomposites, t_{max} becomes very small and Equation 1 can be reduced to the following (Ref. 4):

Eq. 3

$$t_{max} = \frac{q_h L}{k \sin\beta}$$

McEnroe's 93 (from Ref 3.)

If $R < 1/4$ (Fig. 2)

$$y_{max} = LS\cdot(R - RS + R^2S^2)^{1/2}\cdot\{[(1-A-2R)(1+A-2RS)]/[(1+A-2R)(1-A-2RS)]\}^{1/(2A)} \quad (5)$$

If $R = 1/4$ (Fig. 2)

$$y_{max} = LSR\cdot(1-2RS)/(1-2R) \times \exp\{2R\cdot(S-1)/[(1-2RS)(1-2R)]\} \quad (6)$$

If $R > 1/4$ (Fig. 2)

$$y_{max} = LS\cdot(R - RS + R^2S^2)^{1/2}\exp\{(1/B)\cdot\tan^{-1}[(2RS-1)/B] - (1/B)\cdot\tan^{-1}[(2R-1)/B]\} \quad (7)$$

The parameters R, A, and B used in above formulas are defined as

$$R = r/(k\sin^2\alpha) \quad (8)$$

$$A = (1-4R)^{1/2} \quad (9)$$

$$B = (4R-1)^{1/2} \quad (10)$$

METHODS Cont.:

McEnroe's 93 (from Ref 3.)

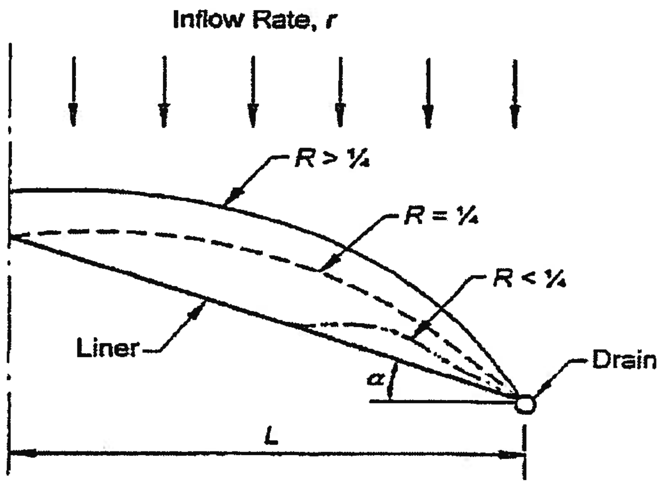


Fig. 2. Phreatic surfaces for different R values

2) The transmissivity of the geocomposite is reduced using the procedures presented in the Geosynthetic Research Institute GC8- "Determination of the Allowable Flow Rate in a Drainage Geocomposite" (Ref. 1).

Geocomposite:		
Measured Transmissivity (T-meas) =	1.00E-04 m^2/sec	(Ref. 2)
Hydraulic Conductivity =	1.97E+00 cm/sec	
RF=RFcr X RFcc X RFbc =	5.21	
where:		
RFcr =	1.7	Reduction Factor for Creep
RFcc =	1.75	Reduction Factor for Chemical Clogging
RFbc =	1.75	Reduction Factor for Biological Clogging
Allowed Transmissivity (T-allowed) =	1.92E-05 m^2/sec	T-allowed = T-meas/RF
hydraulic conductivity K=	1071.24 ft/day	Allowed Transmissivity/thickness
conversion =	0.378 cm/sec	
Thickness of geonet =	200 mils	

Golder Associates	SUBJECT		LEACHATE HEAD CALCULATIONS			
	Job No.	083-94322	Made By	LFG	Date	9/3/2009
	Ref.	Proposed	Checked	PCM	Sheet	4 of 6
	Permit Unit 16, Alvin, TX		Reviewed	JBF		

CALCULATIONS:

See following worksheet for the following scenario:
1. One foot of sand drainage layer in the primary collection system on the floor.
2. Bi-axial 200 mil geocomposite layer in the primary collection system on the sidewalls.

CONCLUSIONS:

Using these materials the anticipated leachate head on the proposed primary leachate collection system is less than 1 foot and less than the thickness of the drainage media, as well. Therefore the proposed drainage layer will function properly.

	Max. Leachate Head	Max. Allowable	
sideslopes	0.01 inches	< 0.2 in	**OK**
floor	4.5 inches	< 12 in	**OK**

REFERENCES:

1- GRI Standard GC8 - Determination of the Allowable Flow Rate of a Drainage Geocomposite, Geosynthetic Institute, April 17, 2001.

2- GSE 200-mil Geocomposite Product Specification, 2009.

3) Richardson, G. N., Giroud, J., Zhao, A., "Design of Lateral Drainage System for Landfills", draft version, 2000.

4.) Richardson, G. N., Giroud, J., Zhao, A., "Lateral drainage design update- Part 1", Designer's Forum, Geotechnical Fabrics Report, January/February 2002.

5) Qian, Xuede; Donald Gray, and Robert M. Koerner, "Estimation of Maximum Liquid Head over Landfill Barriers", Journal of Geotechnical and Geoenvironmental Engineering, ASCE, May 2004.

Leachate Head-On-Liner Calculation

FACILITY:	Proposed Permit Unit 16, Alvin, TX	Date 8/27/09
UNIT:		Sheet 5 of 6

PRIMARY LEACHATE COLLECTION SYSTEM

Sideslope using bi-axial 200-mil double sided geocomposite

	Design Variables for input				
	Calculated Values				
		Units		Units	Notation
Slope to Pipe	0.4000	ft/ft	40.00%		***S1***
Slope of Pipe	0.0000	ft/ft	0.00%		***S2***
Combined Slope	0.4000	ft/ft	40.00%		***S***
Slope Angle	0.381	radians	21.80	degrees	**a**
Max. Perp. Length to Pipe	51	feet	614	inches	
Adjusted Flow Length	51	feet	614	inches	***L***
Geocomposite Thickness	200	mils	0.20	inches	
Geocomposite Permeability	1.97	cm/sec			***T=1.0 E-4 sm/sec***
Reduction/Safety Factor	5.21			RFcr, cc, bc	
Geocompositee Permeability	0.38	cm/s	12,854	in/day	***K geotextile***
Effective Permeability	3.78E-01	cm/s	12,854	in/day	***K avg.***
Percolation Rate	983	gpad	0.0362	ipad	***r***

Predicted Leachate Head				
Method	**Modeled Design**			
Giround 2000	**0.00** inches	< 0.2 inches	OK	
McEnroe's 93	**0.01** inches	< 0.2 inches	OK	

R =	0.0000	
A =	1.0000	
B =	N/A	
R < 0.25	0.000	Y max
	0.005	y max
R = 0.25	N/A	Y max
	N/A	y max
R > 0.25	N/A	Y max
	N/A	y max

Leachate Head-On-Liner Calculation

FACILITY:	Proposed Permit Unit 16, Alvin, TX	Date 8/27/09
UNIT:		Sheet 6 of 6

PRIMARY LEACHATE COLLECTION SYSTEM

Floor using 1-foot of Sand Drainage Layer

	Design Variables for Input				
	Calculated Values				
		Units		Units	Notation
Slope to Pipe	0.0100	ft/ft	1.00%		*S1*
Slope of Pipe	0.0100	ft/ft	1.00%		*S2*
Combined Slope	0.0141	ft/ft	1.41%		*S*
Slope Angle	0.014	radians	0.81	degrees	a
Max. Perp. Length to Pipe	49	feet	588	inches	
Adjusted Flow Length (1)	69	feet	832	inches	*L*
Sand Thickness	1.00	feet	12.0	inches	
Permeability	1.00E-02	cm/sec	340	in/day	*K sand*
Effective Permeability	1.00E-02	cm/s	340	in/day	*K avg.*
Percolation Rate	983	gpad	0.0362	lpad	*r*

Predicted Leachate Head				
Method	**Modeled Design**			
Giround 2000	**4.5**	inches	≤ 12 inches	OK
McEnroe's 93	**4.0**	inches	≤ 12 inches	OK

R =	0.5326	
A =	N/A	
B =	1.0632	
R < 0.25	N/A	Y max
	N/A	y max
R = 0.25	N/A	Y max
	N/A	y max
R > 0.25	0.339	Y max
	3.984	y max

Note (1) Maximum length of accepting areas from one side of the chimney drain including sideslopes.

ATTACHMENT D
GEOTEXTILE FILTER PERMITTIVITY CALCULATIONS

Golder Associates	Subject: Geotextile Filter Permittivity Calculations		
	Job No.: 083-94322	Made by: LFG	Date: 9/3/2009
	Ref: Proposed	Checked: PRM	Sheet: 1 of 3
	Permit Unit 16, Alvin, TX	Reviewed: JBF	

OBJECTIVE: Determine the required permeability of the geotextile filter overlying the sand drainage layer, the geotextile component of the geocomposite, and the geotextile around the leachate trench aggregate.

GIVEN: The peak daily leachate generation rates are used for the calculations, i.e. the geotextile permeability is required to accommodate the peak daily leachate generation rate.

The maximum leachate impingement rate, for active life condition, was assumed based on 2008 leachate collection data for Unit 2 permitted cells. The data indicates a maximum leachate rate of 131 cf/acre/day (see Leachate Generation Rate Calculation).

For final cover conditions, the maximum leachate generation rate was estimated using the Hydrologic Evaluation of Landfill Performance (HELP) model.

CALCULATIONS: 1.) Required Permeability of the Geotextile Overlying the Sand Drainage Layer and the geotextile component of the geocomposite

The required permeability is calculated directly by converting the units of the leachate generation rates (impingement rates) to centimeter per second.

2.) Required Permeability of the Geotextile Around the Leachate Trench Aggregate

The required permeability is calculated by assuming all flow to go through a 1-ft wide geotextile at the top of the trench. This will be the most critical scenario.

The following equation applies to per unit foot of trench:

$$k * i * 1' * 1' = q_{max} * L * 1'$$

where: k = required permeability of geotextile

i = hydraulic gradient = 1

q_{max} = maximum leachate impingement rate

L = maximum length of accepting areas from both sides of the chimney drain

= 138 ft

Table 1. Required hydraulic conductivity of Geotextile Filter

Condition Modeled	Peak Daily Leachate Generation Rate (cf/acre/day)	Required Permeability of Geotextile overlying the sand drainage layer and the geotextile component of the geocomosite (cm/sec)	Required Permeability of Geotextile around the leachate trench aggregate (cm/sec)
Active Life (Short-term)	131	1.06E-06	1.46E-04
Final Cover (Long-term)	0	0.00E+00	0.00E+00

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Note that the industry standard nonwoven geotextiles (see attached) have a permeability ranging from 0.2 ~ 0.3 cm/sec, which is three orders of magnitude greater than the required permeability in Table 1.

CONCLUSION: Standard nonwoven geotextiles meet the required design permeability as shown in this calculation.

REFERENCE: 1.) GSE Nonwoven geotextile, Product Data Sheet, 2007.

GSE STANDARD PRODUCTS

Product Data Sheet

GSE Nonwoven Geotextiles

GSE Nonwoven Geotextiles is a family of polypropylene, staple fiber, nonwoven, needlepunched geotextiles. Manufactured using an advanced manufacturing and quality system, these products are the most uniform and consistent nonwoven, needlepunched geotextile currently available in the industry. GSE combines a fiber selection and approval system with in-line quality control and a state-of-the-art laboratory to ensure that every roll shipped meets customer specifications. The company has performed extensive performance testing to evaluate suitability of its nonwovens for various applications. GSE Nonwoven Geotextiles are available in a range of weights to meet your specific project needs. *These product specifications meet or exceed GRI GT12, GRI GT13 and AASHTO M288.*

Product Specifications

TESTED PROPERTY	TEST METHOD	FREQUENCY	NW4	NW6	NW8	NW10	NW12	NW16
Product Code			GEO 0408002	GEO 0608002	GEO 0808002	GEO 1008002	GEO 1208002	GEO 1608002
AASHTO M288 Class			3	2	1	>1	>>1	>>>1
Mass per Unit Area, oz/yd² (g/m²)	ASTM D 5261	90,000 ft²	4 (135)	6 (200)	8 (270)	10 (335)	12 (405)	16 (540)
Grab Tensile Strength, lb (N)	ASTM D 4632	90,000 ft²	120 (530)	170 (755)	220 (975)	260 (1,155)	320 (1,420)	390 (1,735)
Grab Elongation, %	ASTM D 4632	90,000 ft²	50	50	50	50	50	50
Puncture Strength, lb (N)	ASTM D 4833	90,000 ft²	60 (265)	90 (395)	120 (525)	165 (725)	190 (835)	240 (1,055)
Trapezoidal Tear Strength, lb (N)	ASTM D 4533	90,000 ft²	50 (220)	70 (310)	95 (420)	100 (445)	125 (555)	150 (665)
Apparent Opening Size, Sieve No. (mm)	ASTM D 4751	540,000 ft²	70 (0.212)	70 (0.212)	80 (0.180)	100 (0.150)	100 (0.150)	100 (0.150)
Permittivity, sec⁻¹	ASTM D 4491	540,000 ft²	1.50	1.50	1.50	1.20	0.80	0.70
Permeability, cm/sec	ASTM D 4491	540,000 ft²	0.22	0.30	0.30	0.30	0.29	0.27
Water Flow Rate, gpm/ft² (l/min/m²)	ASTM D 4491	540,000 ft²	120 (4,885)	110 (4,480)	110 (4,480)	85 (3,460)	60 (2,440)	50 (2,035)
UV Resistance (% retained after 500 hours)	ASTM D 4355	per formulation	70	70	70	70	70	70
Roll Length(1), ft (m)			600 (182)	600 (182)	600 (182)	300 (91)	300 (91)	300 (91)
Roll Width(1), ft (m)			15 (4.6)	15 (4.6)	15 (4.6)	15 (4.6)	15 (4.6)	15 (4.6)
Roll Area, ft² (m²)			9,000 (836)	9,000 (836)	9,000 (836)	4,500 (418)	4,500 (418)	4,500 (418)

NOTES:

- The property values listed are in weaker principal direction. All values listed are Minimum Average Roll Values (MARV) except apparent opening size in mm and UV resistance. Apparent opening size (mm) is a Maximum Average Roll Value. UV is a typical value.
- (1)Roll lengths and widths have a tolerance of ±1%.

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South America	GSE Lining Technology Chile S.A.	Santiago, Chile		56.2.595.4200	Fax: 56.2.595.4290
Asia Pacific	GSE Lining Technology Company Limited	Bangkok, Thailand		66.2.937.0091	Fax: 66.2.937.0097
Europe & Africa	GSE Lining Technology GmbH	Hamburg, Germany		49.40.767420	Fax: 49.40.7674234
Middle East	GSE Lining Technology-Egypt	The 6th of October City, Egypt		20.2.828.8888	Fax: 20.2.828.8889

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ATTACHMENT E

LEACHATE COLLECTION PIPE PERFORATION INFLOW CAPACITY CALCULATIONS

Golder Associates	Subject: Leachate Collection Pipe Perforation Inflow Capacity Calculations		
	Job No.: 083-94322 Ref: Proposed Permit Unit 16, Alvin, TX	Made by: LFG Checked: PCM Reviewed: JBF	Date: 9/3/2009 Sheet: 1 of 2

OBJECTIVE: Evaluate the leachate collection header pipe perforation design based on the maximum anticipated leachate production at the site.

GIVEN: The proposed leachate collection header pipes are 6-inch dia. HDPE pipes.
The proposed perforation schedule is 3 rows at 6-inch spacing, staggered.

diameter of perforations= 3/8 inches

ASSUMPTIONS: The maximum leachate impingement rate was assumed based on 2008 leachate collection data for permitted Unit 2 cells. The data indicates a total maximum leachate rate of 131 cf/acre/day (see Leachate Generation Rate Calculation).

Maximum leachate impingement rate (q_{max}) = 131 cf/acre/day

METHOD:

1. The maximum leachate flow rate per foot of pipe can be calculated using the following equation:

$$Q_{req} = q_{max} * L * 1 \qquad (1)$$

where:

Q_{req} = maximum leachate flow rate (ft^3/sec)

q_{max} = maximum leachate impingement rate ($ft^3/ft^2/sec$) based on 2008 Unit 2 data.

L = maximum length of accepting areas from both sides of the chimney drain (a conservative measurement including sideslope and floor was considered).

= 138 ft

1 = unit foot along the leachate header pipe (ft)

2. The inflow capacity per orifice can be calculated from the following equation:

$$Q_b = C * A * v \qquad (2)$$

where:

Q_b = inflow capacity per orifice, ft^3/sec;

C = discharge coefficient = 0.62 for sharp edged orifices

A = cross-sectional area of a perforation, ft^2

v = limit leachate entrance velocity, ft/sec = 0.1 ft/sec (Driscoll, 1986)

3. The inflow capacity per foot of the leachate collection pipe can be calculated as follows:

$$Q_{in} = Q_b * n \qquad (3)$$

where:

Q_{in} = inflow capacity per foot of the leachate collection pipe ft^3/sec

n = number of orifices per foot of the leachate collection pipe

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Golder Associates	Subject: Leachate Collection Pipe Perforation Inflow Capacity Calculations		
	Job No.: 083-94322 Ref: Proposed Permit Unit 16, Alvin, TX	Made by: LFG Checked: PCM Reviewed: JBF	Date: 9/3/2009 Sheet: 2 of 2

CALCULATION:

Maximum Leachate Generation Rate

Peak daily leachate impingement rate (q_{max}) = 131 ft^3/acre/day

= 3.48E-08 ft^3/ft^2/sec

Max. leachate flow rate per foot of pipe (Eq.1) Q_{req} = **4.80E-06 cfs**

Pipe Perforation Inflow Capacity

Inflow rate per perforation (Eq. 2) Q_b = 4.8E-05 cfs

Total perforations per foot of pipe (for conservative purposes, only the bottom two rows are included) = 2

Inflow rate per foot of pipe (Eq. 3) Q_{in} = **9.5E-05 cfs**

Factor of Safety = Q_{in}/Q_{req} = **19.8** **OK**

CONCLUSION: The proposed leachate collection pipe perforations have adequate inflow capacity for leachate collection and drainage.

REFERENCE:

1. Driscoll, F.G. (1986) "Groundwater and Wells," Second Edition, Johnson Division, St. Paul, MN, p997.

ATTACHMENT F
LEACHATE PIPE SIZING

Golder Associates	Subject: Leachate Pipe Sizing		
	Job No.: 083-94322 Ref: Proposed Permit Unit 16, Alvin, TX	Made by: LFG Checked: PCM Reviewed: JBF	Date: 9/3/2009 Sheet: 1 of 2

OBJECTIVE: Determine the leachate collection header pipe size required to convey the maximum anticipated leachate generated at the site.

GIVEN:

Minimum slope of Header Pipe = 1.00%

Approx. Maximum Contributing Area = 0.746 acres (all cells are the same size)

Maximum Daily Leachate Vol = 131 cf/acre/day

Note: The maximum leachate impingement rate was estimated based on 2008 site leachate collection data for Permit Unit 2 cells. The data indicates a maximum leachate rate of 131 cf/acre/day (see Leachate Generation Rate Calculation).

METHOD:

1. Compare the maximum leachate generation rate to the capacity of the proposed leachate collection header pipe.
2. Use Manning's Equation to determine the pipe capacity:

$$Q = \frac{1.49}{n} S^{1/2} R_h^{2/3} A \quad = \text{Flow Rate}$$

$$R_h = \frac{\text{Area}}{\text{Wetted Perim.}} = \frac{D}{4} \quad = \text{Hydraulic Radius}$$

$$A = \frac{\pi D^2}{4} \quad = \text{Area}$$

Where,

n = Manning's Roughness number
S = Slope
A = Area
Q= Pipe Flow Rate

ASSUMPTIONS: It was conservatively assumed that all leachate flow must enter the pipe: ignore the capacity of the gravel.

CALCULATIONS:

Maximum Leachate Generation Rate

Peak daily leachate generation rate over largest contributing area = 98 cf/day

Converting the peak daily rate to cfs = 0.001 cfs

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Golder Associates	Subject: Leachate Pipe Sizing		
	Job No.: 083-94322	Made by: LFG	Date: 9/3/2009
	Ref: Proposed Permit	Checked: PCM	Sheet: 2 of 2
	Unit 16, Alvin, TX	Reviewed: JBF	

CALCULATIONS Cont.:

Pipe Capacity

Use Manning's Equation to determine the pipe capacity.

For HDPE pipe, Manning's n = 0.011 (Represents long-term conditions)

Pipe OD (in)	Rating	Wall Thickness (in)	Pipe ID (in)	Full Flow Capacity (cfs)	Factor of Safety
6.625	SDR-17 HDPE	0.413	5.799	**0.61**	537
6.625	SDR-26 HDPE	0.270	6.085	**0.69**	610
6.625	SDR-32.5 HDPE	0.216	6.193	**0.72**	640

CONCLUSION: The capacity of a 6-in HDPE pipe SDR 17, SDR 26 or SDR 32.5, at the minimum slope of approximate 1%, exceeds the peak leachate generation rate predicted for a conservative estimate of the worst-case conditions. Therefore, a 6-in diameter HDPE pipe SDR 17, SDR 26, or SDR 32.5 will be adequate for use as the leachate collection header pipe. SDR 17 is the most commonly used for landfills in this area.

REFERENCE: 1.) ISCO Industries, HDPE Pipe Sizes, Product Specifications, 2009.

ATTACHMENT G
LEACHATE PIPE STRUCTURAL DESIGN

Golder Associates	Subject: Leachate Pipe Structural Design		
	Job No 083-94322	Made by LFG	Date 08/26/09
	Ref: Proposed Permit Unit 16	Checked by PCM	Sheet No 1 of 8
	Alvin, TX	Reviewed by JEF	

OBJECTIVE:

Evaluate the structural integrity of the proposed leachate collection pipes and upslope riser pipes. The leachate pipes consist of 6" diameter HDPE header pipe and 18" diameter HDPE upslope riser pipe. The HDPE pipes were analyzed for SDR 17, SDR 26 and SDR 32.5.

METHOD:

The performance of piping under load needs to be considered to verify that the LCS system will function as designed. Design parameters considered in the analysis include:

- pipe material and properties;
- loading; and
- material (soil, gravel, etc.) surrounding the pipe.

Pipe Material and Properties:
Properties such as wall thickness, pipe stiffness, and modulus of elasticity were taken from manufacturer's literature from Plexco, Driscopipe and ISCO-Industries.

Loading:
The average waste density was assumed at 65 lb/cu. ft., and the maximum fill height was determined to be approximately 19 feet for the leachate collection pipes and for the upslope risers. It is important to note that the pipe used in the leachate collection system does not carry the entire load of the overlying waste. As a load is applied to the pipe, the pipe deflects slightly, transferring the load to the bedding material. This phenomenon is referred to as "soil arching" (Gipson and Deschamps, 1996). Research performed by Adams, Muindi, and Selig, documented in "Polyethylene Pipe under High Fill" (1989), indicates that arching is a significant factor in high fills, and can reduce the vertical load acting on the pipe by 80% as compared to the free-field overburden stress. These findings, which were based on a 95-foot high fill and pipes instrumented with strain and earth pressure gauges, are widely accepted.

The calculations have conservatively assumed that no soil arching occurs.

Material Surrounding Pipe:
Based on the current design, the material surrounding the pipes will be clean gravel. Reference 5 presents a range of values on the appropriate soil modulus for clean gravel of 1,000 to 3,000 psi: a value of 3,000 psi is chosen for a high degree of compaction. This value is reasonable given that the gravel will be in a trench under relatively high loads and significantly constrained.

CALCULATIONS / RESULTS:

Using standard pipe design calculation methods for flexible pipe found in literature and manufacturer's guides, pipes were checked under design loads for 3 potential failure modes: wall crushing, wall buckling, and ring deflection (see references below). Factors of safety for crushing are computed by comparing the actual wall area to the wall area required to prevent crushing. Factors of safety for buckling are computed by comparing the actual load to the critical load that would cause buckling. For ring deflection, the predicted deflection is compared to manufacturer's recommendations for acceptable deflection.

See attached sheets for calculations.

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A summary of the leachate pipe structural analyses are presented in Table 1.

Table 1. Pipe Strength and Deflection Calculation Results

Pipe Structural Analyses	6"-dia HDPE Header Pipe			18"-dia Riser Sump Pipe		
	SDR 17	SDR 26	SDR 32.5	SDR 17	SDR 26	SDR 32.5
Wall Crushing Safety Factor	**14.6**	**9.3**	**7.4**	**13.5**	**8.7**	**6.9**
Wall Buckling Safety Factor	**13.9**	**7.3**	**5.2**	**12.9**	**6.8**	**4.9**
Pipe Deflection	**0.68%**	**0.70%**	**0.70%**	**0.73%**	**0.75%**	**0.75%**
Allowable pipe deflection	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*	*5.0%*

CONCLUSIONS:

Review of the results shows that the 6"-dia. and 18"-dia. HDPE pipes with SDR 17, SDR 26, and SDR 32.5 have satisfactory factors of safety and acceptable deflection.

REFERENCES:

1. J.B. Goddard, "Advanced Drainage Systems Technical Report 4.103, Plastic Pipe Design", Columbus, OH, Dec. 1992.

2. AASHTO Section 18 "Soil Thermoplastic Pipe Interaction Systems"

3. Adams, Muindi, and Selig, "Polyethylene Pipe Under High Fill" TRB 1231, Washington, D.C., 1989 Analysis, Design and Behavior of Underground Culverts

4. Wilson-Fahmy, Ragui F., and Koerner, Robert, "Finite Element Analysis of Plastic Pipe Behavior in Leachate Collection and Removal Systems" Geosynthetic Research Institute Report #12, June 1994.

5. Chevron Phillips Chemical Company LP, "Performance Pipe Engineering Manual", March 2003.

6. Chevron Chemical Company, "Plexco Application Note No. 3", October 1991.

7. Gipson, Allen H. Jr., and Deschamps, Jean-Guy, "Soil Box Able to Test 700-foot Heap Leach Heights," 1996.

8. Xuede Qian, Robert M. Koerner and Donald H. Gray *"Geotechnical Aspects of Landfill Design and Construction"* Prentice Hall, New Jersy, 2002

PIPE STRENGTH AND STABILITY

HDPE PIPE Property	SDR 17	SDR 26	SDR 32.5	
Diameter =	6	6	6	inches (smooth wall HDPE pipes)
Wall Thickness =	0.413	0.270	0.216	inches (smooth wall HDPE pipes)
Outside Diameter =	6.625	6.625	6.625	inches (smooth wall HDPE pipes)

OBJECTIVE: Determine the structural stability of the leachate collection pipe. The maximum overburden pressure will be calculated and the pipe will be designed to withstand the maximum load.

METHODOLOGY: The analysis determines the vertical loads acting on the pipe and will calculate the stress induced at the top of the pipe. To be conservative, the often significant effect of soil arching was neglected for this calculation. The pipe will be evaluated for wall crushing, wall buckling, and ring deflection.

The deflection of the pipe will have negligible effect upon the flow area.

CALCULATIONS:

- Determine the overburden pressure on the pipe

Waste

Thickness =	19	feet
Density =	65	pcf

Final Cover soil

Thickness =	3.5	feet
Density =	110	pcf

'==

Total Overburden Pressure =	1,620	psf
conversion =	11.3	psi

(no arching effects assumed)

- Apply perforation correction factor

A correction factor must be applied to the overburden stress to compensate for the perforations of the pipe. The following equation calculates the design stress (PD) that the pipe must be able to withstand.

$P_D = Po * 12/(12 - n*d)$

where: P_D = design stress, psi

P_O = overburden stress, psi

n = number of perforated holes per row per foot of pipe (Reference 8). For conservative purposes, the total numbers of perforations above and below the pipe spring line are compared and the greater number is used for analysis.

d = diameter of perforated holes on the pipe, inch

Diameter of perforations (d) = 0.375 inch

Number of holes/foot of pipe (n) = 4 (max)

P_O = 11.3 psi

P_D = 12.9 psi

Golder Associates	SUBJECT: 6" HDPE Pipe Structural Design			
	Job No.: 083-94322	Made by: LFG	Date: 8/26/2009	
	Ref: Proposed Permit Unit 16, Alvin, TX	Checked: pcm	Sheet: 4	of 8
		Reviewed: JSP		

CALCULATIONS Cont:

Crushing Analysis

- Determine compressive stress on pipe (Ref. 5):

$S_A = (SDR - 1)/2 * P_T$

S_A = actual compressive stress, psi

SDR = standard dimension ratio of pipe

$P_D = P_T$ = external (overburden) design pressure, psi

SDR	S_A (psi) psi
17	102.9
26	160.7
32.5	202.5

-Determine Factor of Safety against wall crushing:

FS = 1500 psi/S_A, where 1500 psi is the compressive yield strength of Driscopipe.

SDR	FS	
17	14.6	OK
26	9.3	OK
32.5	7.4	OK

Buckling Analysis

- Determine maximum load before wall buckling will occur (Ref. 5):

$P_c = 2.32(E)/SDR^3$

P_c = Critical Collapse Differential Pressure

E = stress and time dependent tensile modulus of elasticity = 35,000 (approximate), Ref. 5.

SDR	P_c (psi)
17	16.53
26	4.62
32.5	2.37

$P_{cb} = 0.8[E'Pc]^{0.5}$

E' = Soil Modulus (psi) (Ref. 5) = 3000 psi

SDR	P_{cb} (psi)	Safety Factor (P_{cb}/P_D)	
17	178.14	13.9	OK
26	94.18	7.3	OK
32.5	67.39	5.2	OK

Ring Deflection Analysis

- Determine maximum pipe deflection using modified Iowa Eqn. (Ref. 4)

$$dX/D = D_L kP/[(EI/r^3)+(0.061E')]*100\%$$

$$PS = 6.7EI/r^3$$

$$dX/D = D_L*[k*P/[(PS/6.7)+(0.061E')]]*100\%$$

CALCULATIONS Cont:

Ring Deflection Analysis Cont.

	SDR 17	26	32.5	
D_L = Deflection lag factor (1.0 from Ref. 4, p.12)	1.0	1.0	1.0	
k = bedding constant (from Ref. 4, p.15)	0.1	0.1	0.1	
r = pipe radius in inches	3	3	3	in
D = pipe diameter in inches	6.625	6.625	6.625	in
E = modulus of elasticity of pipe material, psi	35000	35000	35000	psi
I = moment of inertia of pipe wall per unit length ($t^3/12$)	0.0059	0.0016	0.0008	in^4/in
E' = modulus of soil reaction, assumed (Ref 5) =	3000	3000	3000	psi
PS = pipe stiffness in lb/in/in	45.9	12.0	6.0	psi
P = design load per unit area of pipe, psi	12.9	12.9	12.9	lb/in

SDR	**dX/D**	**Allowable Deflection (Ref. 5)**	
17	**0.68%**	**5.0%**	**OK**
26	**0.70%**	**5.0%**	**OK**
32.5	**0.70%**	**5.0%**	**OK**

CONCLUSION: The HDPE pipe will be able to withstand the proposed overburden loads under the waste material. The following safety factors were computed for the leachate collection pipe:

6" diameter HDPE Pipe:	SDR 17	SDR 26	SDR 32.5	
Wall Crushing Safety Factor:	**14.6**	**9.3**	**7.4**	OK
Wall Buckling Safety Factor:	**13.9**	**7.3**	**5.2**	OK
Pipe Deflection:	**0.68%**	**0.70%**	**0.70%**	OK
Allowable Deflection (Ref. 5):	**5%**	**5%**	**5%**	

PIPE STRENGTH AND STABILITY

HDPE PIPE Property	SDR 17	SDR 26	SDR 32.5	
Diameter =	18	18	18	inches (smooth wall HDPE pipes)
Wall Thickness =	1.123	0.734	0.587	inches (smooth wall HDPE pipes)
Outside Diameter =	18	18	18	inches (smooth wall HDPE pipes)

OBJECTIVE: Determine the structural stability of the leachate collection pipe. The maximum overburden pressure will be calculated and the pipe will be designed to withstand the maximum load.

METHODOLOGY: The analysis determines the vertical loads acting on the pipe and will calculate the stress induced at the top of the pipe. To be conservative, the often significant effect of soil arching was neglected for this calculation. The pipe will be evaluated for wall crushing, wall buckling, and ring deflection.

The deflection of the pipe will have negligible effect upon the flow area.

CALCULATIONS:

- Determine the overburden pressure on the pipe

Waste

Thickness =	19	feet
Density =	65	pcf

Final Cover soil

Thickness =	3.5	feet
Density =	110	pcf

'===

Total Overburden Pressure =	1,620	psf
conversion =	11.3	psi

(no arching effects assumed)

- Apply perforation correction factor

A correction factor must be applied to the overburden stress to compensate for the perforations of the pipe. The following equation calculates the design stress (PD) that the pipe must be able to withstand.

$P_D = Po * 12/(12 - n*d)$

where: P_D = design stress, psi

P_O = overburden stress, psi

n = number of perforated holes per row per foot of pipe (Reference 8). For conservative purposes, the total numbers of perforations above and below the pipe spring line are compared and the greater number is used for analysis.

d = diameter of perforated holes on the pipe, inch

Diameter of perforations (d) = 0.375 inch

Number of holes/foot of pipe (n) = 6 (max)

P_O = 11.3 psi

P_D = 13.8 psi

CALCULATIONS Cont:

Crushing Analysis

- Determine compressive stress on pipe (Ref. 5):

S_A = (SDR -1)/2*P_T

S_A = actual compressive stress, psi

SDR = standard dimension ratio of pipe

P_D = P_T = external (overburden) design pressure, psi

SDR	S_A (psi) psi
17	110.8
26	173.1
32.5	218.1

-Determine Factor of Safety against wall crushing:

FS = 1500 psi/S_A, where 1500 psi is the compressive yield strength of Driscopipe.

SDR	FS	
17	14	OK
26	9	OK
32.5	7	OK

Buckling Analysis

- Determine maximum load before wall buckling will occur (Ref. 5):

P_c = 2.32(E)/SDR^3

P_c = Critical Collapse Differential Pressure

E = stress and time dependent tensile modulus of elasticity = 35,000 (approximate) , Ref. 5.

SDR	P_c (psi)
17	16.53
26	4.62
32.5	2.37

P_{cb} = 0.8[E'Pc]^0.5

E' = Soil Modulus (psi) (Ref. 5) = 3000 psi

SDR	P_{cb} (psi)	Safety Factor (P_{cb}/P_D)	
17	178.14	13	OK
26	94.18	7	OK
32.5	67.39	5	OK

Ring Deflection Analysis

- Determine maximum pipe deflection using modified Iowa Eqn. (Ref. 4)

$$dX/D = D_L kP/[(EI/r^3)+(0.061E')]*100\%$$

$$PS = 6.7EI/r^3$$

$$dX/D = D_L*[k*P/[(PS/6.7)+(0.061E')]]*100\%$$

CALCULATIONS Cont:

Ring Deflection Analysis Cont.

	SDR 17	26	32.5	
D_L = Deflection lag factor (1.0 from Ref. 4, p.12)	1.0	1.0	1.0	
k = bedding constant (from Ref. 4, p.15)	0.1	0.1	0.1	
r = pipe radius in inches	9	9	9	in
D = pipe diameter in inches	18	18	18	in
E = modulus of elasticity of pipe material, psi	35000	35000	35000	psi
I = moment of inertia of pipe wall per unit length ($t^3/12$)	0.1180	0.0330	0.0169	in^4/in
E' = modulus of soil reaction, assumed (Ref 5) =	3000	3000	3000	psi
PS = pipe stiffness in lb/in/in	46.1	12.0	6.0	psi
P = design load per unit area of pipe, psi	13.8	13.8	13.8	lb/in

SDR	**dX/D**	**Allowable Deflection (Ref. 5)**	
17	**0.73%**	**5.0%**	**OK**
26	**0.75%**	**5.0%**	**OK**
32.5	**0.75%**	**5.0%**	**OK**

CONCLUSION:

The HDPE pipe will be able to withstand the proposed overburden loads under the waste material. The following safety factors were computed for the leachate collection pipe:

18" diameter HDPE Pipe:	**SDR 17**	**SDR 26**	**SDR 32.5**	
Wall Crushing Safety Factor:	**13.5**	**8.7**	**6.9**	OK
Wall Buckling Safety Factor:	**12.9**	**6.8**	**4.9**	OK
Pipe Deflection:	**0.73%**	**0.75%**	**0.75%**	OK
Allowable Deflection (Ref. 5):	**5%**	**5%**	**5%**	

ATTACHMENT H

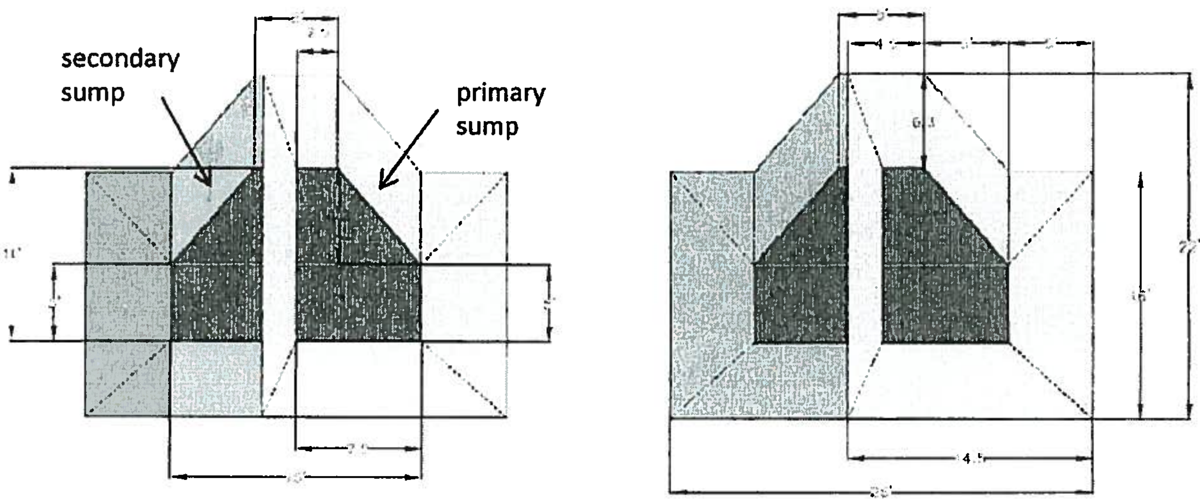
SUMP VOLUME CALCULATION

Golder Associates	Subject: Sumps Volume Calculation		
	Job No.: 083-94322	Made by: LFG	Date: 9/3/2009
	Ref: Proposed	Checked: CEC	Sheet: 1 of 3
	Permit Unit 16, Alvin, TX	Reviewed: JBF	

OBJECTIVE: I) Calculate the volume of the primary & secondary leachate collection system sump.
II) Determine the minimum time to fill the primary sump.

GEOMETRY:

Plan view of the primary and secondary leachate collection system sumps



Base dimensions

Top dimensions

GIVEN:

1) 3H:1H and 2.5H:1H sideslopes in sump.
2) Sump gravel porosity = 0.3 (Ref. 1).
3) Sump depth = 2 ft
4) The maximum leachate impingement rate was assumed based on 2008 site records of leachate generation rate for permitted cells. Data evaluation indicates a maximum leachate rate of 131 cf/acre/day (see Leachate Generation Rate Calculation).

METHODOLOGY:

1.) The effective storage volume of the sumps is estimated as the volume of frustum of pyramid using the following equation:

Frustrum of Pyramid

$$V = \frac{D^* (A_1 + A_2 + (A_1{}^*A_2)^{1/2})}{3}$$

where, A_1 = area at base of sump
A_2 = area at top of sump
D = depth of sump

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CALCULATION:

I) Sumps Effective Volume

Primary leachate collection system sump

A_1 = (7.5 ft * 5 ft) + (2.5 ft * 6.3 ft) + (5 ft * 6.3 ft)*1/2

A_1 = 69.0 ft^2

A_2 = (14.5 ft * 16 ft) + (4.5 ft * 6.3 ft) + (5 ft * 6.3 ft)*1/2

A_2 = 276.1 ft^2

D= 2 ft

Total Volume	Effective (Void) Volume	
(ft^3)	(ft^3)	gallons
322	97	723

The primary sump has a volume (capacity) of 97 cubic feet or 723 gallons.

Secondary leachate collection system sump

Total Volume	Effective (Void) Volume	
(ft^3)	(ft^3)	gallons
247	74	554

The secondary sump has a volume (capacity) of 74 cubic feet or 554 gallons.

II) Time to Fill Sump

Conservatively, the maximum leachate generation rate was assumed as 131 cf/acre/day.

The maximum leachate generation rate is:

q_{max} = 131 ft^3/acre/day

maximum cell size (all cell are the same size) = 0.746 acres

maximum flow rate into sump = 731 gal/day

= 0.5 gpm

Assuming 9 inches of leachate remains at the base of the sump, the remaining void volume in the sump is =

543 gal

The time required to fill the sump when 9 inches of leachate remains at the sump base

= 1069.0 minutes

= 17.8 hr

CONCLUSION: Each primary leachate collection sump will have a total capacity of approximately 723 gallons. Under the maximum, i.e. peak daily leachate generation rate, the empty sump will be filled to the crest in approximately 18 hours.

Each secondary leachate collection sump will have a total capacity of approximately 554 gallons. The sumps are designed to be used in conjunction with a pumping schedule necessary to maintain less than 1-ft of head on the liner.

REFERENCE: Freeze, R.A. and Cherry, J.A. (1979). *Groundwater*. Prentice Hall, 604 p.

GSI Job No. G-3379
Issued: 31 December 2009

ATTACHMENT V.8
ENGINEERING REPORT FOR
NEW LANDFILL (PERMIT UNIT 16)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

APPENDIX V.8.7

Surface Water Drainage Analyses

Issued: 31 December 2009

GSI ENVIRONMENTAL

APPENDIX V.8.7
SURFACE WATER DRAINAGE ANALYSES
PERMIT UNIT 16 LANDFILL
CHOCOLATE BAYOU FACILITY
BRAZORIA COUNTY, TEXAS

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

Prepared by:

Golder Associates

Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, Texas 77073

Texas Registration Number: F-2578

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12/30/09
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Subject	Ascend Chocolate Bayou Plant	Made by	MBR	Job	083-94322
Proposed Permit Unit 16 Landfill		Checked by	TL	Date	9/17/2009
Conceptual Hydrology and Hydraulics		Approved by	PM	Sheet	1 of 36

OBJECTIVE:

Size perimeter channels and culverts to convey stormwater flows resulting from the 100-year, 24-hour design storm event on the proposed Permit Unit 16 Landfill (South Landfill). Design channels to discharge into New Bayou on the west side of Permit Unit 2.

METHOD:

Subbasins are delineated based on proposed landfill conceptual plans. Kinematic Wave methodology along with SCS Curve Number method is used to model the landfill subbasins in HEC-HMS (USACE, 2008). Parameters including subbasin area, loss parameter, plane geometry, and routing information are input into HEC-HMS to develop peak flows for the Landfill. Manning's n and overland flow roughness values used in calculating subbasin travel times are presented in Attachment A. Hydrologic routing paths are developed based on subbasin delineation and proposed flow paths. Muskingum-Cunge method used to route subbasin runoff through perimeter channels. Channel sizing is performed using a spreadsheet that solves for normal depth using manning's equation. Culvert sizing is performed using HY8 culvert sizing software (FHWA, 2009).

Due to the small total area, peak flows from the HEC-HMS model are compared with peak flows calculated using the rational method. The Brazoria County Drainage Criteria Manual (Klotz, 2003) is used to calculate times of concentration, rainfall intensity, runoff coefficients, and peak flows for the rational method.

DATA AND ASSUMPTIONS:

- 100-year, 24-hour precipitation depth: 13.48 inches (TXDOT, 2009)
- The rainfall hyetograph assumed an SCS Type III storm distribution.
- Kinematic wave overland flow roughness values (See Attachment A):

Average Grass Cover	Dirt Roads
0.3	0.1

- SCS Curve Number rationale (SCS, 1986):

Grassy Areas (Meadow, HSG D.)	Dirt Roads (HSG D)	Impervious Areas
78	89	98

- Manning's roughness coefficient for channel lining:

Channel Lining	Manning's n for Stability	Manning's n for Capacity
Grass	0.030	0.033

- All channels designed with a minimum of 0.5 foot freeboard.
- Maximum velocity for grass-lined channels is 5 feet per second.
- Culvert sizing calculations assumed smooth-wall HDPE pipes (Manning's n = 0.012) with square-edge headwall entrances (See Figure 3).
- Rational method runoff coefficients are shown in Attachment E.

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CALCULATIONS:

Figure 1 presents the subbasin delineations. A routing schematic displaying the routing flow paths is presented as Figure 2 and is included in the attached HEC-HMS output (Attachment B). Table 1 presents the area-weighted curve number calculations for each basin as well as NRCS runoff volumes for each. Table 2 presents area-weighted curve number calculations for each kinematic wave flow plane. The NRCS soil survey information used in determining curve numbers is presented as Attachment C. Table 3 shows the Kinematic Wave transform parameters for each subbasin. Table 4 includes a summary of the HEC-HMS model output. The "Time of Peak" column in Table 4 represents a hypothetical future rainfall event. The actual date is unimportant, but the time is provided in the HEC-HMS model output for the purpose of comparing the lag between the peaks of the various hydrographs. Table 5 provides channel geometry and flow information for the landfill perimeter channels. HY8 culvert sizing output files are presented in Attachment D. Rational method peak flow calculations are included in Attachment E.

CONCLUSIONS/RESULTS:

All perimeter channels are trapezoidal channels with varying widths and depths (Table 5). Road crossings were designed with HDPE culverts as shown in the table below (Refer to Attachment D):

Culvert Crossing ID	Pipe Dia. (inches)	No. of Culverts	Length (ft)	Slope (ft/ft)	Depth of Cover (ft)
P1	36	3	60	0.003	2
P2	36	2	60	0.003	2

Culverts manufactured from materials with similar hydraulic performance may be substituted.

The calculated rational method peak flows are 20 to 35 percent smaller than the corresponding peak flows from the HEC-HMS model (Refer to Attachment E).

REFERENCES:

HEC-HMS Hydrologic Modeling System [computer software] October 2008 US Army Corps of Engineers Version 3.3.0

Klotz Associates. 2003. *Final Brazoria County Drainage Criteria Manual.* Klotz Associates Project No. 25906, November 2003.

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Texas Department of Transportation (TXDOT). 2009. *Hydraulic Design Manual.* March 2009.

U.S. Federal Highway Administration (FHWA). 2009. HY8 - Culverts Version 7.2 FHWA Culvert Analysis. Washington, DC. : FHA Office of Technology Applications.

U. S. Soil Conservation Service (USSCS). 1986. *Urban Hydrology for Small Watersheds, 2nd edition* (USSCS Technical Release Number 55). Washington D.C.: United States Department of Agriculture.

TABLE 1
SUBBASIN SUMMARY TABLE

Ascend Permit Unit 16 Landfill
Brazoria County, Texas
Project Number: 083-94322

Date:	9/17/09
By:	MBR
Chkd:	TE 9/17
Apprvd:	

Design Storm 100 -Year Recurrence Interval

Storm Duration (hours)	2-Year Depth (inches)	100 -Year Depth (inches)	Storm Distribution
24	5.05	13.48	III

Subbasin ID	Subbasin Area (ft²)	Subbasin Area (acres)	Subbasin Area (sq mile)	CN = 78 Grassy Areas (Meadow - HSG D) (acres)	CN = 98 Impervious (Roofs, Open Water) (acres)	CN = 89 Dirt Roads (HSG D) (acres)	Composite SCS Curve No.	S = 1000/CN - 10	Unit Runoff Q (in)	Runoff Volume (ac-ft)	Runoff Volume (ft³)
P1-C	156,271	3.59	0.0056	3.05	0.54		CN = 81	2.35	11.02	3.30	143,554
P1-E	45,263	1.04	0.0016	0.75	0.16	0.13	CN = 82	2.20	11.16	0.97	42,103
P1-N	113,551	2.61	0.0041	2.22	0.27	0.12	CN = 81	2.35	11.02	2.39	104,311
P1-S	129,092	2.96	0.0046	2.22	0.26	0.48	CN = 82	2.20	11.16	2.76	120,078
P1-W	47,643	1.09	0.0017	0.96		0.13	CN = 79	2.66	10.74	0.98	42,652
P2-C	62,152	1.43	0.0022	1.43			CN = 78	2.82	10.60	1.26	54,906
P2-E	50,254	1.15	0.0018	0.90		0.26	CN = 80	2.50	10.88	1.05	45,580
P2-N	48,702	1.12	0.0017	1.07		0.05	CN = 78	2.82	10.60	0.99	43,024
P2-S	59,131	1.36	0.0021	1.08		0.28	CN = 80	2.50	10.88	1.23	53,631
P2-W	45,367	1.04	0.0016	0.91		0.13	CN = 79	2.66	10.74	0.93	40,615
E.DIT	201,742	4.63	0.0072	3.86	0.29	0.48	CN = 80	2.50	10.88	4.20	182,976
W.DIT	334,990	7.69	0.0120	5.86	0.81	1.01	CN = 82	2.20	11.16	7.15	311,599
Total:	1,294,159	29.71	0.0464							27.20	1,185,028

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TABLE 2
KINEMATIC WAVE PLANE SUBBASIN SUMMARY TABLE

Ascend Permit Unit 16 Landfill
Brazoria County, Texas
Project Number: 083-94322

Date:	9/17/09
By:	MBR
Chkd:	TE 9/17
Apprvd:	JM

			CN = 78	CN = 98	CN = 89	
Subbasin ID	Plane Area (ft^2)	Plane Area (acres)	Grassy Areas (Meadow - HSG D) (acres)	Impervious (Roofs, Open Water) (acres)	Dirt Roads (HSG D) (acres)	Composite SCS Curve No.
P1-C (Plane 1)	77,914	1.79	1.52	0.27		CN = 81
P1-C (Plane 2)	78,357	1.80	1.53	0.27		CN = 81
P1-E (Plane 1)	15,429	0.35	0.22		0.13	CN = 82
P1-E (Plane 2)	29,835	0.68	0.53	0.16		CN = 83
P1-N (Plane 1)	61,007	1.40	1.28		0.12	CN = 79
P1-N (Plane 2)	52,544	1.21	0.94	0.27		CN = 82
P1-S (Plane 1)	60,888	1.40	0.92		0.48	CN = 82
P1-S (Plane 2)	68,204	1.57	1.30	0.26		CN = 81
P1-W (Plane 1)	17,423	0.40	0.27		0.13	CN = 82
P1-W (Plane 2)	30,220	0.69	0.69			CN = 78
P2-C (Plane 1)	31,132	0.71	0.71			CN = 78
P2-C (Plane 2)	31,020	0.71	0.71			CN = 78
P2-E (Plane 1)	25,889	0.59	0.34		0.26	CN = 83
P2-E (Plane 2)	24,365	0.56	0.56			CN = 78
P2-N (Plane 1)	32,670	0.75	0.70		0.05	CN = 79
P2-N (Plane 2)	16,031	0.37	0.37			CN = 78
P2-S (Plane 1)	32,617	0.75	0.47		0.28	CN = 82
P2-S (Plane 2)	26,514	0.61	0.61			CN = 78
P2-W (Plane 1)	15,211	0.35	0.22		0.13	CN = 82
P2-W (Plane 2)	30,156	0.69	0.69			CN = 78
E.DIT (Plane 1)	103,722	2.38	1.75	0.15	0.48	CN = 81
E.DIT (Plane 2)	98,020	2.25	2.11	0.15		CN = 79
W.DIT (Plane 1)	216,933	4.98	3.56	0.41	1.01	CN = 82
W.DIT (Plane 2)	118,057	2.71	2.30	0.41		CN = 81
Total:	1,895,047	43.50	43.50			

Table 3
Subbasin Kinematic Wave Transform Parameters

Ascend Permit Unit 16 Landfill
Brazoria County, Texas
Project Number: 083-94322

Date:	9/17/09
By:	MBR
Chkd:	TE 9/17
Apprvd:	

	KW Properties									Plane 1				Plane 2				
BASIN ID	Area (ft2)	Area (ac)	Area (mi²)	Plane 1 Area (ft²)	% Plane 1 Area	Collector Len. (ft)	Collector Slope (ft/ft)	Channel Len. (ft)	Channel Slope (ft/ft)	Length (ft)	Slope (ft/ft)	% Area	Roughness	Length (ft)	Slope (ft/ft)	Plane 2 Area (ft²)	% Area	Roughness
P1-C	156,271	3.59	0.00561	77,914	50%	385	0.003	245	0.003	110	0.093	50%	0.20	110	0.093	78,357	50%	0.20
P1-E	45,263	1.04	0.00162	15,429	34%			470	0.003	30	0.003	34%	0.10	131	0.079	29,835	66%	0.20
P1-N	113,551	2.61	0.00407	61,007	54%	420	0.003	160	0.003	50	0.003	54%	0.30	110	0.093	52,544	46%	0.20
P1-S	129,092	2.96	0.00463	60,888	47%	420	0.003	110	0.003	80	0.003	47%	0.10	110	0.093	68,204	53%	0.20
P1-W	47,643	1.09	0.00171	17,423	37%			470	0.003	50	0.003	37%	0.10	131	0.079	30,220	63%	0.30
P2-C	62,152	1.43	0.00223	31,132	50%			375	0.003	110	0.093	50%	0.30	110	0.093	31,020	50%	0.30
P2-E	50,254	1.15	0.00180	25,889	52%			470	0.003	50	0.003	52%	0.10	110	0.093	24,365	48%	0.30
P2-N	48,702	1.12	0.00175	32,670	67%			395	0.003	50	0.003	67%	0.30	110	0.093	16,031	33%	0.30
P2-S	59,131	1.36	0.00212	32,617	55%			400	0.003	80	0.003	55%	0.10	110	0.093	26,514	45%	0.30
P2-W	45,367	1.04	0.00163	15,211	34%			470	0.003	30	0.003	34%	0.10	131	0.079	30,156	66%	0.30
E.DIT	201,742	4.63	0.00724	103,722	51%			840	0.0016	123	0.040	51%	0.10	115	0.044	98,020	49%	0.30
W.DIT	334,990	7.69	0.01202	216,933	65%			1765	0.00178	123	0.059	65%	0.10	58	0.121	118,057	35%	0.30

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TABLE 4
FLOW RESULTS FROM HEC-HMS

Ascend Permit Unit 16 Landfill
Brazoria County, Texas
Project Number: 083-94322

Date:	9/17/09
By:	MBR
Chkd:	TE 9/17
Apprvd:	PM

HEC-HMS Basin Model:	Final LayoutR1
HEC-HMS Met. Model:	100-YR 24-HR
HEC-HMS Control Specs:	48-HR 5-MIN

Hydrologic Element	Drainage Area (sq mile)	Peak Discharge (cfs)	Time of Peak	Total Volume (ac-ft)
E.DIT	0.017	93.4	07Sep2121, 03:05	9
J-P1	0.018	112.7	07Sep2121, 03:05	9.4
J-P1C	0.010	66.6	07Sep2121, 03:05	5.3
J-P1-D	0.034	206.1	07Sep2121, 03:05	18.4
J-P2	0.009	59.7	07Sep2121, 03:05	5.4
J-P2E	0.006	40	07Sep2121, 03:05	3.5
J-P2N	0.003	20.7	07Sep2121, 03:05	1.9
P1-C	0.006	36.9	07Sep2121, 03:05	2.8
P1-E	0.002	10.9	07Sep2121, 03:05	1
P1-N	0.004	26	07Sep2121, 03:05	2.1
P1-S	0.005	30.2	07Sep2121, 03:05	2.5
P1-W	0.002	10.9	07Sep2121, 03:05	1
P2-C	0.002	14.3	07Sep2121, 03:05	1.2
P2-E	0.002	12.2	07Sep2121, 03:05	1.1
P2-N	0.002	10.7	07Sep2121, 03:05	1
P2-S	0.002	13.7	07Sep2121, 03:05	1.2
P2-W	0.002	10.4	07Sep2121, 03:05	0.9
R-P1C	0.005	29.8	07Sep2121, 03:05	2.5
R-P1E	0.002	10.6	07Sep2121, 03:05	1
R-P1N	0.010	65.4	07Sep2121, 03:05	5.3
R-P1W	0.002	10.7	07Sep2121, 03:05	1
R-P2EA	0.002	13.5	07Sep2121, 03:05	1.2
R-P2EB	0.006	38.9	07Sep2121, 03:05	3.5
R-P2W	0.002	10	07Sep2121, 03:05	0.9
Sink-1	0.046	247.5	07Sep2121, 03:10	25.2
W.DIT	0.046	247.5	07Sep2121, 03:10	25.2

Table 5
Channel Hydraulic Calculations

Ascend Permit Unit 16 Landfill
Brazoria County, Texas
PROJECT NO.: 083-94322

Date:	9/2/09
By:	MBR
Chkd:	TE 9/17
Apprvd:	

			Channel Design Geometry										Channel Roughness Parameters			
Reach Designation	Q100 from HEC-HMS (cfs)	HEC HMS Element ID for Q	Approx. Channel Length (ft)	Down-stream Reach	Design Upstream Invert Elev. (ft)	Design Down-stream Invert Elev. (ft)	Bed Slope (ft/ft)	Left Side Slope (H:1V)	Right Side Slope (H:1V)	Bottom Width (ft)	Minimum Channel Design Depth (ft)	Design Channel Lining		Mannings 'n' for Capacity (Depth Calculation)	Mannings 'n' for Stability (Velocity Calculation)
R-P1C	66.6	J-P1C	232	R-P1N	9.05	8.35	0.0030	2.0	2.0	12	2.2	G	Grass-lined	0.035	0.030
R-P1N	112.7	J-P1	50	P1 Culvert	8.35	8.20	0.0030	2.0	2.0	12	2.7	G	Grass-lined	0.035	0.030
R-P1S	30.2	P1-S	232	R-P1C	9.74	9.05	0.0030	2.0	2.0	12	1.6	G	Grass-lined	0.035	0.030
R-P1E	10.9	P1-E	464	R-P1NE	10.88	9.48	0.0030	2.0	2.0	12	1.1	G	Grass-lined	0.035	0.030
R-P1NW	23.9	N/A[(1)]	378	R-P1N	9.48	8.35	0.0030	2.0	2.0	12	1.5	G	Grass-lined	0.035	0.030
R-P1NE	23.9	N/A[(1)]	378	R-P1N	9.48	8.35	0.0030	2.0	2.0	12	1.5	G	Grass-lined	0.035	0.030
R-P1CW	18.5	N/A[(1)]	378	R-P1C	10.18	9.05	0.0030	2.0	2.0	10	1.4	G	Grass-lined	0.035	0.030
R-P1CE	18.5	N/A[(1)]	378	R-P1C	10.18	9.05	0.0030	2.0	2.0	10	1.4	G	Grass-lined	0.035	0.030
R-P1SW	15.1	N/A[(1)]	189	R-P1S	10.31	9.74	0.0030	2.0	2.0	14	1.15	G	Grass-lined	0.035	0.030
R-P1SE	15.1	N/A[(1)]	378	R-P1S	10.88	9.74	0.0030	2.0	2.0	14	1.15	G	Grass-lined	0.035	0.030
R-P1OUT	112.7	J-P1	65	R-POUT	8.20	8.00	0.0030	2.0	2.0	16	2.5	G	Grass-lined	0.035	0.030
R-P1W	10.9	P1-W	464	R-P1NW	10.88	9.48	0.0030	2.0	2.0	14	1.1	G	Grass-lined	0.035	0.030
R-P2C	14.3	P2-C	378	R-P2EB	10.18	9.05	0.0030	2.0	2.0	10	1.3	G	Grass-lined	0.035	0.030
R-P2N	20.7	J-P2N	378	R-P2EC	9.48	8.35	0.0030	2.0	2.0	12	1.4	G	Grass-lined	0.035	0.030
R-P2S	13.7	P2-S	378	R-P2EA	10.88	9.74	0.0030	2.0	2.0	14	1.15	G	Grass-lined	0.035	0.030
R-P2EA	19.8	N/A[(1)]	232	R-P2EB	9.74	9.05	0.0030	2.0	2.0	14	1.3	G	Grass-lined	0.035	0.030
R-P2EB	40.0	J-P2E	232	R-P2EC	9.05	8.35	0.0030	2.0	2.0	16	1.6	G	Grass-lined	0.035	0.030
R-P2EC	59.7	J-P2	50	P2 Culvert	8.35	8.20	0.0030	2.0	2.0	16	1.8	G	Grass-lined	0.035	0.030
R-P2W	10.4	P2-W	464	R-P2N	10.88	9.48	0.0030	2.0	2.0	10	1.1	G	Grass-lined	0.035	0.030
East Ditch	59.7	J-P2	772	West Ditch	8.00	6.65	0.00175	3.0	3.0	16	2.1	G	Grass-lined	0.035	0.030
West Ditch	206.1	J-P1-D	1800	Bayou	6.65	3.50	0.00175	3.0	3.0	16	6.3	G	Grass-lined	0.035	0.030

N/A[(1)] - Exact HEC-HMS Element ID's are not contained in the model, but peak flows from appropriate ID's are added and/or ratioed by area for other reaches

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Table 5
Channel Hydraulic Calculations

Ascend Permit Unit 16 Landfill
Brazoria County, Texas
PROJECT NO.: 083-94322

Date:	9/2/09
By:	MBR
Chkd:	[illegible]
Apprvd:	[illegible]

Assumed Ground Elev.: 12 ft (amsl)

Reach Designation	Q100 from HEC-HMS (cfs)	Hydraulic Calculations: Maximum Velocity (ft/sec)	Maximum Normal Flow Depth (ft)	Froude Number	Normal Depth Shear Stress (lb/ft^2)	Stream Power (W/m^2)	Top Width of Flow (ft)	Design Invert Based Upstream Top Width of Channel (ft)	Design Invert Based Downstream Top Width of Channel (ft)	Available Width (ft)	Available Freeboard (ft)	Min. Up-stream TOC Elev. (ft)	Min. Down-stream TOC Elev. (ft)
R-P1C	66.6	3.0	1.60	0.48	0.30	13.2	18.4	23.8	26.6	30.0	0.60	11.2	10.6
R-P1N	112.7	3.6	2.15	0.50	0.40	20.9	20.6	26.6	27.2	30.0	0.55	11.1	10.9
R-P1S	30.2	2.3	1.02	0.46	0.19	6.5	16.1	21.0	23.8	30.0	0.58	11.3	10.6
R-P1E	10.9	1.6	0.56	0.42	0.10	2.5	14.2	16.5	22.1	23.0	0.54	12.0	10.6
R-P1NW	23.9	2.2	0.89	0.45	0.17	5.2	15.6	22.1	26.6	50.0	0.61	11.0	9.9
R-P1NE	23.9	2.2	0.89	0.45	0.17	5.2	15.6	22.1	26.6	50.0	0.61	11.0	9.9
R-P1CW	18.5	2.1	0.85	0.44	0.16	4.7	13.4	17.3	21.8	25.0	0.55	11.6	10.4
R-P1CE	18.5	2.1	0.85	0.44	0.16	4.7	13.4	17.3	21.8	25.0	0.55	11.6	10.4
R-P1SW	15.1	1.8	0.62	0.43	0.12	3.0	16.5	20.8	23.0	25.0	0.53	11.5	10.9
R-P1SE	15.1	1.8	0.62	0.43	0.12	3.0	16.5	18.5	23.0	25.0	0.53	12.0	10.9
R-P1OUT	112.7	3.4	1.86	0.50	0.35	17.2	23.4	31.2	32.0	50.0	0.64	10.7	10.5
R-P1W	10.9	1.6	0.51	0.41	0.10	2.2	16.1	18.5	24.1	25.0	0.59	12.0	10.6
R-P2C	14.3	1.9	0.73	0.43	0.14	3.7	12.9	17.3	21.8	25.0	0.57	11.5	10.3
R-P2N	20.7	2.1	0.82	0.44	0.15	4.6	15.3	22.1	26.6	50.0	0.58	10.9	9.8
R-P2S	13.7	1.7	0.59	0.42	0.11	2.7	16.3	18.5	23.0	25.0	0.56	12.0	10.9
R-P2EA	19.6	1.9	0.73	0.44	0.14	3.8	16.9	23.0	25.8	30.0	0.57	11.0	10.3
R-P2EB	40.0	2.4	1.02	0.46	0.19	6.7	20.1	27.8	30.6	33.0	0.58	10.6	10.0
R-P2EC	59.7	2.8	1.29	0.47	0.24	9.7	21.2	30.6	31.2	33.0	0.51	10.2	10.0
R-P2W	10.4	1.7	0.60	0.42	0.11	2.8	12.4	14.5	20.1	20.5	0.50	12.0	10.6
East Ditch	59.7	2.2	1.47	0.37	0.16	5.1	24.8	40.0	46.1	50.0	0.63	10.1	8.8
West Ditch	206.1	3.2	2.88	0.40	0.31	14.8	33.3	46.1	67.0	50.0	2.42	12.0	8.8

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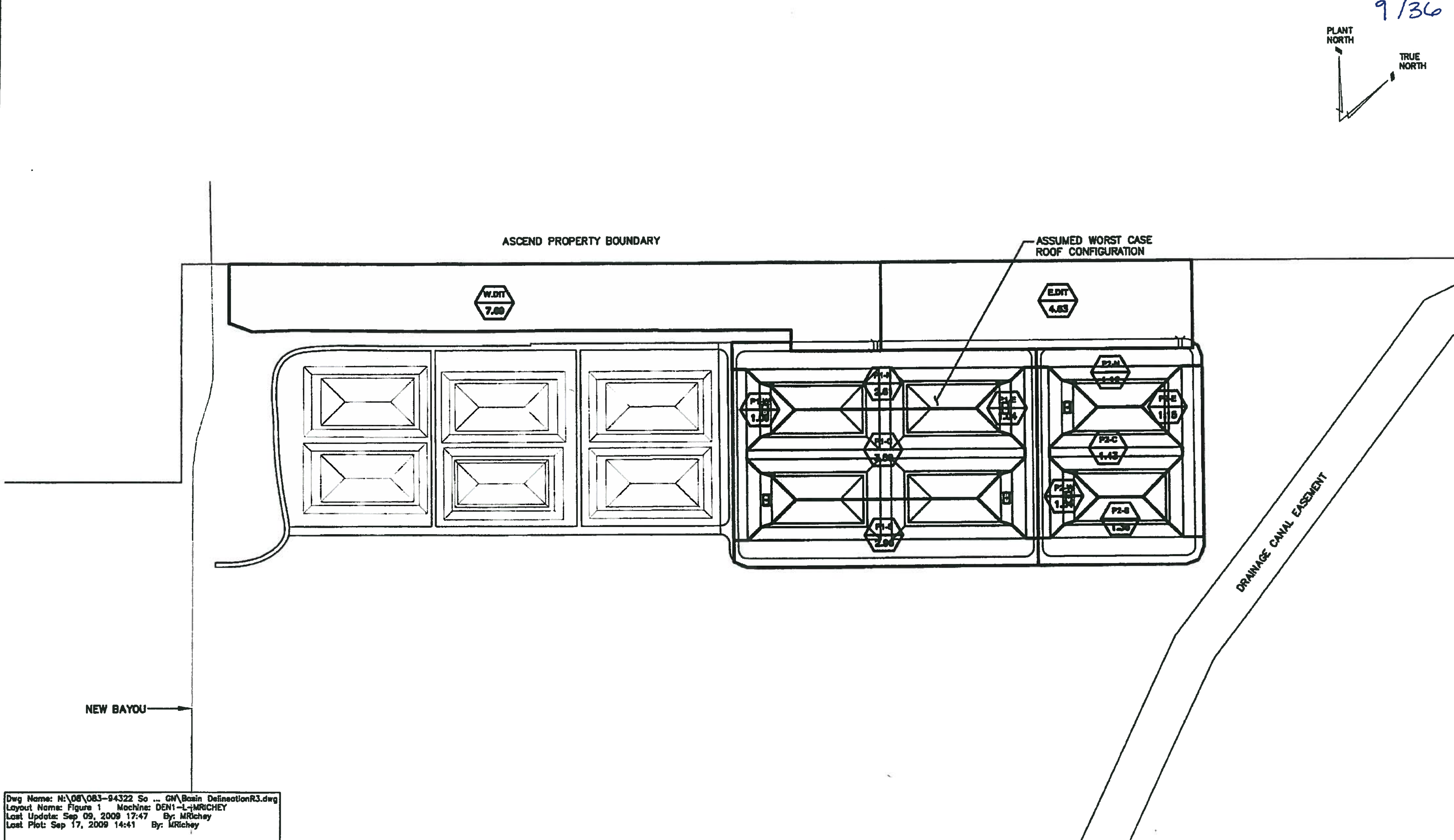

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Layout Name: Figure 1 Machine: DEN1-L-jMRICHEY
Last Update: Sep 09, 2009 17:47 By: MRichey
Last Plot: Sep 17, 2009 14:41 By: MRichey

Golder Associates
DENVER, COLORADO

SUBBASIN DELINEATION

FIGURE 1

PROJECT No.083-94322 CADD MBR DATE 08/25/09 FILE No. Basin DelineationR3.dwg

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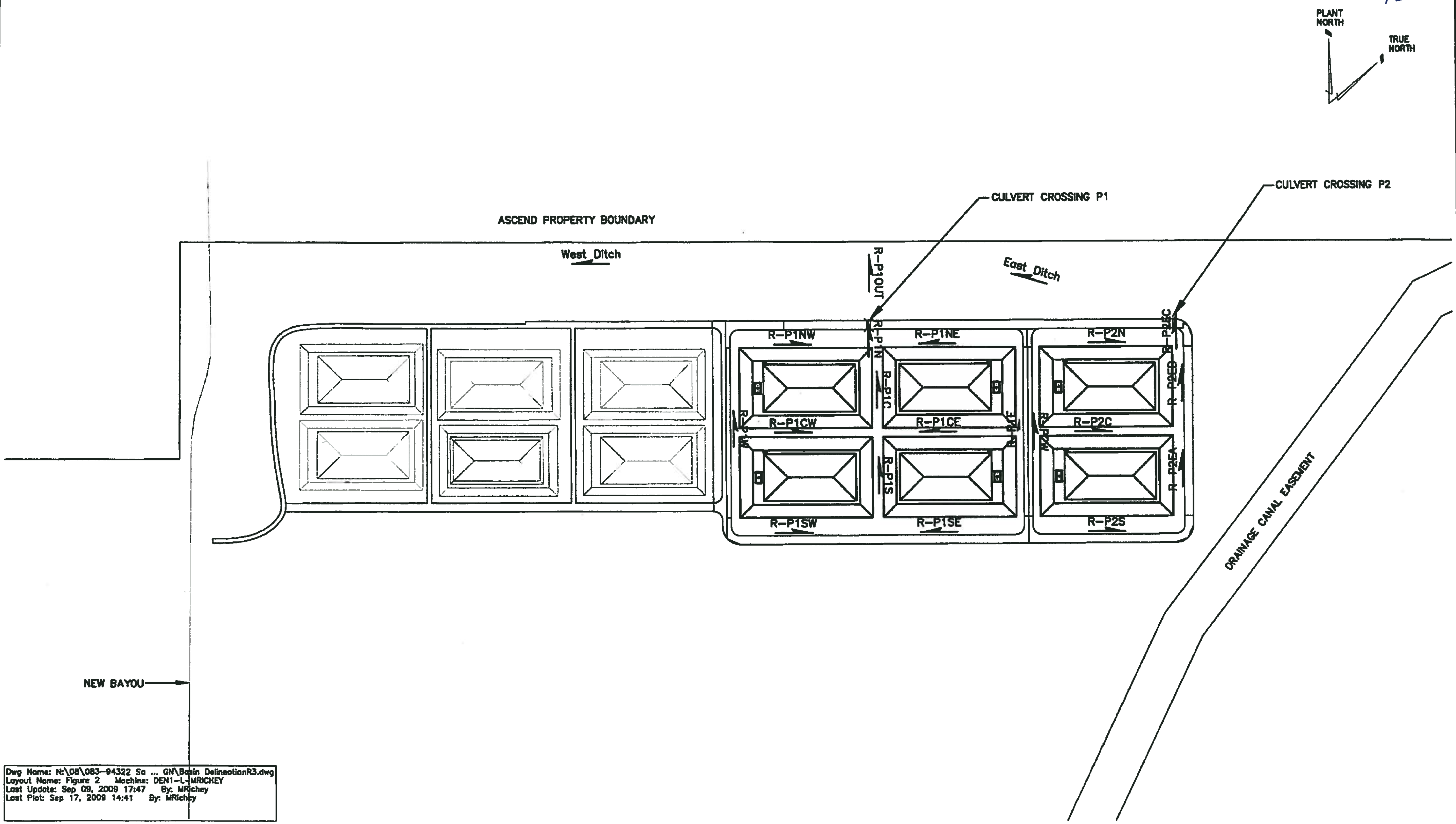


Dwg Name: N:\08\083-94322 Sa ... GN\Basin DelineationR3.dwg
Layout Name: Figure 2 Machine: DEN1-L-MRICHEY
Last Update: Sep 09, 2009 17:47 By: MRichey
Last Plot: Sep 17, 2009 14:41 By: MRichey

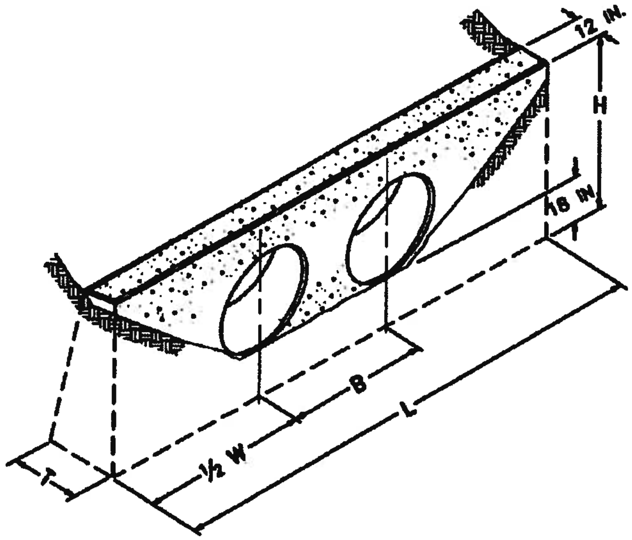
Golder Associates
DENVER, COLORADO

CHANNEL SCHEMATIC

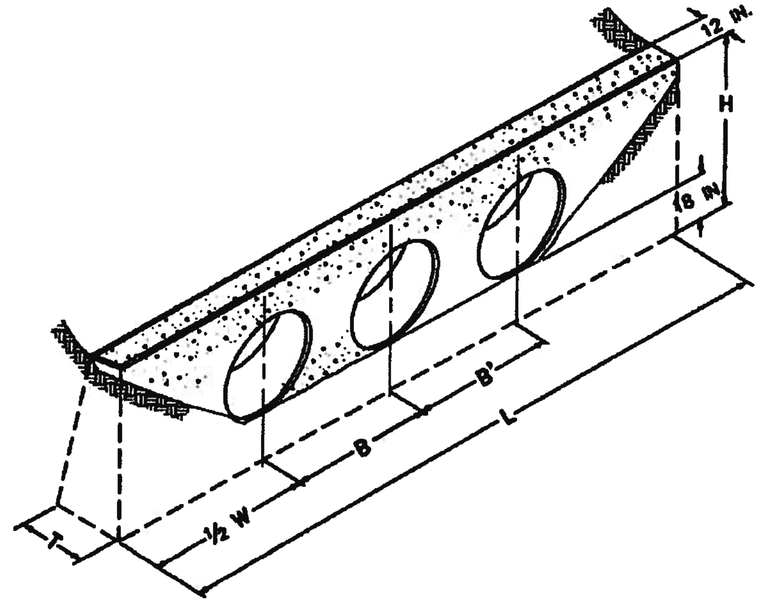
FIGURE 2

PROJECT No.083-94322 CADD MBR DATE 08/25/09 FILE No. Basin DelineationR3.dwg

Dwg Name: R:\08\083-94322 Solutia\083943222A001.dwg
Layout Name: 8.5X11 Landscape Machine: DEN1-L-MRICHEY
Last Update: Sep 08, 2009 11:01 By: GLawen
Last Plot: Sep 09, 2009 17:46 By: MRichey



1 DOUBLE PIPE
N.T.S



2 TRIPLE PIPE
N.T.S

TYPE OF PIPE	HEADWALL DIMENSIONS
C	D = PIPE DIAMETER (INSIDE) H = D +30 IN. W = 3d + 18 IN. T = 0.4 h (NEAREST IN.) B = 1.5 D (30 IN. MINIMUM) L = W + B + B'

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HEADWALLS

FIGURE 3

Golder Associates
DENVER, COLORADO
PROJECT No. 033-1001 CADD XYZ DATE 01/01/03 FILE No. 083943222A001.dwg
Plot Time: 09/09/09 17:46

ATTACHMENT A

Time of concentration and Mannings roughness coefficients

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Attachment A
Time of Concentration and Mannings Flow Coefficients

Channel Flow Velocity (Mannings Velocity)

$v = 1.49/n\ Rh^{2/3} S^{1/2}$	Where: v = velocity (fps); n = roughness coeffient; Rh = Hydraulic Radius (ft), S = slope (ft/ft)

Lining Type	Mannings n for Depth	Mannings n for Velocity	Material	Maximum Velocity	Maximum Shear Stress
A	0.028	0.028	ACB	25	
C	0.024	0.022	CSP	50	
E	0.025	0.022	Earth-lined	3	
G	0.035	0.030	Grass-lined	5	
I	0.017	0.013	Ductile Iron	50	
P	0.012	0.009	Plastic	25	
R	0.040	0.035	Riprap	16	
T	0.035	0.030	Turf Reinf.	10	1.5
Z	0.060	0.005	Other	25	

Overland Flow Resistance Factors (Kinematic Wave)

Table 3.5

Resistance Factor for Overland Flow

Surface	N value	Source
Asphalt/Concrete*	0.05 - 0.15	a
Bare Packed Soil Free of Stone	0.10	c
Fallow - No Residue	0.008 - 0.012	b
Convential Tillage - No Residue	0.06 - 0.12	b
Convential Tillage - With Residue	0.16 - 0.22	b
Chisel Plow - No Residue	0.06 - 0.12	b
Chisel Plow - With Residue	0.10 - 0.16	b
Fall Disking - With Residue	0.30 - 0.50	b
No Till - No Residue	0.04 - 0.10	b
No Till (20-40 percent residue cover)	0.07 - 0.17	b
No Till (60-100 percent residue cover)	0.17 - 0.47	b
Sparse Rangeland with Debris:		
0 Percent Cover	0.09 - 0.34	b
20 Percent Cover	0.05 - 0.25	b
Sparse Vegetation	0.053 - 0.13	f
Short Grass Prairie	0.10 - 0.20	f
Poor Grass Cover On Moderately Rough	0.30	c
Bare Surface		
Light Turf	0.20	a
Average Grass Cover	0.4	c
Dense Turf	0.17 - 0.80	a,c,e,f
Dense Grass	0.17 - 0.30	d
Bermuda Grass	0.30 - 0.48	d
Dense Shrubbery and Forest Litter	0.4	a

Legend a) Harley (1975), b) Engman (1986), c) Hathaway (1945), d) Palmer (1946), e) Ragan and Duru (1972), f) Woolhiser (1975) (See Hjemfelt, 1986)

*Asphalt/Concrete n value for open channel flow 0.01 - 0.016

From: *HEC-1 Flood Hydrograph Package User's Manual*, USACE, 1998.

ATTACHMENT B

HEC-HMS Model Parameters

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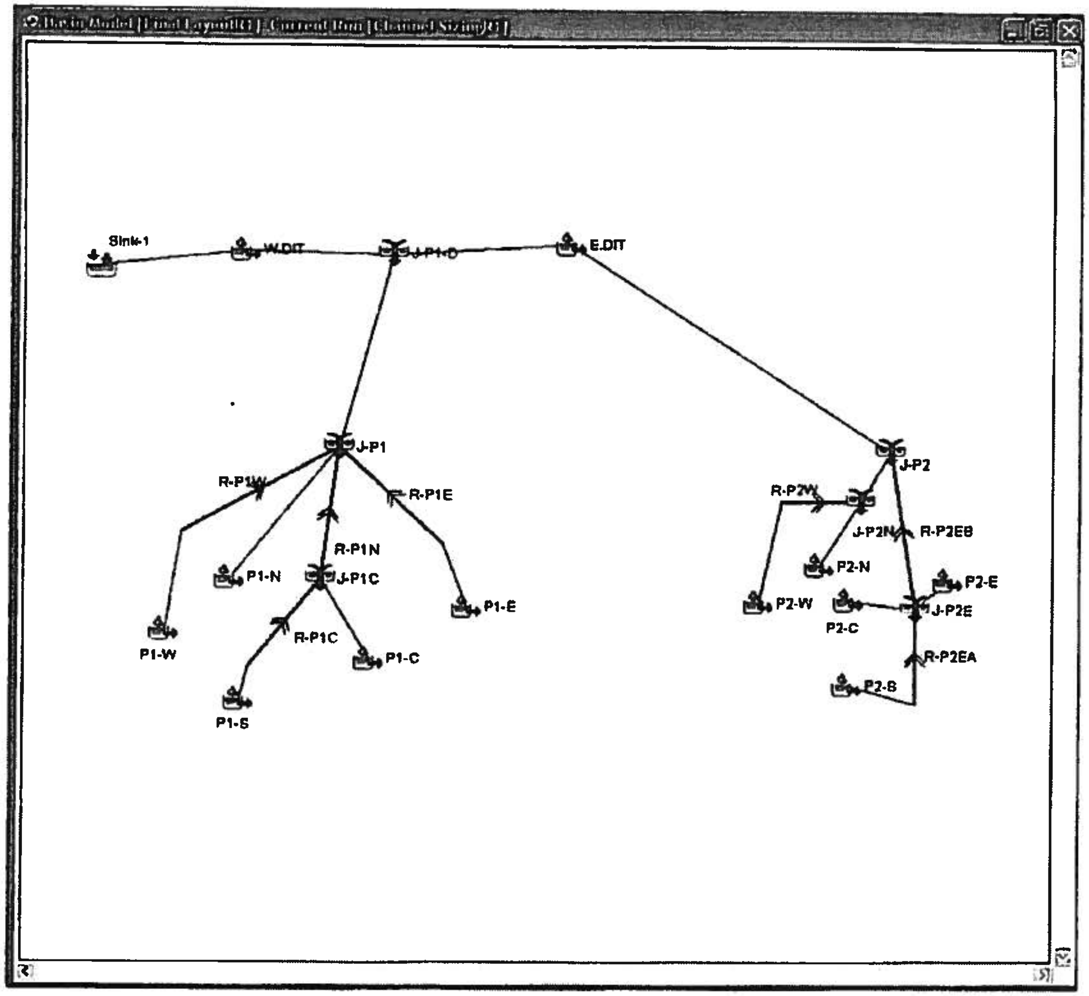
Attachment B
HEC-HMS Screen Captures and Inputs

HEC-HMS Basin Model Schematic



Attachment B
HEC-HMS Screen Captures and Inputs

Sub Basin Area	
Subbasin	Area (mi^2)
E.DIT	0.007200
P1-C	0.005600
P1-E	0.001600
P1-N	0.004100
P1-S	0.004600
P1-W	0.001700
P2-C	0.002200
P2-E	0.001800
P2-N	0.001700
P2-S	0.002100
P2-W	0.001600
W.DIT	0.012000

Loss SCS Curve Number			
Subbasin	Initial Abstraction (in)	Curve Number	Impervious (%)
E.DIT (Plane 1)		81	0
E.DIT (Plane 2)		79	0
P1-C (Plane 1)		81	0
P1-C (Plane 2)		81	0
P1-E (Plane 1)		82	0
P1-E (Plane 2)		83	0
P1-N (Plane 1)		79	0
P1-N (Plane 2)		82	0
P1-S (Plane 1)		82	0
P1-S (Plane 2)		81	0
P1-W (Plane 1)		82	0
P1-W (Plane 2)		78	0
P2-C (Plane 1)		78	0
P2-C (Plane 2)		78	0
P2-E (Plane 1)		83	0
P2-E (Plane 2)		78	0
P2-N (Plane 1)		79	0
P2-N (Plane 2)		78	0
P2-S (Plane 1)		82	0
P2-S (Plane 2)		78	0
P2-W (Plane 1)		82	0
P2-W (Plane 2)		78	0
W.DIT (Plane 1)		82	0
W.DIT (Plane 2)		81	0

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Attachment B
HEC-HMS Screen Captures and Inputs

Routing Muskingum-Cunge Channel								
Reach	Length (ft)	Slope (ft/ft)	Manning's n	Invert	Shape	Diameter (ft)	Width (ft)	Side Slope (xH:1V)
R-P1C	245	0.003	0.03		Trapezoid		12	2
R-P1E	370	0.003	0.03		Trapezoid		10	2
R-P1N	160	0.003	0.03		Trapezoid		12	2
R-P1W	370	0.003	0.03		Trapezoid		12	2
R-P2EA	232	0.003	0.03		Trapezoid		14	2
R-P2EB	234	0.003	0.03		Trapezoid		16	2
R-P2W	340	0.003	0.03		Trapezoid		10	2

Transform (Flow Panes) Kinematic Wave Transform					
Subbasin	Length (ft)	Slope (ft/ft)	Roughness	Area (%)	Routing Steps
E.DIT(Plane 1)	123	0.0402	0.3	51	5
E.DIT(Plane 2)	115	0.0435	0.3	49	5
P1-C(Plane 1)	110	0.093	0.2	50	5
P1-C(Plane 2)	110	0.093	0.2	50	5
P1-E(Plane 1)	30	0.003	0.1	34	5
P1-E(Plane 2)	131	0.079	0.2	66	5
P1-N(Plane 1)	50	0.003	0.3	54	5
P1-N(Plane 2)	110	0.093	0.2	46	5
P1-S(Plane 1)	80	0.003	0.1	47	5
P1-S(Plane 2)	110	0.093	0.2	53	5
P1-W(Plane 1)	50	0.003	0.1	37	5
P1-W(Plane 2)	131	0.079	0.3	63	5
P2-C(Plane 1)	110	0.093	0.3	50	5
P2-C(Plane 2)	110	0.093	0.3	50	5
P2-E(Plane 1)	50	0.003	0.1	52	5
P2-E(Plane 2)	110	0.093	0.3	48	5
P2-N(Plane 1)	50	0.003	0.3	67	5
P2-N(Plane 2)	110	0.093	0.3	33	5
P2-S(Plane 1)	80	0.003	0.1	55	5
P2-S(Plane 2)	110	0.093	0.3	45	5
P2-W(Plane 1)	30	0.003	0.1	34	5
P2-W(Plane 2)	131	0.079	0.3	66	5
W.DIT(Plane 1)	123	0.0588	0.3	65	5
W.DIT(Plane 2)	58	0.1214	0.3	35	5

Kinematic Wave Transform (Main Channel)							
Subbasin	Route Upstream	Route Method	Length (ft)	Slope (ft/ft)	Subreaches	Shape	Manning's n
E.DIT	Yes	Muskingum Cunge	840	0.002		Trapezoid	0.03
P1-C	Yes	Muskingum Cunge	240	0.003		Trapezoid	0.03
P1-E	No	Muskingum Cunge	465	0.003		Trapezoid	0.03
P1-N	Yes	Muskingum Cunge	160	0.003		Trapezoid	0.03
P1-S	No	Muskingum Cunge	110	0.003		Trapezoid	0.03
P1-W	No	Muskingum Cunge	465	0.003		Trapezoid	0.03
P2-C	No	Muskingum Cunge	365	0.003		Trapezoid	0.03
P2-E	Yes	Muskingum Cunge	465	0.003		Trapezoid	0.03
P2-N	Yes	Muskingum Cunge	387	0.003		Trapezoid	0.03
P2-S	No	Muskingum Cunge	400	0.003		Trapezoid	0.03
P2-W	No	Muskingum Cunge	465	0.003		Trapezoid	0.03
W.DIT	Yes	Muskingum Cunge	1765	0.002		Trapezoid	0.03

Kinematic Wave Transform (Collector Channel)						
Subbasin	Length	Slope (ft/ft)	Manning's n	Subreaches	Area (mi^2)	Shape
P1-C(Collector)	360	0.003	0.03	5.000	0.00275	Trapezoid
P1-N(Collector)	414	0.003	0.03	5.000	0.001975	Trapezoid
P1-S(Collector)	414	0.003	0.03	5.000	0.00203	Trapezoid

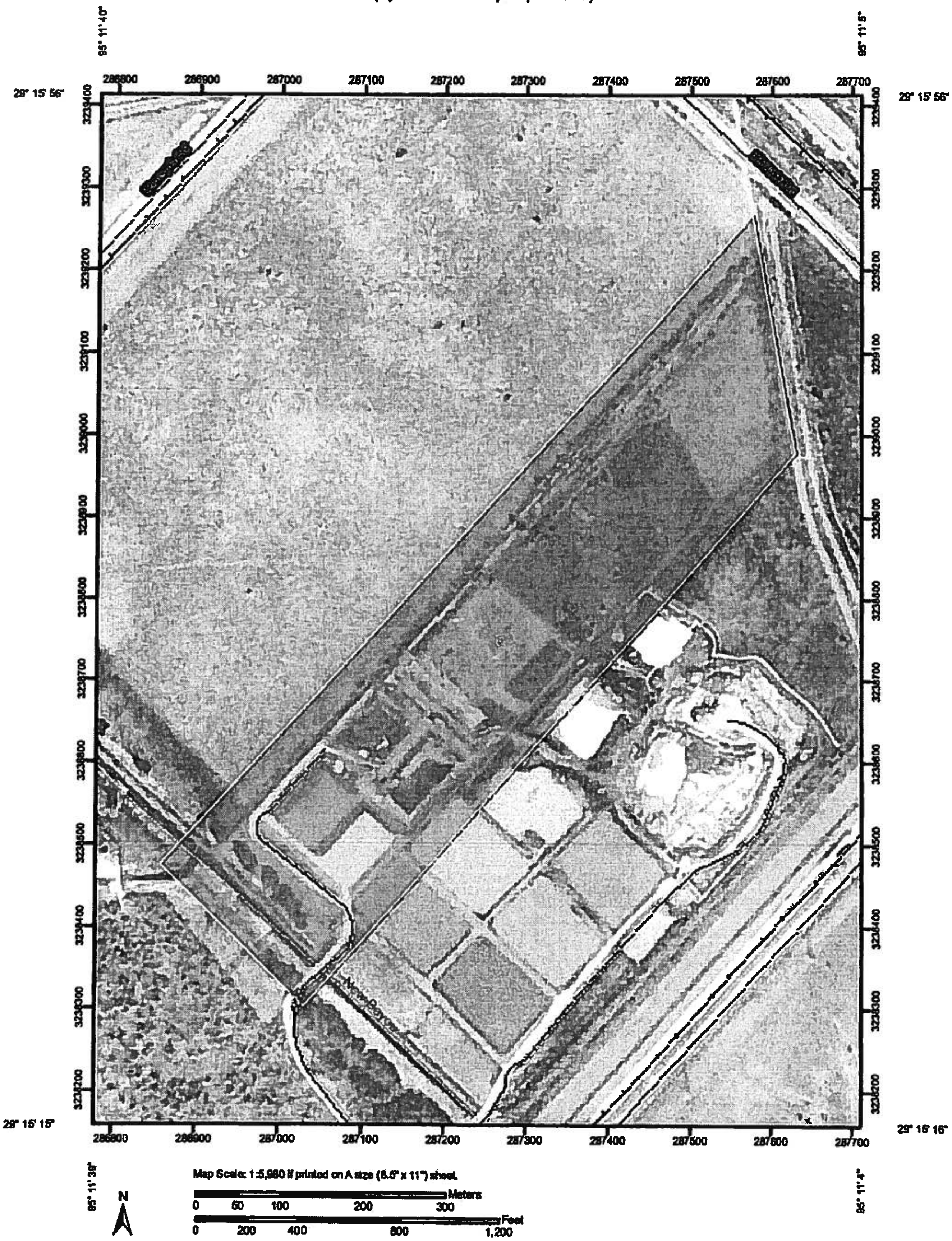
1V36

ATTACHMENT C

NRCS Soil Survey Map

19136

Hydrologic Soil Group—Brazoria County, Texas
(Hydraulic Soil Group Map - Solutia)



20136

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Political Features

Cities

Water Features

Oceans

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:5,980 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 15N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Brazoria County, Texas
Survey Area Data: Version 7, May 28, 2008

Date(s) aerial images were photographed: 1995

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Brazoria County, Texas				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6	Bacliff clay, 0 to 1 percent slopes	D	57.9	100.0%
Totals for Area of Interest			57.9	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower

ATTACHMENT D
HY8 Culvert Analysis Output

HY-8 Culvert Analysis Report

Table 1 - Summary of Culvert Flows at Crossing: Crossing P1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert P1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
8.20	0.00	0.00	0.00	1
9.12	11.28	11.28	0.00	1
9.52	22.56	22.56	0.00	1
9.83	33.84	33.84	0.00	1
10.11	45.12	45.12	0.00	1
10.37	56.40	56.40	0.00	1
10.60	67.68	67.68	0.00	1
10.83	78.96	78.96	0.00	1
11.05	90.24	90.24	0.00	1
11.26	101.52	101.52	0.00	1
11.47	112.80	112.80	0.00	1
13.20	184.77	184.77	0.00	Overtopping

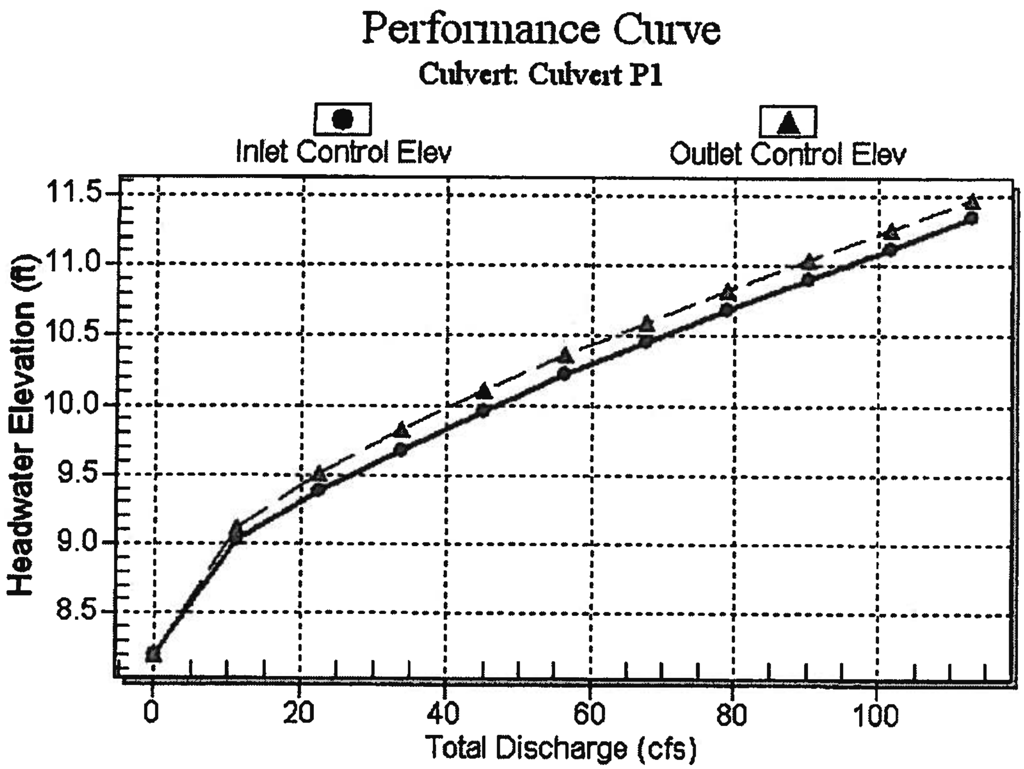
Table 2 - Culvert Summary Table: Culvert P1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	8.20	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
11.28	11.28	9.12	0.826	0.917	2-M2c	0.627	0.604	0.604	0.443	3.703	1.609
22.56	22.56	9.52	1.184	1.315	2-M2c	0.896	0.857	0.857	0.668	4.494	1.949
33.84	33.84	9.83	1.470	1.632	2-M2c	1.103	1.055	1.055	0.848	5.066	2.255
45.12	45.12	10.11	1.759	1.911	2-M2c	1.295	1.233	1.233	1.004	5.498	2.496
56.40	56.40	10.37	2.020	2.165	2-M2c	1.474	1.382	1.382	1.144	5.905	2.695
67.68	67.68	10.60	2.259	2.401	2-M2c	1.645	1.526	1.526	1.273	6.245	2.868
78.96	78.96	10.83	2.483	2.626	2-M2c	1.815	1.650	1.650	1.391	6.609	3.023
90.24	90.24	11.05	2.702	2.846	2-M2c	1.991	1.776	1.775	1.502	6.910	3.161
101.52	101.52	11.26	2.921	3.058	2-M2c	2.180	1.884	1.884	1.609	7.250	3.284
112.80	112.80	11.47	3.148	3.272	2-M2c	2.387	1.989	1.989	1.709	7.569	3.400

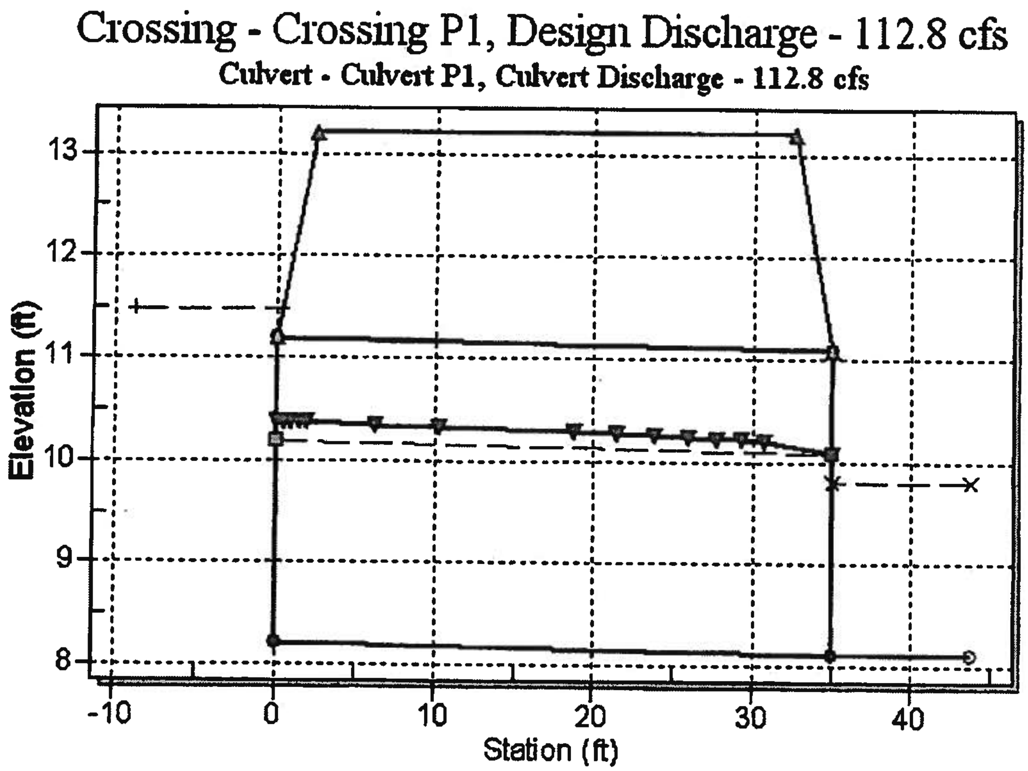
Inlet Elevation (invert): 8.20 ft, Outlet Elevation (invert): 8.10 ft

Culvert Length: 35.00 ft, Culvert Slope: 0.0029

Culvert Performance Curve Plot: Culvert P1



Water Surface Profile Plot for Culvert: Culvert P1



Site Data - Culvert P1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 8.20 ft

Outlet Station: 35.00 ft

Outlet Elevation: 8.10 ft

Number of Barrels: 3

Culvert Data Summary - Culvert P1

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Summary of Culvert Flows at Crossing: Crossing P2

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert P2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
8.20	0.00	0.00	0.00	1
9.00	5.97	5.97	0.00	1
9.36	11.94	11.94	0.00	1
9.64	17.91	17.91	0.00	1
9.88	23.88	23.88	0.00	1
10.10	29.85	29.85	0.00	1
10.31	35.82	35.82	0.00	1
10.50	41.79	41.79	0.00	1
10.68	47.76	47.76	0.00	1
10.86	53.73	53.73	0.00	1
11.03	59.70	59.70	0.00	1
13.20	123.19	123.19	0.00	Overtopping

Table 4 - Culvert Summary Table: Culvert P2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	8.20	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
5.97	5.97	9.00	0.726	0.804	2-M2c	0.653	0.522	0.522	0.303	3.549	1.186
11.94	11.94	9.36	1.046	1.158	2-M2c	0.785	0.753	0.753	0.458	4.256	1.542
17.91	17.91	9.64	1.304	1.441	2-M2c	0.976	0.940	0.940	0.582	4.746	1.793
23.88	23.88	9.88	1.519	1.684	2-M2c	1.140	1.088	1.088	0.690	5.146	1.992
29.85	29.85	10.10	1.751	1.903	2-M2c	1.290	1.229	1.229	0.787	5.482	2.168
35.82	35.82	10.31	1.961	2.106	2-M2c	1.432	1.347	1.347	0.876	5.818	2.303
41.79	41.79	10.50	2.155	2.297	2-M2c	1.570	1.465	1.465	0.959	6.090	2.431
47.76	47.76	10.68	2.339	2.481	2-M2c	1.704	1.570	1.570	1.038	6.381	2.546
53.73	53.73	10.86	2.515	2.657	2-M2c	1.841	1.669	1.669	1.112	6.656	2.651
59.70	59.70	11.03	2.688	2.833	2-M2c	1.980	1.767	1.767	1.183	6.893	2.748

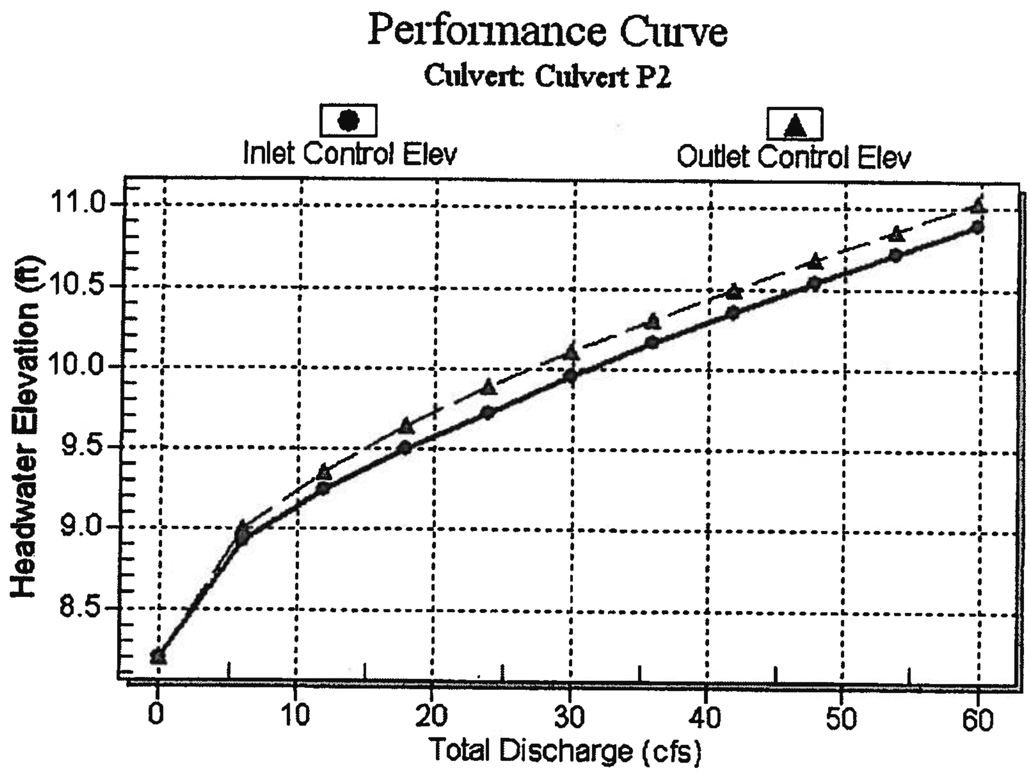
****

Inlet Elevation (invert): 8.20 ft, Outlet Elevation (invert): 8.10 ft

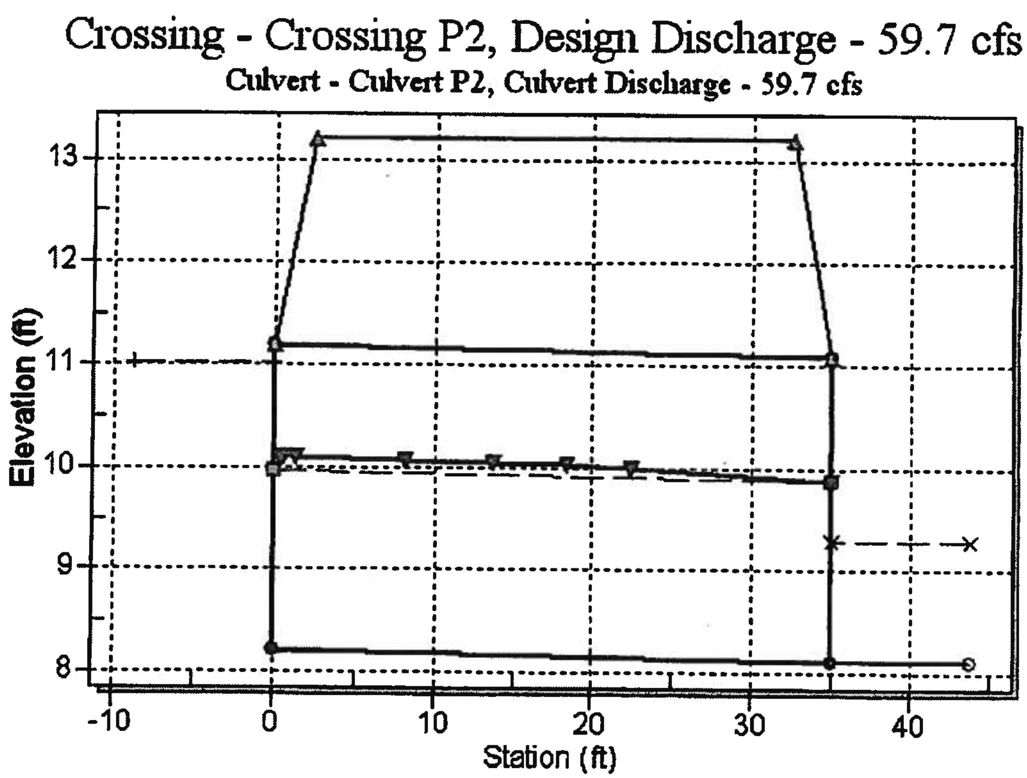
Culvert Length: 35.00 ft, Culvert Slope: 0.0029

****

Culvert Performance Curve Plot: Culvert P2



Water Surface Profile Plot for Culvert: Culvert P2



Site Data - Culvert P2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 8.20 ft

Outlet Station: 35.00 ft

Outlet Elevation: 8.10 ft

Number of Barrels: 2

Culvert Data Summary - Culvert P2

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

ATTACHMENT E
Rational Method Hydrology Calculations

TABLE E1
SUBBASIN SUMMARY TABLE - RATIONAL METHOD

Ascend Permit Unit 16 Landfill
Brazoria County, Texas
Project Number: 083-94322

Date:	9/17/09
By:	TAC
Chkd:	
Apprvd:	

Design Storm: 100 -Year Recurrence Interval

Frequency Factor Adjustment, Cf: 1.25

Subbasin ID	Upstream Subbasins	Subbasin Area (ft^2)	Subbasin Area (acres)	C = 0.50 Clay Soil - Pasture (acres)	C = 0.85 Impervious (Roofs, Open Water) (acres)	C = 0.80 Dirt Roads (Light Industrial) (acres)	Composite "C" Coefficient	Adjusted Composite "C" Coefficient
Cells 1 Through 4								
P1-W	None	47,643	1.09	0.96		0.13	C = 0.54	C = 0.67
P1-E	None	45,263	1.04	0.75	0.18	0.13	C = 0.59	C = 0.74
P1-S	*None*	*129,092*	*2.96*	*2.26*	*0.25*	*0.45*	*C = 0.58*	*C = 0.72*
P1-S (east)	1/2 P1-S	64,546	1.48	1.00	0.25	0.23	C = 0.61	C = 0.76
P1-S (west)	1/2 P1-S	64,546	1.48	1.26		0.23	C = 0.55	C = 0.68
P1-C	*None*	*156,271*	*3.59*	*3.08*	*0.51*	*0*	*C = 0.55*	*C = 0.69*
P1-C (east)	1/2 P1-C	78,138	1.79	1.29	0.51	0	C = 0.60	C = 0.75
P1-C (west)	1/2 P1-C	78,138	1.79	1.79		0	C = 0.50	C = 0.63
P1-C (TOT)	P1-S, P1-C	285,363	6.55	5.34	0.76	0.45	C = 0.56	C = 0.70
P1-N	*None*	*113,551*	*2.61*	*1.90*	*0.25*	*0.45*	*C = 0.59*	*C = 0.73*
P1-N (east)	P1-E	102,039	2.34	1.73	0.25	0.36	C = 0.58	C = 0.73
P1-N (west)	P1-W	104,418	2.40	2.04		0.36	C = 0.54	C = 0.68
P1-OUT	All of P1	491,820	11.29	8.95	1.17	1.17	C = 0.57	C = 0.71
Cells 5 & 6								
P2-W	None	45,367	1.04	0.91		0.13	C = 0.54	C = 0.67
P2-N	*None*	*48,702*	*1.12*	*1.07*		*0.05*	*C = 0.51*	*C = 0.64*
P2-N (TOT)	P2-W	94,069	2.16	1.99	0.00	0.17	C = 0.52	C = 0.66
P2-S	None	59,131	1.36	1.08		0.28	C = 0.56	C = 0.70
P2-C	None	62,152	1.43	1.43			C = 0.50	C = 0.63
P2-E	*None*	*50,254*	*1.15*	*0.90*		*0.26*	*C = 0.57*	*C = 0.71*
P2-E (south)	P2-S	84,258	1.93	1.81		0.13	C = 0.52	C = 0.65
P2-E (north)	P2-C & S	171,538	3.94	3.40	0.00	0.54	C = 0.54	C = 0.68
P2-E (TOT)	P2-S, P2-C	159,640	3.66	2.87	0.00	0.80	C = 0.57	C = 0.71
P2-OUT	All of P2	265,607	6.10	5.39	0.00	0.71	C = 0.54	C = 0.67
East & West Ditch								
E.DIT	*None*	*201,742*	*4.63*	*3.86*	*0.29*	*0.48*	*C = 0.55*	*C = 0.69*
E.DIT (TOT)	P2-OUT	467,349	10.73	9.24	0.29	1.20	C = 0.54	C = 0.68
W.DIT	*None*	*334,990*	*7.69*	*5.86*	*0.81*	*1.01*	*C = 0.58*	*C = 0.72*
W.DIT (TOT)	P1-Out, P2-Out	1,294,159	29.71	24.06	2.28	3.38	C = 0.56	C = 0.70
Total:		1,294,159	29.71					

LEGEND:	
102,039	subbasins split from Figure 2
113,551	subbasins as shown on Figure 2
285,363	Combined subbasins form Figure 2

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TABLE E2
SUBBASIN PEAK FLOW TABLE - RATIONAL METHOD

Ascend Permit Unit 16 Landfill
Brazoria County, Texas
Project Number: 083-94322

Date:	9/17/09
By:	TAC
Chkd:	[signature]
Apprvd:	[signature]

Design Storm: 100 -year
Minimum Travel Time: 5 min.

Subbasin ID	Upstream Subbasins	Subbasin Area (acres)	"C" Factor	Subbasin Travel Time (min)	Intensity (in/hr)	Rational Method Peak Flow (cfs)	Flow Segment 1: Type of Flow	Length (ft)	Slope (ft/ft)	Overland Flow Coefficients: m & b(1)			Channel Roughness (n)	Channel Bottom Width	Assumed Channel Depth	Channel Side Slope	Velocity (f/s)	Travel Time (min)
P1-W	None	1.09	0.67	5.7	10.5	7.7	Overland	65	0.02	SG	2.000	2.000					1.00	1.1
P1-E	None	1.04	0.74	5.0	10.6	8.2	Overland	60	0.02	PA	0.253	1.998					2.82	0.4
P1-S (east)	1/2 P1-S	1.48	0.76	5.1	10.6	11.9	Overland	65	0.02	PA	0.253	1.998					2.82	0.4
P1-S (west)	1/2 P1-S	1.48	0.68	5.8	10.4	10.6	Overland	65	0.02	SG	2.000	2.000					1.00	1.1
P1-S	None	2.96	0.72	4.3	10.7	22.7	Overland	65	0.02	SG	2.000	2.000					1.00	1.1
P1-C (east)	1/2 P1-C	1.79	0.75	3.9	10.7	14.3	Overland	65	0.02	PA	0.253	1.998					2.82	0.4
P1-C (west)	1/2 P1-C	1.79	0.63	4.6	10.7	11.9	Overland	65	0.02	SG	2.000	2.000					1.00	1.1
P1-C (TOT)	P1-S, P1-C	6.55	0.70	8.3	9.8	44.9	Channel	123	0.003	–	–	–	0.03	12	1.5	2	3.08	0.7
P1-N (east)	P1-E	2.34	0.73	6.9	10.1	17.3	Overland	65	0.02	PA	0.253	1.998					2.82	0.4
P1-N (west)	P1-W	2.40	0.68	7.5	10.0	16.3	Overland	65	0.02	PA	0.253	1.998					2.82	0.4
P1-OUT	All of P1	11.29	0.71	7.7	9.9	79.4	Channel	49	0.003	–	–	–	0.03	16	1.9	2	3.62	0.2
P2-W	None	1.04	0.67	5.3	10.6	7.4	Overland	65	0.02	SG	2.000	2.000					1.00	1.1
P2-N (TOT)	P2-W	2.16	0.66	8.1	9.8	13.9	Overland	65	0.02	SG	2.000	2.000					1.00	1.1
P2-S	None	1.38	0.70	3.6	10.7	10.2	Overland	65	0.02	SG	2.000	2.000					1.00	1.1
P2-E (south)	P2-S	1.93	0.65	5.6	10.5	13.2	Channel	220	0.003	–	–	–	0.03	14	0.6	2	1.82	2.0
P2-C	None	1.43	0.63	3.5	10.7	9.5	Overland	65	0.02	SG	2.000	2.000					1.00	1.1
P2-E (north)	P2-C & S	3.94	0.68	7.1	10.1	26.8	Channel	220	0.003	–	–	–	0.03	16	1	2	2.50	1.5
P2-OUT	All of P2	6.10	0.67	8.4	9.8	39.8	Channel	49	0.003	–	–	–	0.03	16	1.9	2	3.62	0.2
E.DIT (TOT)	P2-OUT	10.73	0.68	14.3	8.5	62.1	Channel	840	0.00178	–	–	–	0.03	16	1.5	3	2.37	5.9
W.DIT (TOT)	P1-Out, P2-Out	29.71	0.70	22.7	7.3	151.7	Channel	1765	0.00178	–	–	–	0.03	16	3	3	3.48	8.4

Subbasin ID	Flow Segment 2: Type of Flow	Length (ft)	Slope (ft/ft)	Overland Flow Coefficients: m & b(1)			Channel Roughness (n)	Channel Bottom Width	Assumed Channel Depth	Channel Side Slope	Velocity (f/s)	Travel Time (min)
P1-W	Overland	30	0.005	NB	1.009	2.003					0.70	0.7
P1-E	Overland	34	0.005	NB	1.009	2.003					0.70	0.8
P1-S (east)	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-S (west)	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-S	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-C (east)	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-C (west)	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-C (TOT)	Channel	245	0.003	–	–	–	0.03	12	0.5	2	1.61	2.5
P1-N (east)	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-N (west)	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-OUT				–	–	–					0.00	0.0
P2-W	Overland	30	0.005	NB	1.009	2.003					0.70	0.7
P2-N (TOT)	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P2-S	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P2-E (south)				–	–	–					0.00	0.0
P2-C	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P2-E (north)				–	–	–					0.00	0.0
P2-OUT	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
E.DIT (TOT)				–	–	–					0.00	0.0
W.DIT (TOT)				–	–	–					0.00	0.0

(1) Overland flow coefficients from the Brazoria County Drainage Manual are shown in ATTACHMENT F, following this table.

Peak Flow Comparison - Rational Method vs. HEC-HMS

Reach Designation	Q100 from HEC-HMS (cfs)	Rational Method Peak Flow (cfs)	Rational Method Peak Flow as % of HMS Flow
R-P1C	66.6	44.9	67%
R-P1N	112.7	79.4	70%
R-P1S	30.2	22.7	75%
R-P1E	10.9	8.2	75%
R-P1NW	23.9	16.3	68%
R-P1NE	23.9	17.3	72%
R-P1CW	18.45	11.9	65%
R-P1CE	18.45	14.3	78%
R-P1SW	15.1	10.6	70%
R-P1SE	15.1	11.9	79%
R-P1OUT	112.7	79.4	70%
R-P1W	10.9	7.7	70%
R-P2C	14.3	9.5	66%
R-P2N	20.7	13.9	67%
R-P2S	13.7	10.2	74%
R-P2EA	19.8	13.2	67%
R-P2EB	40	26.8	67%
R-P2EC	59.7	39.8	67%
R-P2W	10.4	7.4	71%
East Ditch	93.4	62.1	66%
West Ditch	206.1	151.7	74%

TABLE E2
SUBBASIN PEAK FLOW TABLE - RATIONAL METHOD

Ascend Permit Unit 16 Landfill
Brazoria County, Texas
Project Number: 083-94322

Date:	9/17/09
By:	TAC
Chkd:	
Apprvd:	

Design Storm: 100 -year
Minimum Travel Time: 5 min.

Subbasin ID	Upstream Subbasins	Subbasin Area (acres)	"C" Factor	Subbasin Travel Time (min)	Intensity (in/hr)	Rational Method Peak Flow (cfs)	Flow Segment 1: Type of Flow	Length (ft)	Slope (ft/ft)	Overland Flow Coefficients: m & b(1)			Channel Roughness (n)	Channel Bottom Width	Assumed Channel Depth	Channel Side Slope	Velocity (f/s)	Travel Time (min)	Flow Segment 2: Type of Flow	Length (ft)	Slope (ft/ft)	Overland Flow Coefficients: m & b(1)			Channel Roughness (n)	Channel Bottom Width	Assumed Channel Depth	Channel Side Slope	Velocity (f/s)	Travel Time (min)
P1-W	None	1.09	0.67	5.7	10.5	7.7	Overland	65	0.02	SG	2.000	2.000					1.00	1.1	Overland	30	0.005	NB	1.009	2.003					0.70	0.7
P1-E	None	1.04	0.74	5.0	10.6	8.2	Overland	60	0.02	PA	0.253	1.998					2.82	0.4	Overland	34	0.005	NB	1.009	2.003					0.70	0.8
P1-S (east)	1/2 P1-S	1.48	0.76	5.1	10.6	11.9	Overland	65	0.02	PA	0.253	1.998					2.82	0.4	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-S (west)	1/2 P1-S	1.48	0.68	5.8	10.4	10.6	Overland	65	0.02	SG	2.000	2.000					1.00	1.1	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-S	None	2.96	0.72	4.3	10.7	22.7	Overland	65	0.02	SG	2.000	2.000					1.00	1.1	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-C (east)	1/2 P1-C	1.79	0.75	3.9	10.7	14.3	Overland	65	0.02	PA	0.253	1.998					2.82	0.4	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-C (west)	1/2 P1-C	1.79	0.63	4.6	10.7	11.9	Overland	65	0.02	SG	2.000	2.000					1.00	1.1	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-C (TOT)	P1-S, P1-C	6.55	0.70	8.3	9.8	44.9	Channel	123	0.003	–	–	–	0.03	12	1.5	2	3.08	0.7	Channel	245	0.003	–	–	–	0.03	12	0.5	2	1.61	2.5
P1-N (east)	P1-E	2.34	0.73	6.9	10.1	17.3	Overland	65	0.02	PA	0.253	1.998					2.82	0.4	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-N (west)	P1-W	2.40	0.68	7.5	10.0	16.3	Overland	65	0.02	PA	0.253	1.998					2.82	0.4	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P1-OUT	All of P1	11.29	0.71	7.7	9.9	79.4	Channel	49	0.003	–	–	–	0.03	16	1.9	2	3.62	0.2				–	–	–					0.00	0.0
P2-W	None	1.04	0.67	5.3	10.6	7.4	Overland	65	0.02	SG	2.000	2.000					1.00	1.1	Overland	30	0.005	NB	1.009	2.003					0.70	0.7
P2-N (TOT)	P2-W	2.16	0.66	8.1	9.8	13.9	Overland	65	0.02	SG	2.000	2.000					1.00	1.1	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P2-S	None	1.36	0.70	3.6	10.7	10.2	Overland	65	0.02	SG	2.000	2.000					1.00	1.1	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P2-E (south)	P2-S	1.93	0.65	5.6	10.5	13.2	Channel	220	0.003	–	–	–	0.03	14	0.6	2	1.82	2.0				–	–	–					0.00	0.0
P2-C	None	1.43	0.63	3.5	10.7	9.5	Overland	65	0.02	SG	2.000	2.000					1.00	1.1	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
P2-E (north)	P2-C & S	3.94	0.68	7.1	10.1	26.8	Channel	220	0.003	–	–	–	0.03	16	1	2	2.50	1.5				–	–	–					0.00	0.0
P2-OUT	All of P2	6.10	0.67	8.4	9.8	39.8	Channel	49	0.003	–	–	–	0.03	16	1.9	2	3.62	0.2	Overland	10	0.005	NB	1.009	2.003					0.70	0.2
E.DIT (TOT)	P2-OUT	10.73	0.68	14.3	8.5	62.1	Channel	840	0.00178	–	–	–	0.03	16	1.5	3	2.37	5.9				–	–	–					0.00	0.0
W.DIT (TOT)	P1-Out, P2-Out	29.71	0.70	22.7	7.3	151.7	Channel	1765	0.00178	–	–	–	0.03	16	3	3	3.48	8.4				–	–	–					0.00	0.0

(1) Overland flow coefficients from the Brazoria County Drainage Manual are shown in ATTACHMENT F, following this table.

Peak Flow Comparison - Rational Method vs. HEC-HMS

Reach Designation	Q100 from HEC-HMS (cfs)	Rational Method Peak Flow (cfs)	Rational Method Peak Flow as % of HMS Flow
R-P1C	66.6	44.9	67%
R-P1N	112.7	79.4	70%
R-P1S	30.2	22.7	75%
R-P1E	10.9	8.2	75%
R-P1NW	23.9	16.3	68%
R-P1NE	23.9	17.3	72%
R-P1CW	18.45	11.9	65%
R-P1CE	18.45	14.3	78%
R-P1SW	15.1	10.6	70%
R-P1SE	15.1	11.9	79%
R-P1OUT	112.7	79.4	70%
R-P1W	10.9	7.7	70%
R-P2C	14.3	9.5	66%
R-P2N	20.7	13.9	67%
R-P2S	13.7	10.2	74%
R-P2EA	19.8	13.2	67%
R-P2EB	40	26.8	67%
R-P2EC	59.7	39.8	67%
R-P2W	10.4	7.4	71%
East Ditch	93.4	62.1	66%
West Ditch	206.1	151.7	74%

Attachment E
Time of Concentration and Mannings Flow Coefficients

Channel Flow Velocity (Mannings Velocity)

$v = 1.49/n\ Rh^{2/3} S^{1/2}$ Where: v = velocity (fps); n = roughness coeffient; Rh = Hydraulic Radius (ft), S = slope (ft/ft)

Lining Type	Mannings n for Depth	Mannings n for Velocity	Material	Maximum Velocity	Maximum Shear Stress
A	0.026	0.026	ACB	25	
C	0.024	0.022	CSP	50	
E	0.025	0.022	Earth-lined	3	
G	0.035	0.030	Grass-lined	5	
I	0.017	0.013	Ductile Iron	50	
P	0.012	0.009	Plastic	25	
R	0.040	0.035	Riprap	16	
T	0.035	0.030	Turf Reinf.	10	1.5
Z	0.060	0.005	Other	25	

Brazoria County

Overland Flow Travel Time

$v = (S/m)^{1/b}$ Where: v = velocity (fps); S = slope (ft/ft); m & b are coefficients

Flow Type	Surface Type	"m"	"b"	Surface Description	Short Description
Overland Flow	HG	15.807	1.9500		Heavy Ground
	MT	4.52	1.9866		Min. Tillage
	SG	2.00	2.0000		Short Grass
	NB	1.01	2.0029		Nearly Bare
	GW	0.45	1.9612		Grass Waterway
	PA	0.25	1.9978		Paved area

Rainfall Intensity

$I = x/(T + y)^z$ Where: I = Rainfall intensity (in/hr); T = travel time (min.); x, y & z are coefficients

Return Period (years)	"x"	"y"	"z"
2	75.5	14.7	0.807
5	82.8	16.9	0.775
10	88.1	18.4	0.756
25	100.8	19.1	0.753
50	107.3	19.8	0.742
100	120.2	21.3	0.741

Hazardous Waste Permit Renewal Application
Ascend Performance Materials Texas Inc., Alvin, Texas

Hazardous Waste Permit No. 50189

Part B, Section V: Appendix V.I.1 – Engineering Report for AN Boilers

Note: There were no changes to the Engineering Report for the AN Boilers, originally issued 31 December 2009 and updated on 10 January 2012 and 21 February 2013. Therefore, the 21 February 2013 Engineering Report and supporting documentation are submitted as is.

ATTACHMENT V.9
ENGINEERING REPORT FOR
AN BOILERS 30H5 AND 31H4 (PERMIT UNITS 11 AND 12)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas, Inc., Alvin, Texas

ATTACHMENT V.9
ENGINEERING REPORT FOR
AN BOILERS 30H5 AND 31H4 (PERMIT UNITS 11 AND 12)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas, Inc., Alvin, Texas

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ATTACHMENT V.9
ENGINEERING REPORT FOR
AN BOILERS 30H5 AND 31H4 (PERMIT UNITS 11 AND 12)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas, Inc., Alvin, Texas

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CERTIFICATION OF
ENGINEERING REPORT FOR
AN BOILERS 30H5 AND 31H4 (PERMIT UNITS 11 AND 12)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas, Inc., Alvin, Texas

I, Elaine A. Higgins, a registered professional engineer in the State of Texas, certify that the Engineering Report in the RCRA Permit Renewal Application issued 31 December 2009 and revised 10 January 2012 for AN Boilers 30H5 And 31H4 (Permit Units 11 And 12) on the Ascend Performance Materials Texas, Inc., Chocolate Bayou Plant in Alvin, Texas, has been prepared in accordance with the requirements of 40 CFR 270.22 and 30 TAC 335.221-.223.

STATE OF TEXAS
ELAINE A. HIGGINS
85482
LICENSED
PROFESSIONAL ENGINEER

Elaine A. Higgins 21 March 2013

Elaine A. Higgins, P.E.
State of Texas Registration No. 85482
GSI Environmental Inc.
Texas Firm Registration Number F-1198

1.0 DESCRIPTION OF AN BOILERS 30H4 AND 31H5

1.1 General Description

Two identical Boiler and Industrial Furnace (BIF) units (Permit Units 11 and 12) are located in the Acrylonitrile (AN) manufacturing unit in the east central portion of the Ascend Chocolate Bayou Plant in Alvin, Texas (see Attachment C.1 and Figure V.9.1). AN Boilers 30H5 AND 31H4 are operated to burn surplus hydrogen cyanide (HCN) from the AN manufacturing process for energy recovery in accordance with standards in 30 TAC 335.221-223 and 40 CFR 266.100-102, .104-112. This section provides RCRA permit application information for AN Boilers 30H5 and 31H4 as required by 40 CFR 270.22.

1.2 Regulatory History of AN Boilers 30H5 and 31H4

AN Boilers 30H5 and 31H4 are currently operating under provisions in RCRA Permit HW-50189-000. Certification reports for compliance with BIF regulations have previously been submitted to the TNRCC (ENSR, 1993; Metco, 1995). General information for AN Boilers 30H5 and 31H4 is summarized on Table V.I.1.

1.3 Components of AN Boilers 30H5 and 31H4

AN Boilers 30H5 and 31H4 are identical Zurn Industries waste heat boilers, each having a two-chamber John Zink forced-draft furnace. Each boiler has three burners each of which is supplied with HCN atomized by a burner gun. The burner configuration is shown on Figure V.9.2. Each burner gun tip is directed to the center of the combustion zone to ensure that the HCN flame does not impinge on and erode the refractory material in the combustion area of the furnace. The combustion zone is constructed of refractory-lined 3/8-inch thick steel.

The furnace in both boilers is made up of two sections: the gas mixing zone and the heat recovery zone. The gas mixing zone has a cross-sectional area of approximately 148 ft^2 and a length of 9 ft. The heat recovery zone has a cross-sectional area of approximately 72.9 ft^2 and is 40 ft long. Each boiler stack is 140 ft high and 7.8 ft in diameter. Each boiler is designed to produce 184,000 pounds per hour of 1,250 psig steam (i.e., the equivalent of approximately 1.8E12 BTU/yr).

1.4 Operation of AN Boilers 30H5 and 31H4

The boilers are operated continuously, but only burn waste HCN less than 5% of the time when surplus HCN resulting from the AN manufacturing process is available. The boilers also burn two types of gaseous fuel: i) natural gas and ii) propane-containing vent gas from the AN unit. When operating, the maximum volume of waste HCN processed in each of AN Boilers 30H5 and 31H4 is 12,250 lb/hr, corresponding to approximately 35 gpm. Total flow to both boilers is 24,500 lb/hr or approximately 70 gpm based on an approximate HCN density of 0.70 gm/cm^2 (CRC, 1994). Detailed engineering drawings for AN Boilers 30H5 and 31H4 are provided on Figures V.9.3 through V.9.12.

2.0 WASTES MANAGED IN AN BOILERS 30H5 AND 31H4

2.1 Types of Wastes Managed

The only hazardous waste managed in AN Boilers 30H5 and 31H4 is HCN, a by-product of the acrylonitrile manufacturing process on the Ascend Chocolate Bayou plant. Only 1% to 5% of the total HCN produced by the AN manufacturing unit is managed in AN Boilers 30H5 and 31H4, the remainder is used as a raw material feedstock in three different Ascend Chocolate Bayou manufacturing units.

No hazardous wastes from off-site sources are managed; therefore, provisions of 30 TAC 335.226-229 are not applicable. As required by 40 CFR 266.102(b), an analysis of the waste HCN was completed for those constituents listed in 40 CFR 261 Appendix VIII expected to be in the waste (see Tables V.9.1 and V.9.2).

2.2 Ignitable or Reactive Wastes

Per 40 CFR 261 Subpart C, the HCN waste stream managed in AN Boilers 30H5 and 31H4 is a listed waste and is characteristically hazardous owing to ignitability, reactivity, and benzene content; corresponding to EPA waste codes of P063, D001, D003, and D018, respectively. In accordance with the provisions of 40 CFR 264.198, Ascend operates AN Boilers 30H5 and 31H4 to safely dispose of any excess HCN. The HCN waste stream is maintained in a totally enclosed, dedicated piping system between the AN manufacturing unit and AN Boilers 30H5 and 31H4. Consequently, HCN is isolated from potential sources of ignition such as open flames, cutting and welding, hot surfaces, frictional heat, sparks, spontaneous reactions with other chemicals, and radiant heat.

2.3 Incompatible Wastes

AN Boilers 30H5 and 31H4 handle a single waste stream from a single manufacturing process in the AN manufacturing unit. Therefore, no potential exists for mixing of incompatible wastes in this unit. Hydrogen cyanide may become unstable in the presence of alkaline materials or water and may react violently with strong mineral acids. Combustion fuels (i.e., natural gas and vent gas) used in AN Boilers 30H5 and 31H4 do not fall into these categories, and pose no risk of reaction. In addition, piping, valves, mechanical components, and refractory lining of the combustion chamber of AN Boilers 30H5 and 31H4 have been selected for compatibility with the HCN waste stream.

3.0 TRIAL BURN

The Trial Burn Plan for AN Boilers 30H5 and 31H4 was submitted to the TNRCC on 12 April 1997 (Focus, 1997), describing test procedures to be employed for determining the following: i) the feasibility of compliance with performance standards of 40 CFR

266.104-107 and ii) adequate operating conditions under 40 CFR 266.103 and 30 TAC 335.224. A Quality Control/Quality Assurance (QA/QC) Plan for the Trial Burn Plan was also submitted to the TCEQ (Focus, 1997). The two AN BIF unit boilers are identical models; therefore, data obtained during the trial burn for boiler 31H4 (i.e., Permit Unit 12) are also representative of boiler 30H5 (i.e., Permit Unit 11). After receiving approval from the TCEQ, the trial burn was implemented in September and December 1997 in accordance with the approved trial burn plan and applicable regulations per 40 CFR 270.66 and 30 TAC 305.572. As specified in 30 TAC 305.573, results of the trial burn, including details specified in 40 CFR 270.66(f), are have been submitted (Focus, 1998). Operating parameters obtained from the trial burn are discussed below.

4.0 OPERATING PROCEDURES FOR AN BOILERS 30H5 AND 31H4

4.1 Permit Standards

Operation of AN Boilers 30H5 and 31H4 will conform to general requirements for burners per 40 CFR 266.102 and specific operating requirements contained in this permit application. Table V.I.2.A summarizes operating requirements determined during the Trial Burn for compliance with the following standards: i) destruction and removal efficiency (DRE) for organic emissions, ii) carbon monoxide and hydrocarbon, iii) particulates, iv) metals emissions, and v) hydrogen chloride and chlorine gas. Operating conditions were determined from the trial burn conducted in September and December 1997. Detailed results of the trial burn are provided in Focus, 1998.

4.2 Waste and Fuel Feed Rates

A total of four streams are fed into AN Boilers 30H5 and 31H4, as follows:

- *Waste HCN:* Liquid HCN is conveyed directly from the AN manufacturing process to AN BIF unit boilers via a closed pipeline system. No tanks or other devices are employed for storage of HCN between the AN manufacturing process and the boilers. The HCN is atomized with 150 psig steam prior to injection into the furnace. The maximum demonstrated total HCN feed rate per boiler is 12,250 lb/hr. Waste HCN is fed into the boilers only when operating conditions of the units meet applicable permit-specified criteria. The HCN supply to the burners is controlled by automatic shutoff valves. The flow of HCN is shut off by these valves if safety system sensors detect any one of the following: i) an off-line burner or absence of burner flame, ii) low atomizing steam pressure, iii) low furnace temperature, or iv) an interlock occurs resulting in furnace shutdown.

- *Natural Gas Fuel:* As the primary fuel for combustion of HCN, natural gas is fed into each boiler at a maximum feed rate of 250,000 ft^3/hour. The natural gas header is equipped with a pressure control valve that maintains a constant supply pressure to both boilers. Variable inlet vanes control the flow of combustion gas from a forced draft 132 L-25 Buffalo Forge blower having a capacity of 73,600 acfm at 100°F and 0.071 lb/ft^3 air. The blower is powered by a Continental NF 806S, 400 hp electric motor.

- *Vent Gas Fuel:* A low-BTU vent gas stream containing propane from the acrylonitrile process is also burned in the boilers. This vent gas has a typical maximum flow rate of 3.0 x 105 lb/hr and an average heating value of 20 to 40 BTU/ft^3.

- *Combustion Air:* Combustion air is supplied to each AN boiler by a forced draft 1325 L-25 Buffalo Forge blower, having a capacity of 73,600 acfm at 100F and 0.071 lb/ft^3 of air. Flow from the blower is controlled by variable inlet vanes. The blower is powered by a Continental NF 806S, 400 hp electric motor

4.3 System Controls

Operating parameters to be monitored for system control are summarized on Table V.I.2.A. As required by 40 CFR 266.102(e)(8), AN Boilers 30H5 and 31H4 are equipped with sensors to monitor and control system operation, as follows:

- *Automatic Waste Feed Cutoffs:* Per 40 CFR 266.103(g), the boilers are equipped with a means to automatically cut off waste feed in the event that operating conditions deviate from permitted limits. An integrated Burner Management System provides continuous monitoring and recording of operating parameters for AN Boilers 30H5 and 31H4. The monitoring system is interlocked with the Boiler Control System which controls operation of AN Boilers 30H5 and 31H4. As shown on Table V.I.2.A, parameters monitored for automatic waste feed cutoff are as follows: i) maximum total hazardous waste feed rate, ii) minimum combustion chamber temperature, iii) maximum carbon monoxide level in the stack, and iv) maximum combustion gas velocity indicator (combustion air and absorber overhead gas flows). Monitoring of permit-specified operating conditions continues during the period of waste feed cutoff, and the burning of HCN recommences only after system parameters comply with permit limits per 266.102(e)(7)(ii).

- *Safety Cutoffs:* Burner Management System safety interlocks automatically shut down the boiler system in the event that an unsafe or off-limits condition is indicated. Safety cutoff parameters are as follows: i) low atomizing steam pressure, ii) low liquid level in steam drum, iii) high natural gas pressure, iv) low intensity of burner flame, and v) low air flow from combustion air blower.

- *Stack Gas Monitoring:* A Continuous Emissions Monitoring System (CEMS) continuously monitors stack gas for carbon monoxide and oxygen. Each boiler stack has two redundant and fully operable carbon monoxide monitors. Carbon monoxide monitors are Thermo Environmental (TECO) Model 48H units having a dual-cell non-dispersive infrared (NDIR) spectrophotometer. Maihak Oxygor Model GN oxygen monitors measure oxygen concentrations. Both the carbon monoxide and oxygen monitors are connected to a data acquisition and processing system.

- *Manual Cutoffs:* A manual waste-feed cutoff is available for the operator in the event of an emergency such as fire, a general plant alarm, medical emergency, waste release, or severe weather condition.

4.4 Control of Air Emissions

Fugitive emissions for AN Boilers 30H5 and 31H4 are controlled by maintaining a totally sealed combustion zone; therefore, no air pollution control devices are required per 40 CFR 266.102(e)(7)(i). Stack emissions monitoring for AN Boilers 30H5 and 31H4 are included in the provisions of 40 CFR 264 Subpart BB and TNRCC air permit R-18251 for the AN Manufacturing Unit.

4.5 Management of Residues

Combustion of waste HCN in AN Boilers 30H5 and 31H4 produces no residuals, therefore, no management is required per 40 CFR 266.112.

4.6 Direct Transfer

The waste stream burned in the two AN BIF unit boilers (31H4 and 30H5) is piped directly from the process to the boilers; thus, no direct transfer operations are employed to feed HCN from transport vehicles as defined in 40 CFR 266.111. Therefore, standards relating to direct transfer referenced in 40 CFR 266.111 and 30 TAC 335.225 are not applicable to the operation of AN Boilers 30H5 and 31H4.

4.7 Flood Protection Measures

Flood Insurance Rate Maps obtained from the Federal Emergency Management Agency (FEMA) indicate that the entire Ascend Chocolate Bayou plant lies within the 100-year floodplain (see Figure II.1). Ground surface elevations on the property average approximately 15 ft mean sea level (msl) as shown on Figure II.1. Base flood elevations corresponding to a 100-year flood event on the property range from 15 to 16 ft msl. Therefore, Ascend has installed flood protection measures and implemented operating procedures to prevent inundation and transport of hazardous waste during a 100-year flood event.

Areas of the 100-year floodplain subject to a coastal flood with velocity hazard (i.e., wave action) are designated as Zone VE on Figure II.1. Only a small area in the extreme southwest portion of the Ascend Chocolate Bayou plant lies within the portion of the 100-year floodplain subject to wave action during a flood, and no hazardous waste management units are located within this area.

Flood protection for AN Boilers 30H5 and 31H4 will be provided by entirely containing the hazardous wastes managed in the unit within elevated process piping; therefore, no means exists for potential contact of rising flood waters with the wastes. In addition, Ascend has developed operating procedures for the AN manufacturing plant to prevent the potential release or transport of hazardous waste during a 100-year flood event by removing the hazardous waste in compliance with 40 CFR 264.18 (b)(1)(i) and 40 CFR 270.14 (b)(11)(iv)(C).

Operating procedures for the AN manufacturing unit specify certain actions to be taken in the event of an impending hurricane or other natural disaster. These procedures involve decontamination of the boiler by flushing the waste feedlines into the boilers, burning any residual HCN, followed by complete shutdown of the boiler unit prior to hurricane landfall or the occurrence of a 100-year flood event. Note there are no waste storage vessels associated with operation of the proposed boiler; therefore, only the waste feed pipelines and the boiler itself have contact with the wastes.

ATTACHMENT V.9
ENGINEERING REPORT FOR
AN BOILERS 30H5 AND 31H4 (PERMIT UNITS 11 AND 12)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

TABLES

TABLE V.9.1
ANALYTICAL RESULTS OF BIF CONSTITUENTS IN HCN WASTE STREAM

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials Texas Operations LLC, Alvin, Texas

Sample ID		Boiler Feed Stream	Boiler Feed Stream	
Sample Date		1993	15-Sep-09	
Analyte	**units**	—	DuPont	CBDLRR0907
Metals				
Antimony	mg/kg or ppm	<0.057	<0.0001	<0.00015
Arsenic	mg/kg or ppm	<0.057	<0.0001	<0.00015
Barium	mg/kg or ppm	<1.43	—	—
Beryllium	mg/kg or ppm	<0.43	<0.0001	<0.00015
Cadmium	mg/kg or ppm	<1.43	**0.0001**	**0.00015 +/-0.00002**
Chromium	mg/kg or ppm	<1.43	**0.0002**	**0.00020 +/-0.00007**
Lead	mg/kg or ppm	<1.43	<0.0001	<0.00015
Mercury	mg/kg or ppm	<0.014	**0.0002**	**0.00031 +/-0.00003**
Silver	mg/kg or ppm	<0.29	<0.0001	<0.00015
Thallium	mg/kg or ppm	<0.057	—	—
Cobalt	mg/kg or ppm	—	**0.0001**	<0.00015
Copper	mg/kg or ppm	—	**0.0016**	**0.0021**
Iron	mg/kg or ppm	—	**0.0134**	**0.00031**
Manganese	mg/kg or ppm	—	**0.0001**	**0.00015**
Molybdenum	mg/kg or ppm	—	**0.0001**	<0.00015
Nickel	mg/kg or ppm	—	**0.0002**	**0.00031**
Niobium	mg/kg or ppm	—	<0.0001	<0.00015
Tin	mg/kg or ppm	—	<0.0001	<0.00015
Tungsten	mg/kg or ppm	—	<0.0001	<0.00015
Vanadium	mg/kg or ppm	—	<0.0001	<0.00015
Zinc	mg/kg or ppm	—	**0.0061**	**0.00662**
Zirconium	mg/kg or ppm	—	<0.0001	<0.00015
Physical Parameters				
Chlorine	mg/kg or ppm	<715	<5	<8
Ash	% w/w	0.0015	—	—
Heat	BTU/lb	9180	—	—
Specific Gravit	g/ml	0.7	—	—

Notes:
1. For the sample analyzed in 1993, chlorine content based analysis of feed stream by Solutia Inc. Remaining analyses conducted by NDRC Laboratories, Inc., Houston, Texas, in accordance with the following methods: metals by EPA Method 6000 or 7000 series, ash by ASTM D482, and heat by ASTM D240. Specific gravity taken from published physical property data on HCN (CRC, 1994).
2. For the sample analyzed in 1993, the HCN stream contains no chlorine; however, the HCN sample was oxidized with sodium hypochlorite, resulting in elevated sodium chloride detection limits.
3. For samples analyzed in 2009, Ascend submitted an extract of hydrogen cyanide (HCN) in nitric acid to DuPont Analytical Solutions, Wilmington, Delaware.
4. Results from 2009 represent the maximum reported concentation for samples analyzed by DuPont Analytical Solutions, Wilmington, Delaware. Metals were analyzed by inductively coupled plasma-mass spectroscopy (ICP-MS) and chlorine by ion chromatography (IC).
5. DuPont results were reported as received. CBDLRR0907 results were calculated from those of DuPont by adjusting for dilution and the density of the nitric acid.
6. Samples analyzed in 1993 were reported in units of mg/kg and samples from 2009 in ppb or ppm. Values reported in ppb have been converted to ppm for consistency.
7. — = Not applicable or not analyzed.
8. CBDLRR0907 = The Chocolate Bayou Development Laboratory Results Report submitted 30 June 2010.

TABLE V.9.2
HCN PURITY ANALYSIS FOR US FDA REQUIREMENTS

Sampling Period: February 1, 1996 - August 8, 1997

RCRA Permit Renewal Application
RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

Analytical Parameter	Average Hydrogen Cyanide By-Product weight %
Hydrogen Cyanide	99.20
Water	0.53
Acetic Acid	0.20
Propionitrile	0.025
Sulfur Dioxide (inhibitor)	0.024
Benzene	0.017
Acrylonitrile	0.012
Propylene Oxide	0.008
Other trace organics not listed in 40 CFR 261 Appendix VIII	0.012
Total	100.0

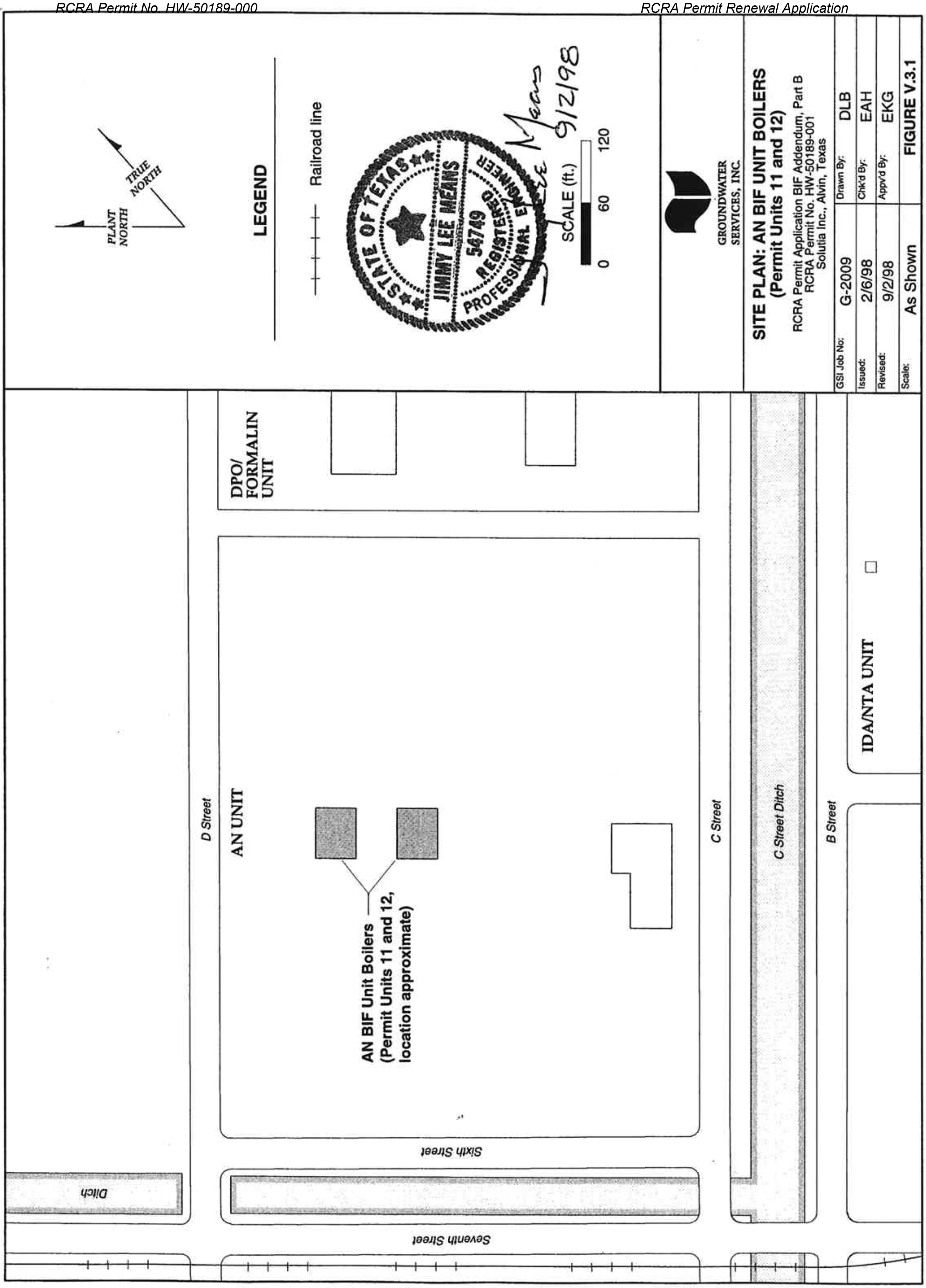
Notes:
1. Values represent average results from U.S. Food and Drug Agency Quality Assurance/Quality Control samples of by-product hydrogen cyanide collected from Tanks 327T3-1 and 327T3-2 during the period of 1 February 1996 to 9 August 1997.
2. Analyses conducted to comply with U.S. Food and Drug Agency using a 1 cubic centimeter sample volume analyzed by gas chromatography and flame ionization / thermal conductivity detectors (FID and TCD).

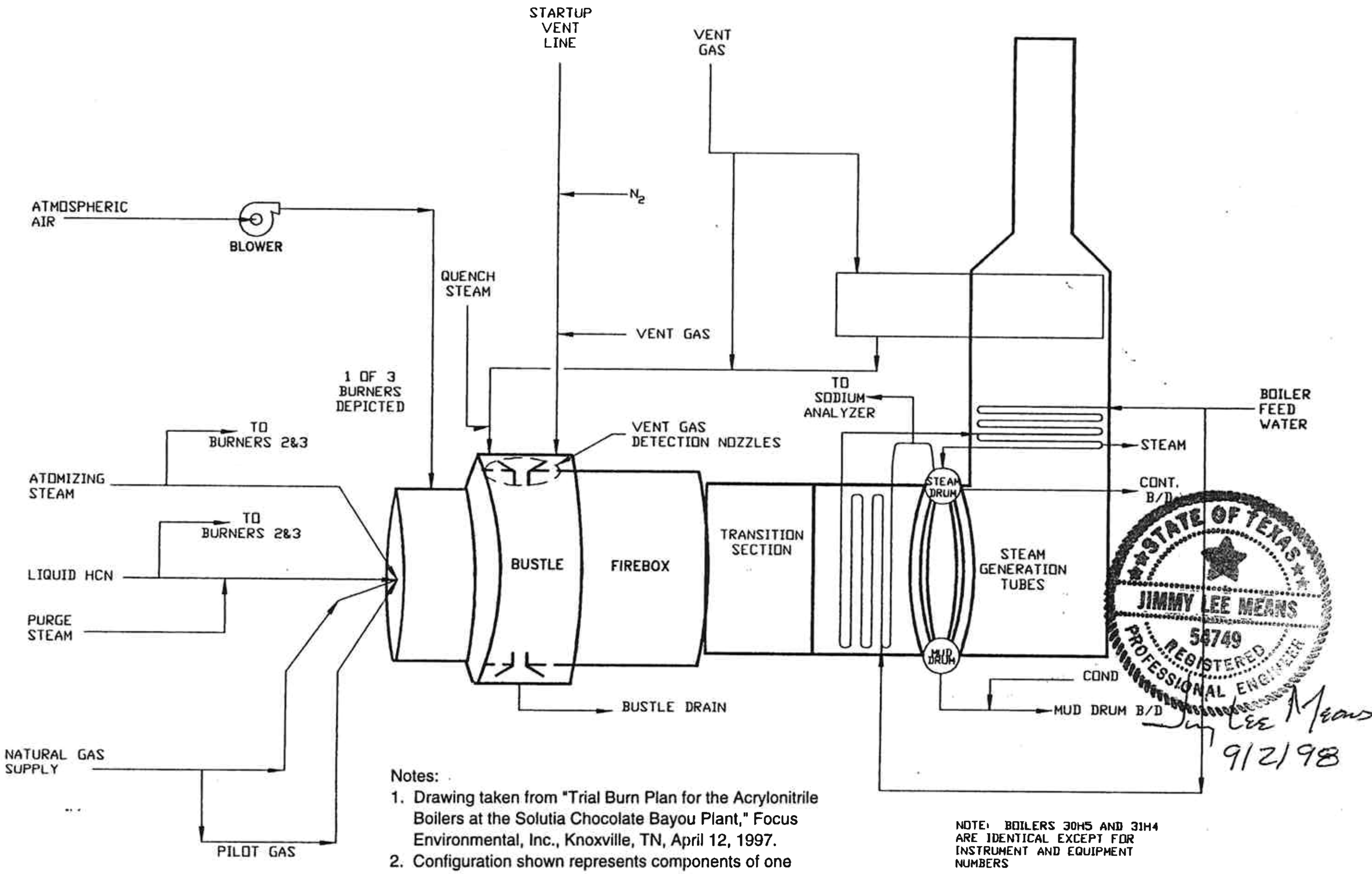
ATTACHMENT V.9
ENGINEERING REPORT FOR
AN BOILERS 30H5 AND 31H4 (PERMIT UNITS 11 AND 12)

RCRA Permit Renewal Application

RCRA Permit No. HW-50189-000
Ascend Performance Materials LLC, Alvin, Texas

FIGURES


PLANT NORTH
TRUE NORTH
LEGEND
Railroad line
STATE OF TEXAS
JIMMY LEE MEANS
54749
REGISTERED
PROFESSIONAL ENGINEER
9/2/98
SCALE (ft.)
0
60
120
GROUNDWATER SERVICES, INC.
SITE PLAN: AN BIF UNIT BOILERS
(Permit Units 11 and 12)
RCRA Permit Application BIF Addendum, Part B
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas
GSI Job No: G-2009
Drawn By: DLB
Issued: 2/6/98
Chk'd By: EAH
Revised: 9/2/98
Appv'd By: EKG
Scale: As Shown
FIGURE V.3.1
DPO/ FORMALIN UNIT
AN UNIT
AN BIF Unit Boilers (Permit Units 11 and 12, location approximate)
IDA/NTA UNIT
D Street
C Street
C Street Ditch
B Street
Sixth Street
Seventh Street
Ditch

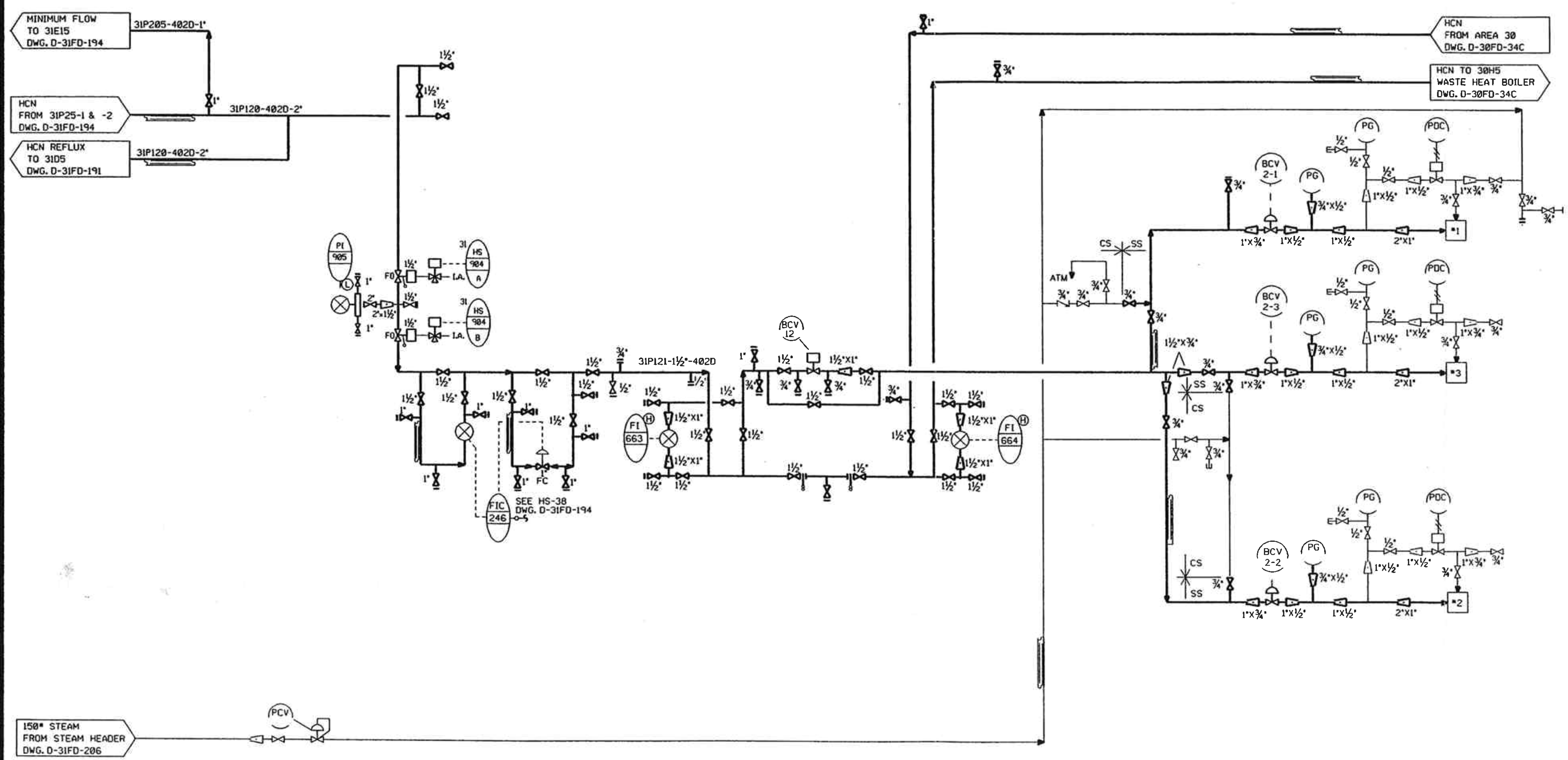


Notes:

1. Drawing taken from "Trial Burn Plan for the Acrylonitrile Boilers at the Solutia Chocolate Bayou Plant," Focus Environmental, Inc., Knoxville, TN, April 12, 1997.
2. Configuration shown represents components of one burner. Each of the two identical AN BIF unit boilers 30H5 and 31H4 (i.e., Permit Units 11 and 12, respectively) has three burners.

GROUNDWATER SERVICES, INC.	GSI Job No. G-2009	Drawn By: EAH		
	Issued: 2/6/98	Chk'd By: EAH		
	Revised: 9/2/98	Aprv'd By: EKG		
	Scale: Not to Scale	FIGURE V.3.2		

TYPICAL BURNER CONFIGURATION:
AN BIF Unit Boilers (Permit Units 11 and 12)
RCRA Permit Application BIF Addendum, Part B
RCRA Permit No. HW-50189-001
Solutia Inc., Alvin, Texas



STATE OF TEXAS
JIMMY LEE MEANS
54749
REGISTERED PROFESSIONAL ENGINEER

Jimmy Lee Means
9/2/98

REV	CEA	BY (PHONE / DATE)	DESCRIPTION	CHKD / APPD
1	-	J.L. RAMOS 4514 9/2/98	P. E. CERTIFICATION	-

PLANT ENGINEERING DEPARTMENT
CHOCOLATE BAYOU PLANT
ALVIN, TEXAS 77512

SOLUTIA

COMPANY CONFIDENTIAL

COMPANY: MONSANTO   PLANT: CHOCOLATE BAYOU

FLOW DIAGRAM
PURIFICATION SECTION
HCN TRANSFER TO 31H4 & 30H5

DRAWN BY:	APPROVED	DATE	APPROVED	DATE
PHONE/DATE: 4514 12/4/96	-	-	-	-
CHKD/DATE: -	-	-	-	-
SCALE				

C.E.A. NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	REV
	46	D	31	EPA	195	1

PLANT DRAWING NO. D-31-EPA-195

THIS DRAWING WAS HAZOPED ON / /95

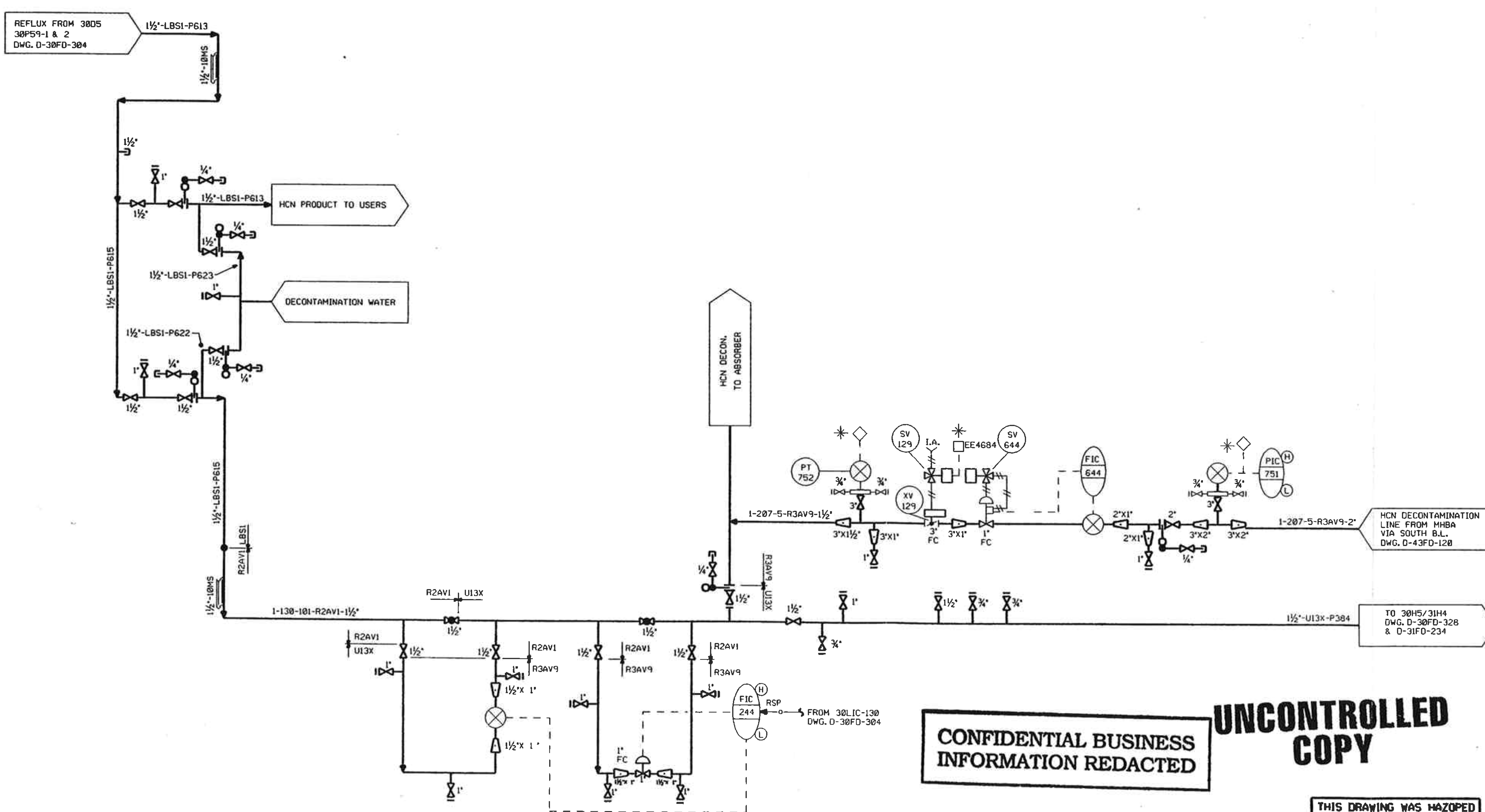
DESIGN FILE NAME: PRINTS ISSUED TO FIELD BY   DATE   REV

CONFIDENTIAL BUSINESS INFORMATION REDACTED

UNCONTROLLED COPY

PLOTTED ON AND AT: 1-SEP-1998 10:59   PLOTTED BY: jramo

Figure V.9.4
RCRA Permit Renewal Application



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JIMMY LEE MEANS
54749
REGISTERED PROFESSIONAL ENGINEER

Jimmy Lee Means
9/2/98

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REV		BY	DATE	DESCRIPTION	CHKD / APPD
1	.	J.L. RAMOS 4514	9/2/98	P. E. CERTIFICATION	
REV	CEA	PHONE	DATE	DESCRIPTION	CHKD APPD

SOLUTIA

PLANT ENGINEERING DEPARTMENT
CHOCOLATE BAYOU PLANT
ALVIN, TEXAS 77512
COMPANY CONFIDENTIAL

COMPANY: MONSANTO PLANT: CHOCOLATE BAYOU

FLOW DIAGRAM
AN-2
HCN BURN LOOP

DRAWN BY: J.L. RAMOS
PHONE/DATE: 4514 12/3/96
SCALE: NONE

C.E.A.NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	REV
	46	D	30	EPA	315	1

PLANT DRAWING NO. D-30-EPA-315

DESIGN FILE NAME: PRINTS ISSUED TO FIELD BY DATE REV

PLOTTED ON AND AT: 1-SEP-1998 10:26 PLOTTED BY: jramo

Ascend Performance Materials LLC, Alvin, Texas
RCRA Permit No. HW-50189-000

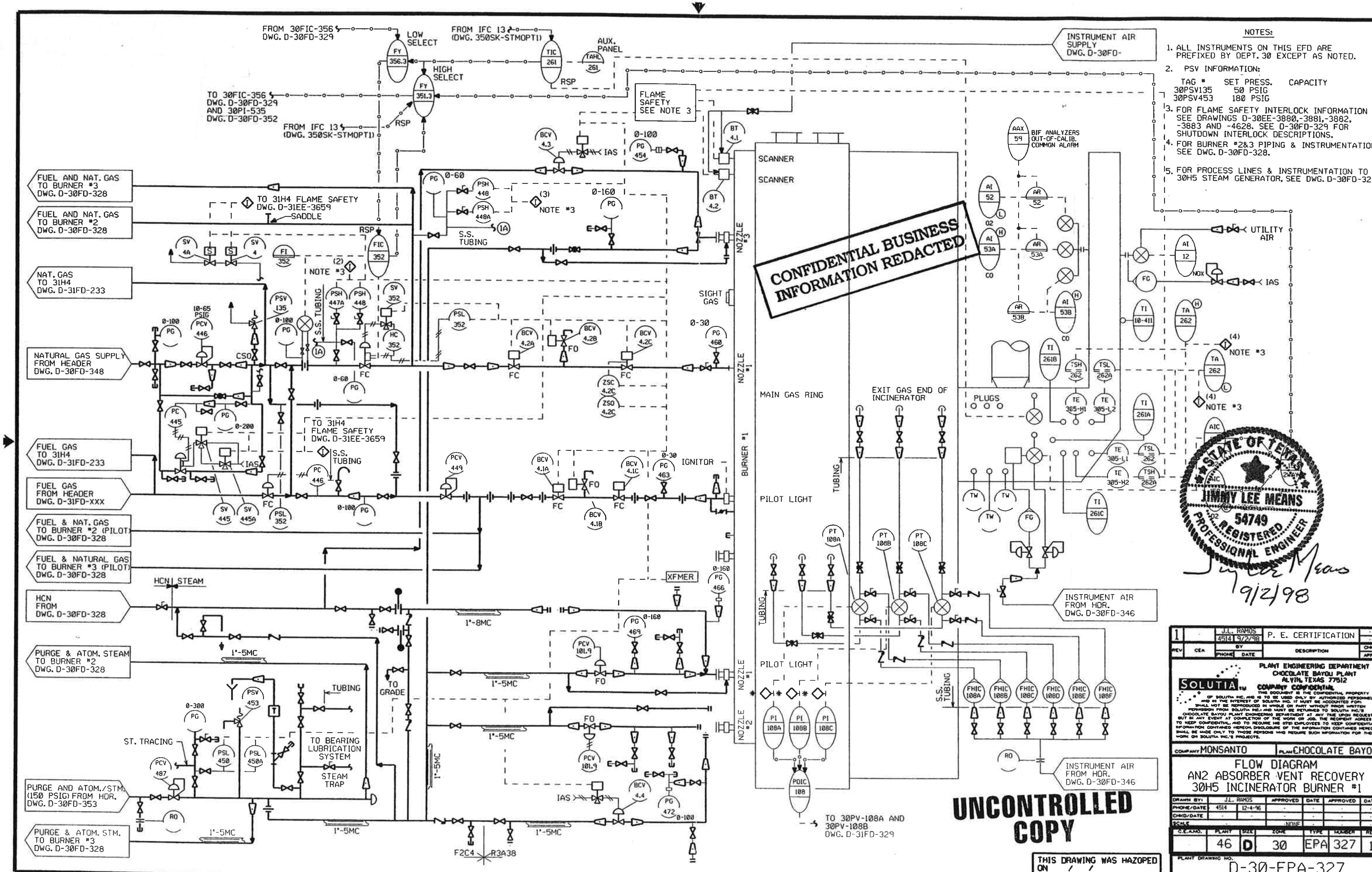


Figure V.9.5
RCRA Permit Renewal Application

Ascend Performance Materials LLC, Alvin, Texas
RCRA Permit No. HW-50189-000

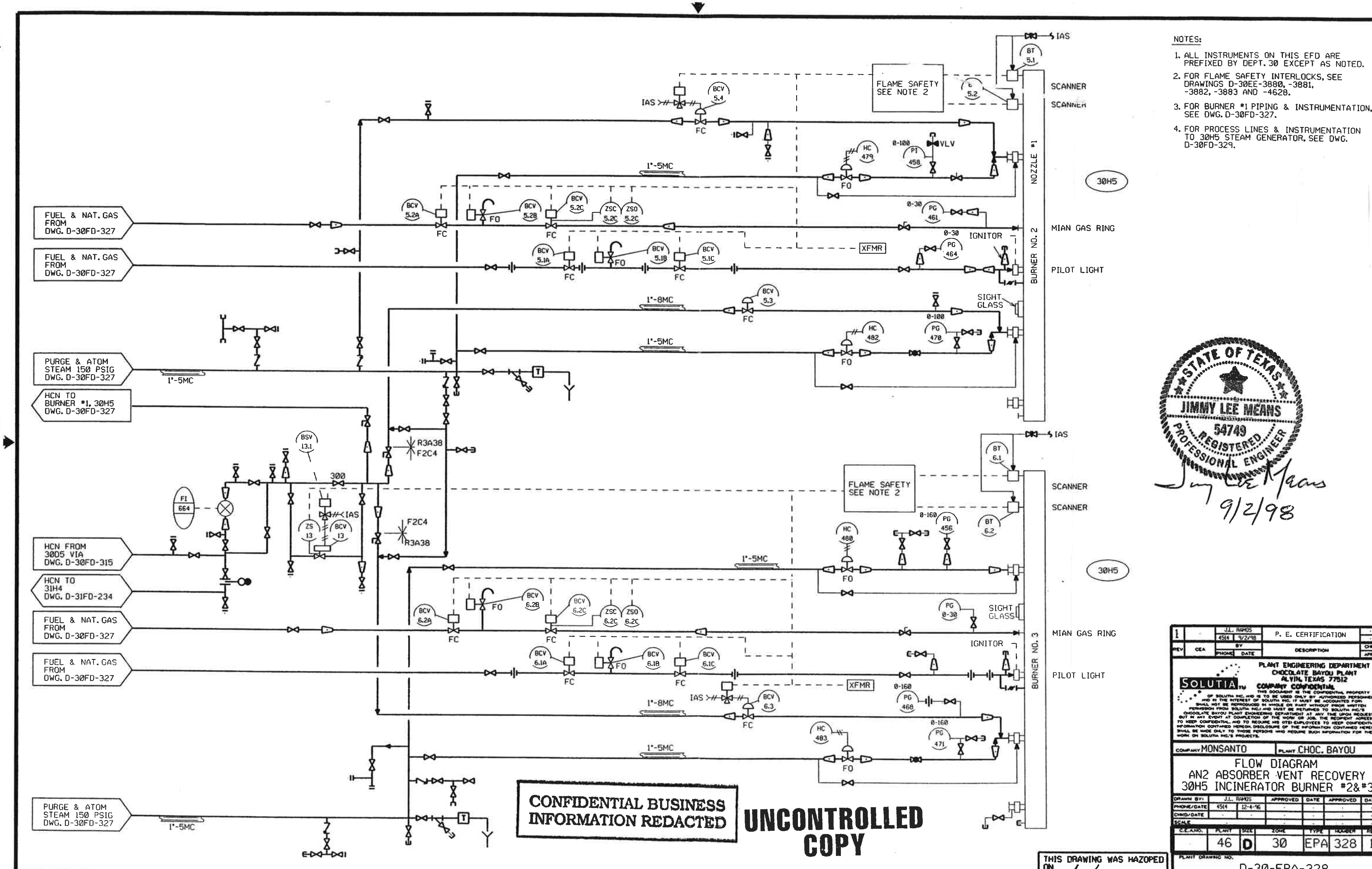
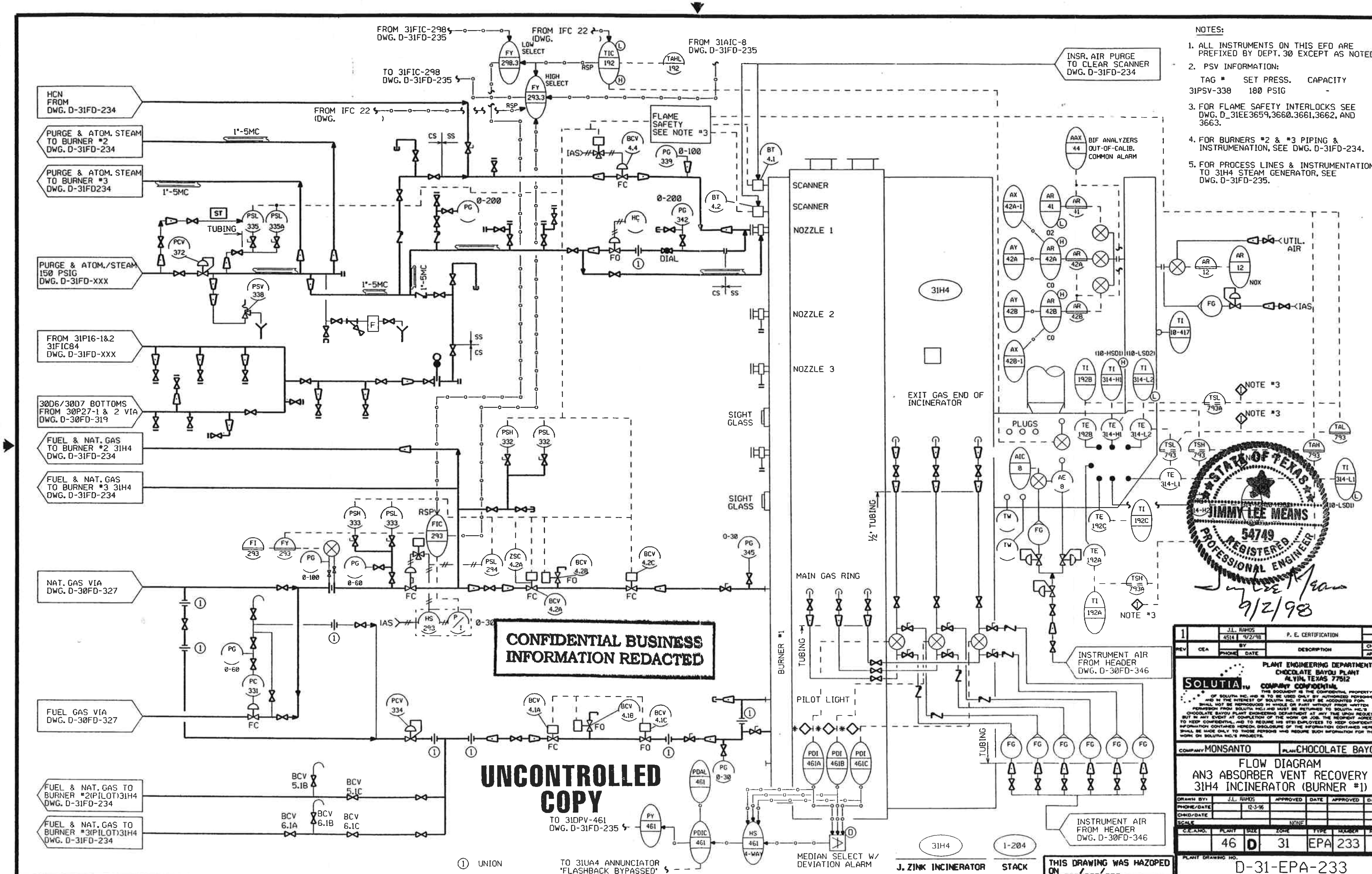


Figure V.9.6
RCRA Permit Renewal Application

Ascend Performance Materials LLC, Alvin, Texas
RCRA Permit No. HW-50189-000

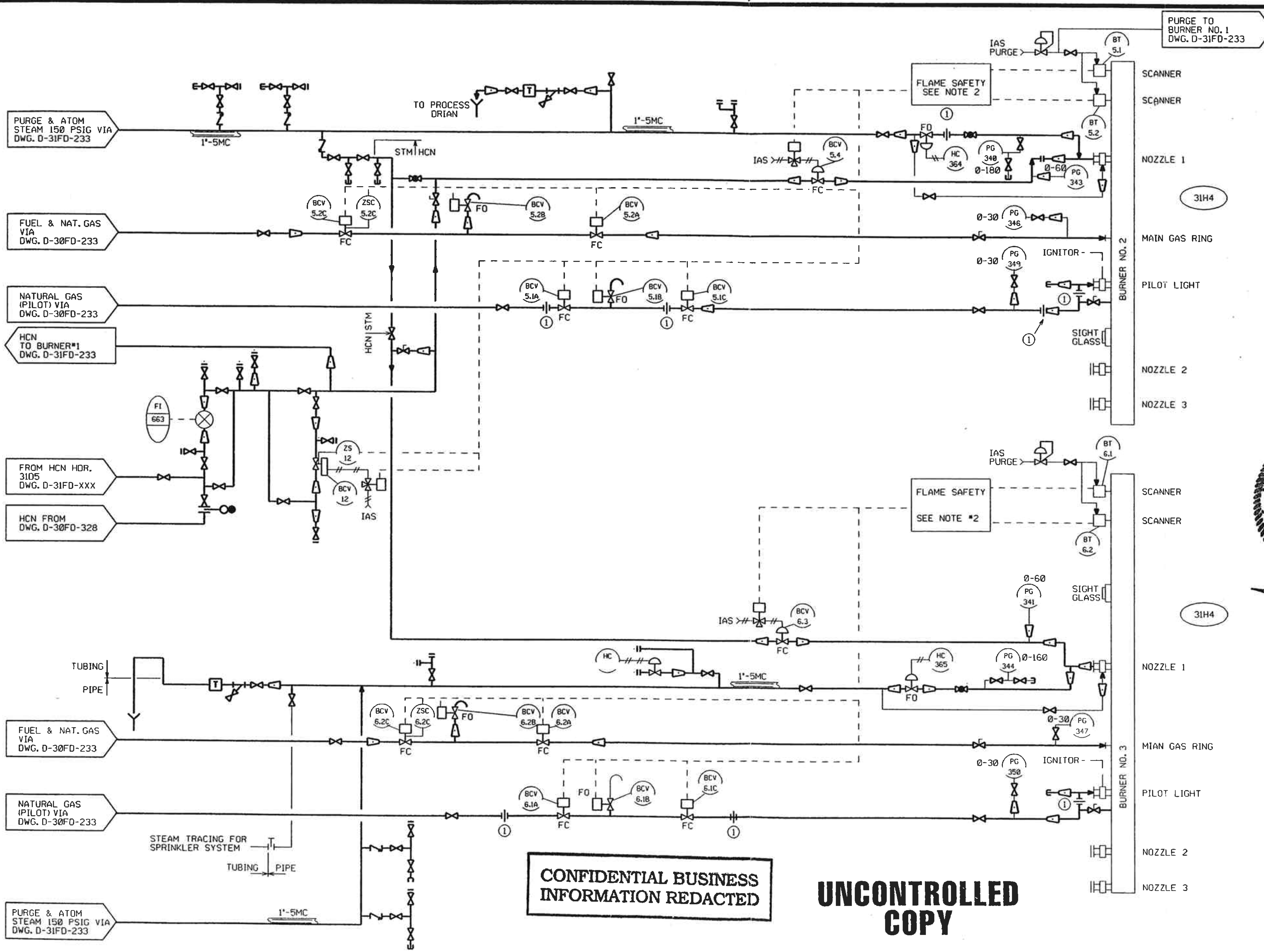
PLOTTED ON AND AT: 1-SEP-1998 10:45 PLOTTED BY: jramo



PLOTTED ON AND AT: 1-SEP-1998 11:05 PLOTTED BY: jiramo

Figure V.9.7
RCRA Permit Renewal Application

Ascend Performance Materials LLC, Alvin, Texas
RCRA Permit No. HW-50189-000



CONFIDENTIAL BUSINESS INFORMATION REDACTED

NOTES:

1. ALL INSTRUMENTS ON THIS EFD ARE PREFIXED BY DEPT. 31 EXCEPT AS NOTED.
2. FOR FLAME SAFETY INTERLOCKS SEE DWG.S D-31EE-3659,3660,3661,3662,AND 3663
3. FOR BURNER *1 PIPING & INSTRUMENTATION, SEE DWG. D-31FD-233.
4. FOR PROCESS LINES & INSTRUMENTATION TO 31H4 STEAM GENERATOR, SEE DWG. D-31FD-235.

① UNION

STATE OF TEXAS
JIMMY LEE MEANS
54749
REGISTERED PROFESSIONAL ENGINEER

Jimmy Lee Means
9/2/98

REV		BY / DATE	DESCRIPTION	
1		J.L. RAMOS 4514 9/2/98	P. E. CERTIFICATION	

SOLUTIA

PLANT ENGINEERING DEPARTMENT
CHOCOLATE BAYOU PLANT
ALVIN, TEXAS 77512

COMPANY CONFIDENTIAL

COMPANY MONSANTO — PLANT CHOC. BAYOU

FLOW DIAGRAM
AN3 ABSORBER VENT RECOVERY
31H4 INCINERATOR (BURNERS*2&*3)

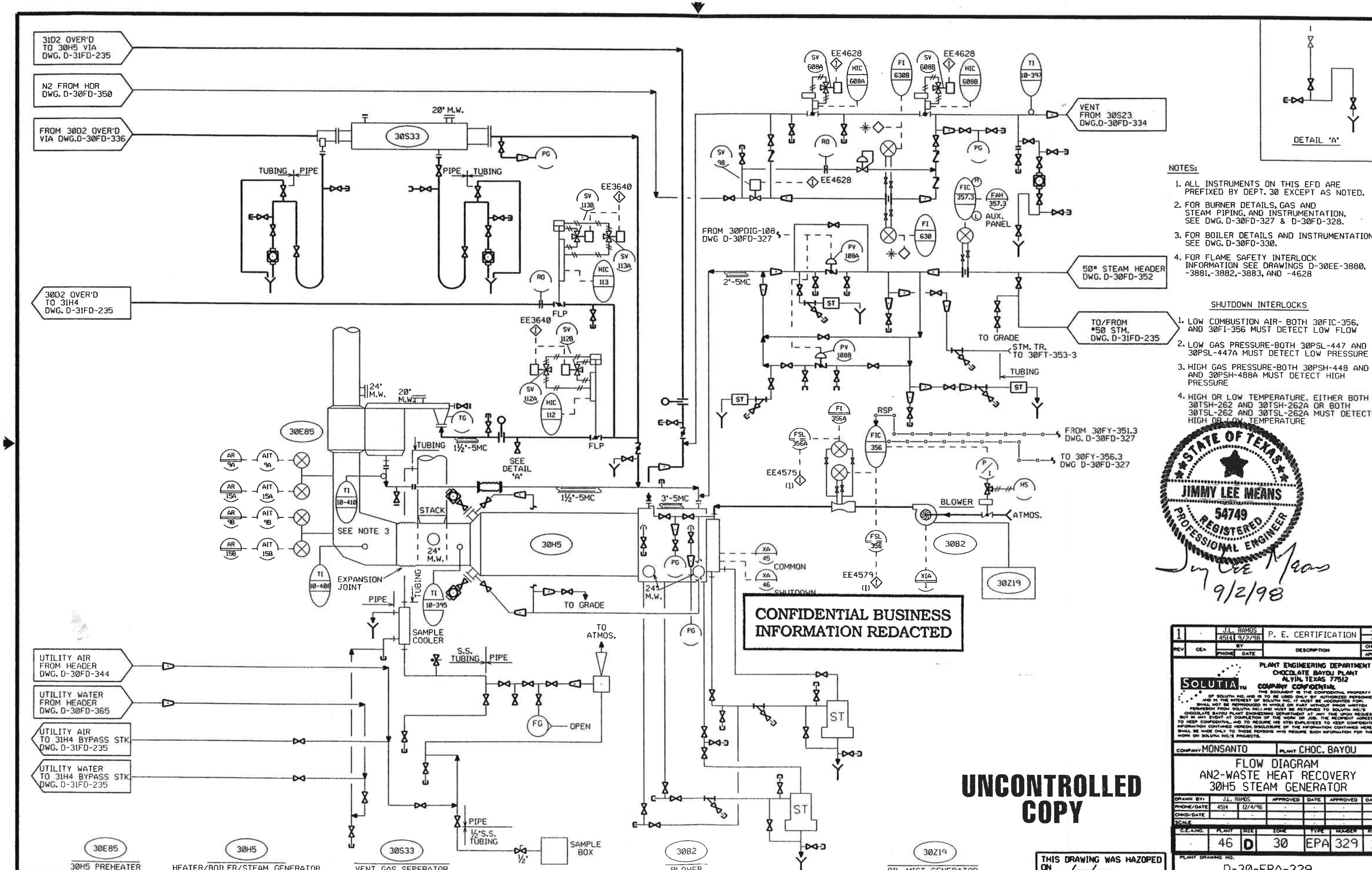
DRAWN BY: J.L. RAMOS 12/3/96

C.E.A.NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	REV
	46	D	31	EPA	234	1

PLANT DRAWING NO. D-31-EPA-234

PLOTTED ON AND AT: 1-SEP-1998 11:10 PLOTTED BY: jiramo

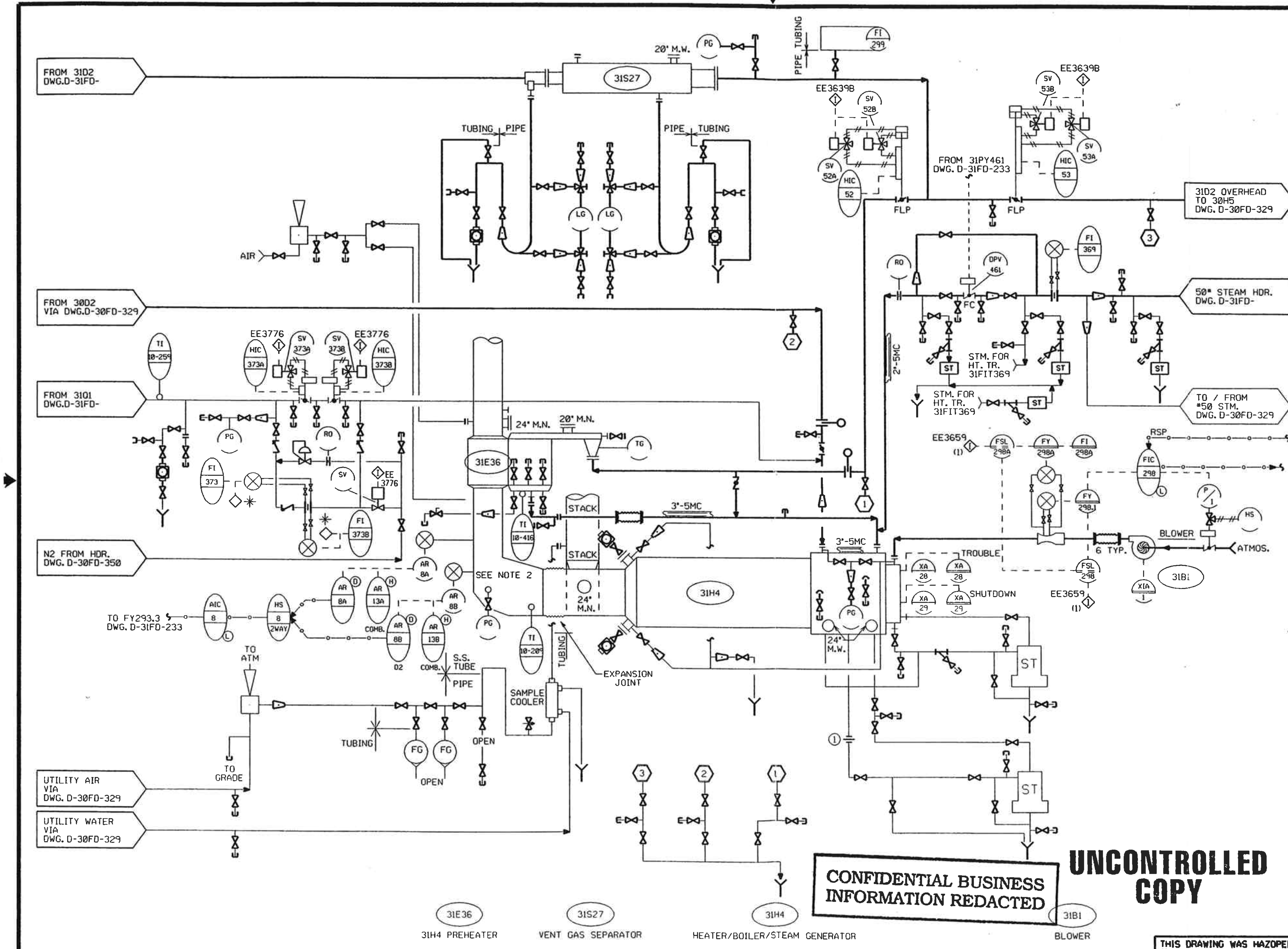
DESIGN FILE NAME: 3P0234.dgn



CONFIDENTIAL BUSINESS INFORMATION REDACTED

Figure V.9.9
RCRA Permit Renewal Application

PLOTTED ON AND AT: 1-SEP-1998 10:54 PLOTTED BY: jiramo
Ascend Performance Materials LLC, Alvin, Texas
RCRA Permit No. HW-50189-000



NOTES:

1. ALL INSTRUMENTS ON THIS EFD ARE PREFIXED BY DEPT. 31 EXCEPT AS NOTED.
2. FOR BURNER DETAILS, GAS AND STEAM PIPING AND INSTRUMENTATION, SEE DWG. D-31FD-233 & 234.

STATE OF TEXAS
JIMMY LEE MEANS
54749
REGISTERED
PROFESSIONAL ENGINEER

Jimmy Lee Means
9/2/98

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REV	CEA	BY	DESCRIPTION	CHKD / APPD
1		J.L. RAMOS 4514 9/2/98	P. E. CERTIFICATION	

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CHOCOLATE BAYOU PLANT
ALVIN, TEXAS 77512

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COMPANY MONSANTO — PLANT CHOC. BAYOU

FLOW DIAGRAM
AN3 WASTE HEAT RECOVERY
31H4 STEAM GENERATOR

DRAWN BY: J.L. RAMOS — 12/3/96

C.E.A.NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	REV
	46	D	31	EPA	235	1

PLANT DRAWING NO. D-31-EPA-235

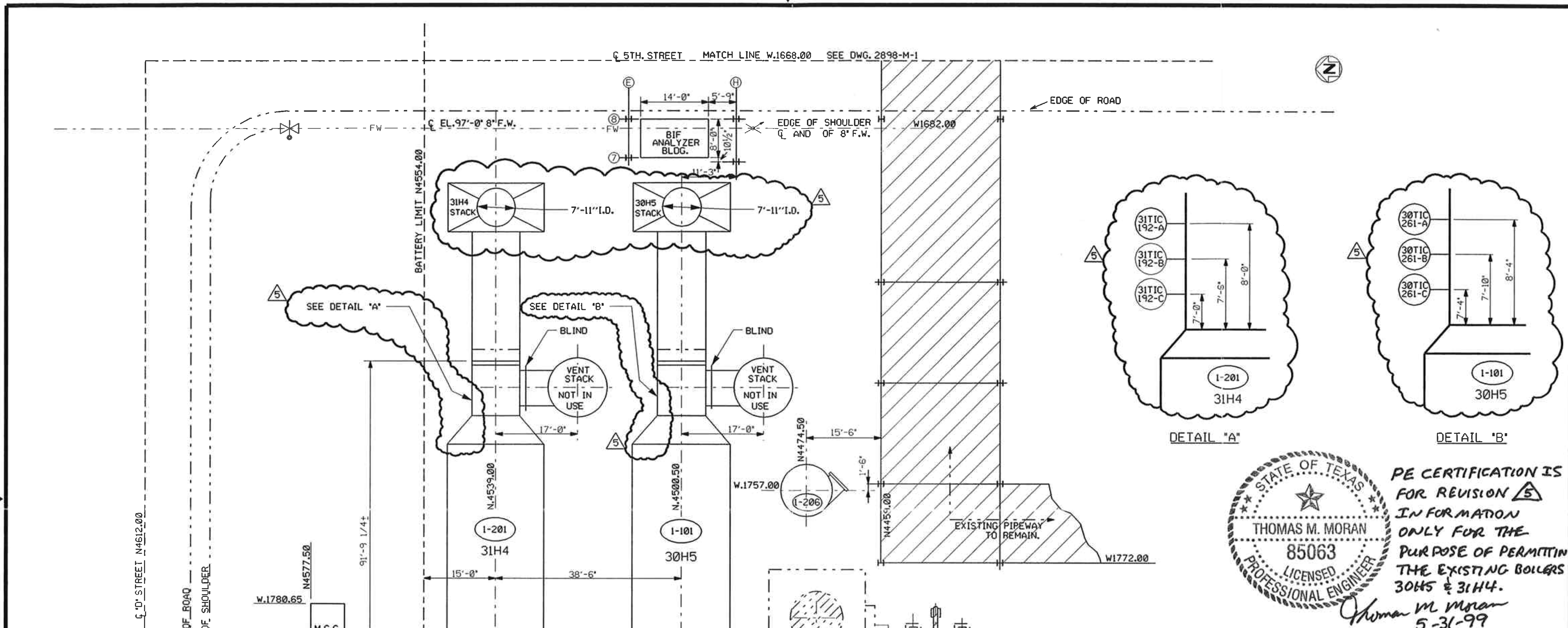
THIS DRAWING WAS HAZOPED ON / /

DESIGN FILE NAME: 31F0235.dgn — PRINTS ISSUED TO FIELD BY — DATE — REV

PLOTTED ON AND AT: 1-SEP-1998 11:14 PLOTTED BY: jramo

~~Ascend Performance Materials LLC, Alvin, Texas~~
RCRA Permit No. HW-50189-000

Figure V.9.10
RCRA Permit Renewal Application



REV	CEA	BY / DATE	DESCRIPTION	CHKD / APPD
5	35030	DMZ 5-26-99	ADDED DIM'S TO STACK, &TIC'S FOR EPA PERMITTING	
4	38134	T.C.G. 9-14-94	REDRAWN ON CAD	
3	12295	S.R.J. 9-17-92	ADDED BIF ANALYZER BLDG. LOCATION	LDM JSM
2	2898	ROTHERMICH 3-8-75	REV. CONTROL PANEL LOCATION	JAE
1	2898	RUTHERMICH 12-16-74	ADD SECT. 1-1 & IT. 1-206 & CONTROL PANELS	JAE

SOLUTIA TM

PLANT ENGINEERING DEPARTMENT
CHOCOLATE BAYOU PLANT
ALVIN, TEXAS 77512

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COMPANY: SOLUTIA PLANT: CHOC. BAYOU

EQUIPMENT ARRANGEMENT INCINERATORS A.N. ABSORBER VENT RECOVERY

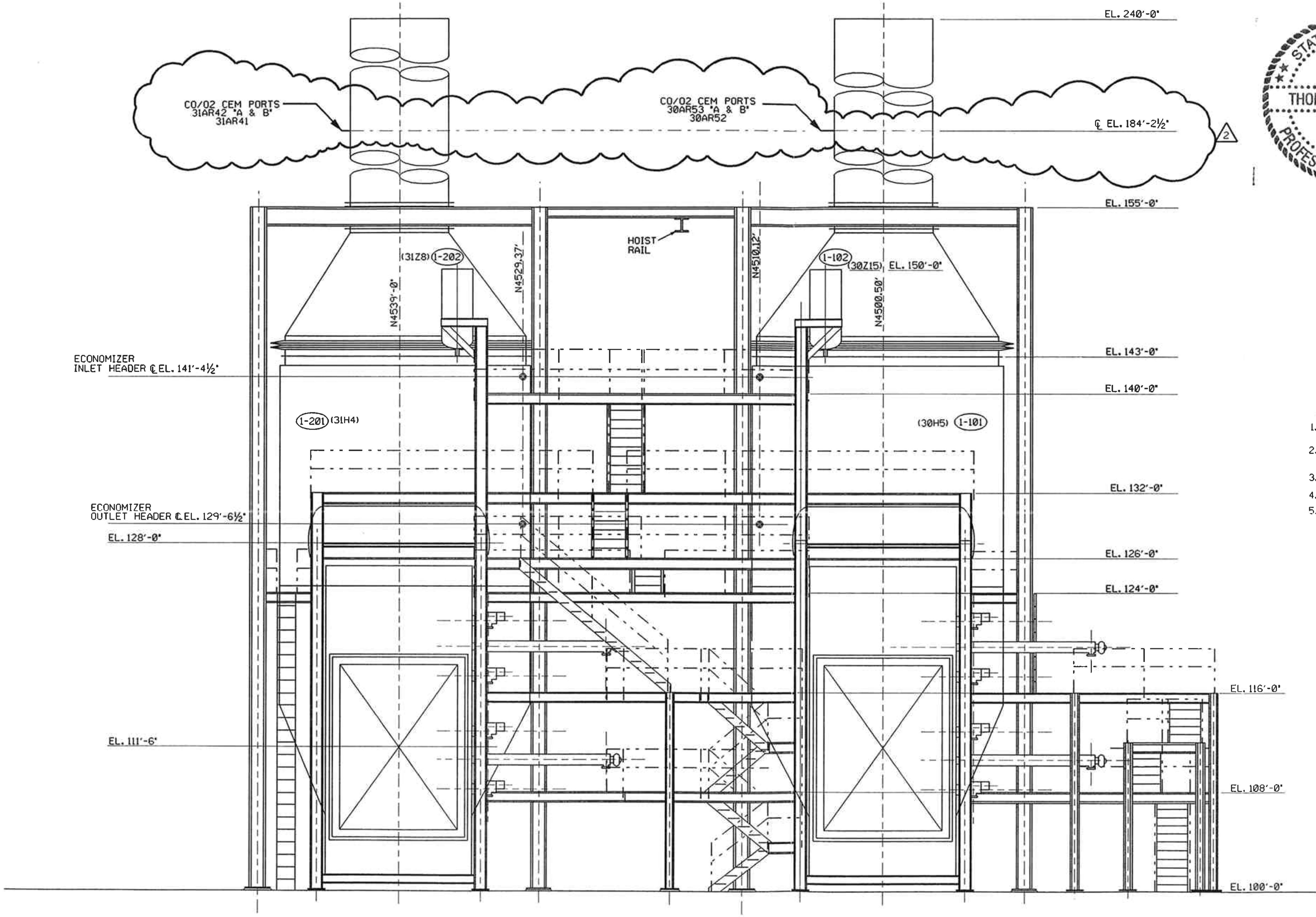
DRAWN BY:	MENKE		APPROVED	DATE	APPROVED	DATE
PHONE/DATE	-	9/74	RUTHERFURD	10/74	RFS	12/74
CHKD/DATE	-	-	RUTHERFURD	10/74	ECKEL	10/74
SCALE	1"=1'-0"		-	.	.	.

C.E.A.NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	REV
2898	46	D	15.000 / 30	M / GA	2 / 6	5

PLANT DRAWING NO. D-30GA-6

DESIGN FILE NAME: PRINTS ISSUED TO FIELD BY DATE REV

PLOTTED ON AND AT: 26-MAY-1999 10:42 PLOTTED BY: dmzeng



ELEVATION-LOOKING EAST

PE CERTIFICATION IS FOR REV. 2 INFORMATION ONLY FOR THE PURPOSE OF PERMITTING THE EXISTING BOILERS 30H5 & 31H4.
Thomas M Moran
5-31-99

STATE OF TEXAS
THOMAS M. MORAN
85063
LICENSED
PROFESSIONAL ENGINEER

REFERENCE STEEL DWG'S

1. S-30 BOILER PLATFORM FRAMING PLAN AT EL. 108'-0", 116'-0" & 124'-0".
2. S-31 BOILER PLATFORM FRAMING PLAN AT EL. 124'-0", 128'-0", 132'-0" & 140'-0".
3. S-32 BOILER STAIR SECTIONS.
4. S-33 BOILER SECTION ELEVATION.
5. S-36 BOILER SECTION ELEVATION

2966-M4	EQUIP. ARRGT. ELEVATION LOOKING NORTH
2966-M3	EQUIP. ARRGT. PLAN ABOVE EL. 148'-0"
2966-M2	EQUIP. ARRGT. PLAN AT GRADE
	REFERENCE DWGS.

REV	CEA	BY / PHONE / DATE	DESCRIPTION	CHKD / APPD
2	85030	DMZ 4253 5-25-99	CEM PORTS SHOWN FOR EPA PERMITTING	-
1	88134	T.C.G. - 8/94	REDRAWN ON CAD	-
0	2966	- - 4-49-76	APPROVED FOR CONST.	-

SOLUTIA™
PLANT ENGINEERING DEPARTMENT
CHOCOLATE BAYOU PLANT
ALVIN, TEXAS 77512
COMPANY CONFIDENTIAL

COMPANY M.P.&P. PLANT CHOCO. BAYOU

EQUIPMENT ARRANGEMENT
ELEVATION LOOKING EAST
DEPT 30

DRAWN BY:	-	APPROVED	DATE	APPROVED	DATE
PHONE/DATE	- -	-	-	-	-
CHKD/DATE	- -	-	-	-	-
SCALE	-	-	-	-	-

C.E.A.NO.	PLANT	SIZE	ZONE	TYPE	NUMBER	REV
2966	46	D	000.00 / 30	M / GA	5 / 14	2

PLANT DRAWING NO.
D-30-GA-14

DESIGN FILE NAME: PRINTS ISSUED TO FIELD BY DATE REV

PLOTTED ON AND AT: 25-MAY-1999 15:55 PLOTTED BY: dmzeng