PART III, ATTACHMENT 6

LANDFILL GAS MANAGEMENT PLAN

Hawthorn Park Recycling and Disposal Facility

Houston, Harris County, Texas

TCEQ Permit MSW-2185A

Owner/Site Operator/Permittee:

WASTE MANAGEMENT

USA Waste of Texas Landfills, Inc.
24275 Katy Freeway, Suite 450
Katy, TX 77494

GOLDER ASSOCIATES INC.
Professional Engineering Firm
Registration Number F-2578

INTENDED FOR PERMITTING PURPOSES ONLY

Submitted By:

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Submitted: February 2021

Project No. 1894269

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1.0 INTRODUCTION

This Landfill Gas Management Plan (LFGMP) has been developed for the Hawthorn Park Recycling and Disposal Facility (referred to hereinafter as "Hawthorn Park RDF," or "facility," "landfill," or "site"). The purpose of this LFGMP is to provide a site-specific approach for managing landfill gas (LFG) at the Hawthorn Park RDF. This plan implements a routine Methane Monitoring Program in accordance with the requirements of §330.371(b) of Title 30 of the Texas Administrative Code (TAC). This regulation requires monitoring on a quarterly basis, at a minimum, unless otherwise directed by the Texas Commission on Environmental Quality (TCEQ). The purpose of the Methane Monitoring Program is to ensure that the site remains within applicable regulatory and safety guidelines regarding the control of LFG generated by the facility. In accordance with the requirements of §330.371(c), this plan also describes the actions to be taken when methane gas levels exceed the limits described below. The TCEQ Executive Director may establish alternative schedules for demonstrating compliance with these regulations.

The Hawthorn Park RDF is a Type IV municipal solid waste (MSW) landfill facility, and waste that has and will continue to be disposed of at the landfill consists of, but is not limited to, the following materials, as defined in 30 TAC §§330.3 and consistent with 330.5(a)(2):

- Construction or demolition waste [30 TAC §330.3(33)]
- Brush [30 TAC §330.3(18)]
- Rubbish [30 TAC §330.3(136)]
- Tires that have been processed (such as by splitting, shredding, quartering or sidewall removal) in a manner acceptable to the executive director. [30 TAC §330.3(142; 30 TAC §330.15(e)(4) (prohibiting disposal of whole used or scrap tires]
- Class 2 industrial solid waste that is construction or demolition waste, brush, or rubbish resulting from or incidental to any process of industry or manufacturing, or mining or agricultural operations. [30 TAC §330.3(22); 30 TAC §330.173(i)]
- Class 3 industrial solid waste. [30 TAC §330.3(23); 30 TAC§330.173(j)]
- Non-regulated asbestos-containing material (non-RACM). [30 TAC §330.3(95); 40 CFR §61.141; 30 TAC §330.171(c)(4)]
- Other special waste that is construction or demolition waste, brush, or rubbish. [30 TAC §330.3(154); 30 TAC §330.171(a)]

The estimated waste acceptance rate for the Hawthorn Park RDF is expected to vary from approximately 150,000 tons per year to 340,000 tons per year at the end of the site's active life. As of 2020, approximately 72,000 cubic yards (CY) of capacity remained in the facility. The expansion proposed in this Permit Amendment Application (PAA) will add to the capacity of the site. Using the current waste acceptance rate and considering the annual growth rate, the active life of the expanded

Hawthorn Park RDF is estimated to be approximately 46 years. A complete set of site life calculations is included in Part III, Attachment 3, Appendix III-3A.

The lower explosive limit (LEL) of a gas is defined as the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25 degrees Celsius (°C) and atmospheric pressure. Methane is explosive when present in the range of 5% to 15% by volume in air. The lower (5%) threshold is referred to as the LEL for methane in air. The upper (15%) threshold is referred to as the upper explosive limit (UEL) for methane in air. Concentrations of methane less than 5% and greater than 15% are typically not explosive.

In addition to the protection of human health, the purpose of this LFGMP is to evaluate the concentration of combustible gases generated by the facility at the point of compliance (permit boundary) and in buildings and structures within the permit boundary.

2.0 SITE CONDITIONS

2.1 Surrounding Land Use, Structures and Habitable Buildings

The majority of land within one mile of the site is industrial. Many commercial tracts are also located throughout the area, including both office parks and small businesses interspersed between residential and industrial uses. Additionally, there are a handful of older, single-family developments with a number of vacant lots. Within one mile of the permit boundary, single-family residential land use includes 2,157 homes plus 48 additional homes presently under construction.

A Site Location Map is shown on Figure III-6-1. A detailed Land Use Analysis is included in Part II, Appendix IIB. A Structures Location Map is shown on Figure II-11 in Part II. The landowners' map is included in Part I, Appendix IB.

3.0 SUBSURFACE CONDITIONS

3.1 Geology/Soil Conditions

The regional and local geologic settings, fault areas, seismic impact zones, unstable areas, and erosion potential present at the Hawthorn Park RDF are discussed in the Geology Report in Part III, Attachment 4. The report describes a generalized regional stratigraphic column of the area, including geologic age, lithology, and variations in lithology, thickness, depth, geometry, hydraulic conductivity, and depositional history (as available through current geologic information).

The results of subsurface investigations show that the site is underlain by four distinct strata, namely (in order from ground surface down):

- Layer I: Clays and sandy clays with minor amounts of sand and silt
- Layer II: Channel fill deposits consisting predominantly of fine sands with gradations to siltyfine sands and silts and is considered the uppermost aquifer at the site for groundwater monitoring purposes
- Layer III: Primarily low permeability clay with sand and silt forming internal transmissive zones
- Layer IV: Fine sand with some interbedded clays

3.2 Hydrogeologic Conditions

The regional hydrogeology surrounding the Hawthorn RDF and the site-specific hydrogeology are discussed in detail in the Geology Report in Part III, Attachment 4. The report examines the most significant regional aquifers in the vicinity of the site, which include the Chicot and Evangeline. The stratigraphy of the area is summarized on Table III-4-1 of the Geology Report. The hydraulic properties of the aquifer units are summarized on Table III-4-2 in the Geology Report.

3.3 Hydraulic Conditions

Hydraulic conditions at the Hawthorn Park RDF are discussed in the Facility Surface Water Drainage Report in Part III, Attachment 2. This report provides a detailed description of the hydrologic and hydraulic analyses performed for the Hawthorn Park RDF PAA.

4.0 MONITORING

Routine methane monitoring will be conducted at the facility, the type and frequency of which has been determined based on the following factors:

- soil conditions;
- the hydrogeologic conditions surrounding the facility;
- the hydraulic conditions surrounding the facility;
- the location of facility structures and property boundaries; and
- the location of any utility lines or pipelines that cross the facility.

The following sections describe monitoring at the perimeter of the facility (at the permit boundary) and in on-site buildings and structures. There are no utility lines or pipelines that are known to cross site. If during site development any utility lines or pipelines are discovered, they will be monitored.

All monitoring probes and on-site structures will be sampled for methane during the monitoring period. Sampling for specified trace gases may be required by the TCEQ Executive Director when there is a possibility of acute or chronic exposure due to carcinogenic or toxic compounds.

4.1 Perimeter Monitoring

4.1.1 Perimeter Monitoring Network

Under current Permit No. MSW-2185, the Hawthorn Park RDF's existing methane monitoring probe network consists of twenty-three (23) monitoring probes as shown in Figure III-6-2. One additional internal monitoring probe (GP-6) is located between West and Center Blocks and, although monitored, this internal probe is not a compliance monitoring point. As-constructed information for the installed methane monitoring probes is included in Appendix III-6A. A typical monitoring probe detail is provided in Figure III-6-4.

The Hawthorn Park RDF's methane monitoring network will be expanded in phases to include the expansion area. Existing methane probes in the expansion area and off the permit boundary in the vicinity of the off-site detention pond will be abandoned as required. Temporary probes may be installed at the site for evaluation purposes. The proposed perimeter monitoring network is shown on Figure III-6-3.

In accordance 30 TAC §330.371(f), the methane monitoring system will be revised and maintained as needed. Post-closure care shall not interfere with the gas monitoring system.

4.1.2 Monitoring Procedures

Methane concentrations will be measured using a portable gas analyzer, or similar device capable of measuring methane concentrations. The equipment will be calibrated against a methane standard, with a suction sampling line for drawing samples directly to the indicator without diluting the sample. Monitoring will be conducted by qualified personnel or a qualified consultant. The results will be recorded on the Gas Monitoring Report form included in Appendix III-6B, or a similar form. The results will be maintained in the Site Operating Record (SOR).

Routine probe monitoring will be conducted as follows:

1. Measure the probe temperature and pressure and record the value (including plus or minus indicating pressure or vacuum, respectively) on the Gas Monitoring Report form;
2. Measure concentration of methane and oxygen in probe:
   A. Connect sampling line to the valve on the probe and open the valve; and
   B. Record percent of methane present once a stabilized reading is achieved and record the percent of methane on the Gas Monitoring Report form.
3. Measure water level in probe, record on Gas Monitoring Report form, and replace cap; and
4. After completion of field measurements, measure ambient temperature and barometric pressure and record on Gas Monitoring Report form.

4.1.3 Maintenance Procedures

During each quarterly gas monitoring event, the sampler will inspect the integrity of the monitoring probes. A record of each inspection will be made and kept on file at the facility. During each inspection, the following information will be noted on the Gas Well Condition Report form included in Appendix III-6B, or a similar form:

- Identify accessibility and the condition of the area near the probe;
- Identify the condition of the concrete pad;
- Identify the condition of the protective outer casing, the condition of the locking cap, the presence of the lock, and the weep hole condition;
- Identify the condition of the well riser, the condition of the well cap, and the depth measurement reference point; and
- Identify the condition of the sampling port.

If damage or excessive wear to the monitoring probe is observed, it will be immediately reported to the Site Manager (SM) or designate, and the monitoring probe will be repaired. If it is not possible to repair the monitoring probe, and the damage can potentially affect the accuracy of the monitoring results, the monitoring probe will be abandoned and replaced with a new monitoring probe.

Prior to replacing a monitoring probe, a permit modification, in accordance with 30 TAC §305.70, for abandoning of the damaged monitoring probe and replacement with a new monitoring probe will be submitted to the TCEQ for review and approval.

4.2 Building/Structure Monitoring

4.2.1 Monitoring Procedures

All structures located within the permit boundary will be monitored with either a portable gas analyzer in conjunction with quarterly monitoring, or a stationary continuous combustible gas monitor, which activates an audible alarm when preset combustible gas concentrations are exceeded. If the alarms are used, they will be calibrated to detect methane concentrations below 25% of the LEL for methane (or 1.25% methane by volume).

If allowable concentration limits are exceeded within structures, the building will be immediately evacuated and ventilated by opening doors and windows. Verification and notification procedures, described in Sections 5.2.2 and 5.3, respectively, will be implemented.

4.2.2 Maintenance Procedures

If continuous LFG monitors/alarms are used, they will be maintained and tested in accordance with the manufacturer's recommendations. The maintenance requirements and testing specifications for continuous LFG monitors/alarms will be available with the LFG monitoring records described in Section 4.3.

4.3 Record-keeping/Reporting

Field records will be maintained in the SOR for the methane gas monitoring. Field data will be recorded on the Gas Monitoring Report form in Appendix III-6B, or a similar form.

Routine monitoring will be conducted quarterly during the following periods:

- First Quarter: January – March
- Second Quarter: April – June
- Third Quarter: July – September
- Fourth Quarter: October – December

If methane concentrations greater than regulatory requirements are detected and verified, as indicated in Section 5.2.2, monthly monitoring or a monitoring frequency established by the TCEQ will be performed at the monitoring probe(s) locations where the exceedance occurred. This monitoring will continue until TCEQ approval to return to routine monitoring is obtained.

The LFG Monitoring Program will continue for a period of five (5) years after the final closure of the facility, or until the owner or operator receives written authorization from the TCEQ to reduce or discontinue the program.

4.4 Back-up Plan for Monitoring Probes and Continuous Monitors

The following is a back-up plan to be used if monitoring probes or continuous monitoring devices become unusable or inoperative.

4.4.1 Stationary Perimeter Probes

1. Damaged or inoperative perimeter probes will be replaced within the same sample quarter or after approval of the associated replacement/abandonment permit modification.
2. Upon completion of the replacement probe, an Installation Report, including logs of boring and construction details, will be submitted to the TCEQ.
3. Should a sampling event occur prior to replacement of a damaged probe, a bar-hole sample will be taken next to the damaged probe and continued until the probe is replaced.

4.4.2 Stationary Combustible Gas Monitor

If stationary units are damaged or are inoperative, a portable gas analyzer, calibrated in the LEL range for methane, will be used quarterly until the stationary units are replaced or repaired.

5.0 ACTION PLAN

5.1 Methane Action Levels

Methane action levels for the site are:

1. Methane concentrations greater than 5% by volume at the methane monitoring probes; and
2. Methane concentrations greater than 1.25% methane by volume in facility structures.

5.2 Initial Response Measure

This Action Plan has been prepared to ensure the protection of human health in the event concentrations of methane exceed allowable limits, either within onsite buildings or at the permit boundary. As the appropriate emergency response is different for each situation, this Action Plan addresses the actions for buildings and the permit boundary separately.

5.2.1 Emergency Action

The initial action to protect human health in the event methane is detected at excessive levels is described below.

5.2.1.1 Building/Structures

If 1.25% methane by volume has been exceeded, the building will be evacuated immediately, and the SM will be notified. For continuous monitors, the SM will determine if the excess indication is due to a power surge or other condition causing the monitor to malfunction. Personnel (except for monitoring personnel) will not be allowed to re-enter the affected structure until a determination of the malfunction, or if necessary, the verification procedures in Section 5.2.2 are performed.

5.2.1.2 Permit Boundary

If quarterly monitoring of the gas probes indicates that 5% methane by volume has been exceeded, the SM will be notified immediately. The immediate emergency response measure will be for the SM to determine if nearby buildings (including offsite buildings) are at risk and if evacuation of the buildings should be requested.

5.2.2 Verification Procedures

Monitoring personnel will begin verification procedures. These procedures are intended to determine if the levels of methane are accurate, or if erroneous levels have been detected due to equipment malfunction or other reasons. Once measures have been taken to protect human health, the SM or designee will perform the notification procedures, as described in Section 5.3.

5.2.2.1 Buildings/Structures

Verification of exceedance of the 1.25% methane by volume in onsite buildings will be accomplished by monitoring personnel using the following procedures:

- If applicable, determine if the continuous monitoring equipment is working properly; and
- If continuous monitoring equipment is working properly, or if the exceedance was detected using a portable gas analyzer, monitor methane levels throughout the building using a portable gas analyzer or similar device capable of measuring methane concentrations. Readings shall be taken in each room and in confined spaces (i.e., closets). If there are any natural gas appliances in the building, they will be checked for leaks.

If exceedance of the 1.25% methane by volume is not detected (i.e., a malfunction or erroneous reading is suspected), personnel may return to the building.

In the event exceedance of the 1.25% methane by volume is detected during initial verification procedures or during the follow-up procedures, notification and corrective action procedures must be implemented as described in Sections 5.3 and 5.5.

5.2.2.2 Permit Boundary

Verification of exceedance of 5%t methane by volume in monitoring probes will be accomplished by monitoring personnel using the following procedures:

- Immediately recheck the methane concentration in the monitoring probe; and
- Measure methane in the monitoring probe again within 24 hours of the initial detection.

If methane concentrations greater than 5% by volume are not detected in the verification procedures, daily monitoring will continue for one week (during operating days) after the initial reading. If excessive levels are not detected during the week, daily monitoring will cease, and routine monitoring procedures will resume. In the event excessive concentrations of methane are detected during initial verification procedures or during follow-up procedures in the ensuing week, notification and corrective action procedures will be implemented as described in Sections 5.3 and 5.5.

5.3 Notification Procedures

When methane concentrations greater than 5% by volume in monitoring probes are initially detected or 1.25% by volume is initially detected in facility structures, the monitoring personnel will notify the SM who will implement appropriate action procedures, and then will verbally, or by email, notify the TCEQ Regional Office, TCEQ's MSW Permits Section, the Environmental Public Health Division of the Harris

County Public Health and Environmental Services, and the local fire department, followed by written notification.

In addition to the above notifications, property owners within 1,000 feet of the probe/facility structures will be notified. Such notification may first be made verbally, followed by written notification.

These notifications will be made for the initial exceedance at the probe or facility structure. Additional notifications will not be made for subsequent exceedances at the probe/structure. If a permit modification with notice has been approved to address LFG exceedances at the site, no additional notifications will be made if probe or facility structures at the site exceed regulatory levels.

5.4 Placement into Operating Record

Records of methane monitoring will be maintained, whether for routine verification or remediation purposes, and placed in the SOR. In the event that concentrations of methane greater than 1.25% by volume in buildings or greater than 5% by volume in monitoring probes are detected, a description of steps taken to protect human health will also be placed in the SOR. Any notifications made, verbally or in writing, will be recorded in the SOR within seven (7) days after detection.

5.5 Landfill Gas Remediation Plan

Once verification procedures have confirmed that methane concentration has exceeded 1.25% by volume in one or more buildings, or 5% by volume in one or more monitoring probes, a LFG remediation plan will be implemented within 60 days of detection.

An investigation of the excessive levels will be implemented. The investigation may include, but is not limited to, some or all of the following elements, depending on the circumstances:

- Bar-hole probe testing in the vicinity of the impacted monitoring probe;
- Installation of additional monitoring probes; and
- Sampling and laboratory analysis of LFG to determine the concentration of methane and other indicator gases.

Using accumulated data, an appropriate course of action will be identified to address the migration of LFG. Such actions will vary with the specific incident, but may include passive venting within the landfill, a cut-off trench between the permit boundary and waste in the vicinity of the monitoring probe, additional monitoring probes at the permit boundary or between the waste and the permit boundary, or other appropriate measures. Proposed remedial actions will be submitted to the TCEQ for review in accordance with appropriate TCEQ procedures, and in cases where the remediation plan calls for changes in the LFGMP, a permit modification will be submitted to the TCEQ.

The incident-specific remediation plan, based on results of the investigation, will be submitted to the TCEQ MSW Permits Section and Region 12 office within 60 days after excessive levels of methane have been detected.

After initial notification of exceedances and implementation of emergency action and/or corrective action plans, subsequent exceedances at that specific probe location will not require additional notification, but will be considered part of the initial response measures, unless the probe or structure is not in an area where remediation is being performed and the initial remedial measures put into place are not effective. Also, if additional probes indicate exceedances while remediation is underway, they will be incorporated into the ongoing remediation program and will not constitute a need for a new plan. The TCEQ will be immediately notified of exceedances at additional probe locations. Incorporation of additional probes within an existing remediation plan will be coordinated with the TCEQ. If additional remediation measures are required in an area with ongoing remediation, a permit modification will be submitted in accordance with 30 TAC §305.70(j)(21).

6.0 LANDFILL GAS CONTROL

Vertical landfill gas vents (VLFGV) or LFG interceptor trenches may be installed if the results of routine inspection of the intermediate and final cover system indicate potential for LFG emission to compromise the cover system, or as a remedial method to limit lateral migration of LFG from the landfill. This may be demonstrated by stressed vegetative cover, bubbling of LFG through the cover system after rainfall, verified exceedances in monitoring probes, or other indicators.

Within 60 days of detection of LFG exceeding regulatory limits, a remediation plan will be implemented. A copy of this remediation plan will be placed in the SOR and a copy will be provided to the TCEQ and notification will be provided to the TCEQ indicating implementation of the plan.

Additionally, a permit modification, in accordance with 30 TAC §305.70, will be submitted to the TCEQ for installation of LFG control features installed for remediation activities. This permit modification will be submitted after notification and coordination with the TCEQ. In accordance with TCEQ policy, VLFGVs and LFG interceptor trenches may be installed as part of remediation prior to TCEQ approval of the permit modification.

6.1 Passive Landfill Gas Vents

The VLFGVs may be constructed through the final cover components or intermediate cover soils. The VLFGV will consist of vertical high-density polyethylene (HDPE) or polyvinyl chloride (PVC) pipe. The upper portion of the VLFGV will consist of non-perforated HDPE or PVC pipe. The base of the VLFGV pipe will be perforated or slotted HDPE or PVC pipe. The perforated or slotted pipe will be embedded in gravel. The remaining annular space above the gravel will consist of alternating layers of general fill and bentonite pellet seals. The final bentonite pellet seal near the landfill surface will be a minimum of 2-feet thick.

The upper non-perforated pipe will extend approximately 3 feet above the landfill surface.

VLFGVs may also be installed outside the waste area for LFG remediation.

6.2 Interceptor Trench System

LFG interceptor trenches may be constructed as a remedial method to limit lateral migration of LFG from the landfill. The LFG interceptor trenches will be installed with gas vents on an as-required basis for LFG remediation. The length and number of LFG interceptor trenches will be determined on a case-by-case basis, dependent upon the extent of LFG migration. LFG interceptor trenches will be constructed by excavating soil and backfilling the excavation with aggregate and a soil cap. VLFGVs will be installed to vent the LFG in the interceptor trenches to the atmosphere. A typical detail for an interceptor trench is included on Figure III-6-4.

LEGEND

(purple dash-dot line)	PERMIT BOUNDARY
(purple dash-dot-dot line)	PROPERTY BOUNDARY
(orange dashed line)	1000' PERMIT BOUNDARY OFFSET
(red dashed line)	LIMITS OF WASTE PLACEMENT (MSW-2185A)
(black dashed line)	WASTE FOOTPRINT (PRIOR TO MSW-2185A)
○ GP-1A	EXISTING GAS PROBE (TO REMAIN)
○ GP-28	PROPOSED GAS PROBE

REFERENCES(S)

BASE MAP TAKEN FROM DALLAS AERIAL SURVEY AERIAL FLYOVER DATED MARCH 6, 2019.

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0 300 600
1" = 600' FEET

REV	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2021-02	ISSUED FOR PERMITTING PURPOSES	PRM	EWT	CGD	CGD

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PROJECT
HAWTHORN PARK RECYCLING & DISPOSAL FACILITY
PERMIT AMENDMENT APPLICATION
TCEQ PERMIT NO. MSW-2185A

TITLE
SITE LOCATION MAP

PROJECT NO	APPLICATION SECTION	REV		FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

LEGEND

— · · —	PERMIT BOUNDARY
— · · —	PROPERTY BOUNDARY
— — —	WASTE FOOTPRINT (PRIOR TO MSW-2185A)
——	25-FT CONTOURS
——	5-FT CONTOURS
⊙ GP-1A	EXISTING GAS PROBE (TO REMAIN)
∅ GP-27	EXISTING GAS PROBE (TO BE ABANDONED)

NOTE(S)

1. EXISTING TOPOGRAPHY COMPILED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPH DATED MARCH 6, 2019.
2. GAS PROBES GP-5, GP-6, GP-7, GP-9, GP-14, GP-16, GP-17, GP-23R, GP-24, AND GP-27 WILL BE ABANDONED UPON APPROVAL OF MSW-2185A.

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0 250 500
1" = 500' FEET

REV	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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PROJECT
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PERMIT AMENDMENT APPLICATION
TCEQ PERMIT NO. MSW-2185A

TITLE
EXISTING LANDFILL GAS PERIMETER MONITORING NETWORK

PROJECT NO	APPLICATION SECTION	REV		FIGURE
1894269	III Attachment 6	0	2 of 4	III-6-2

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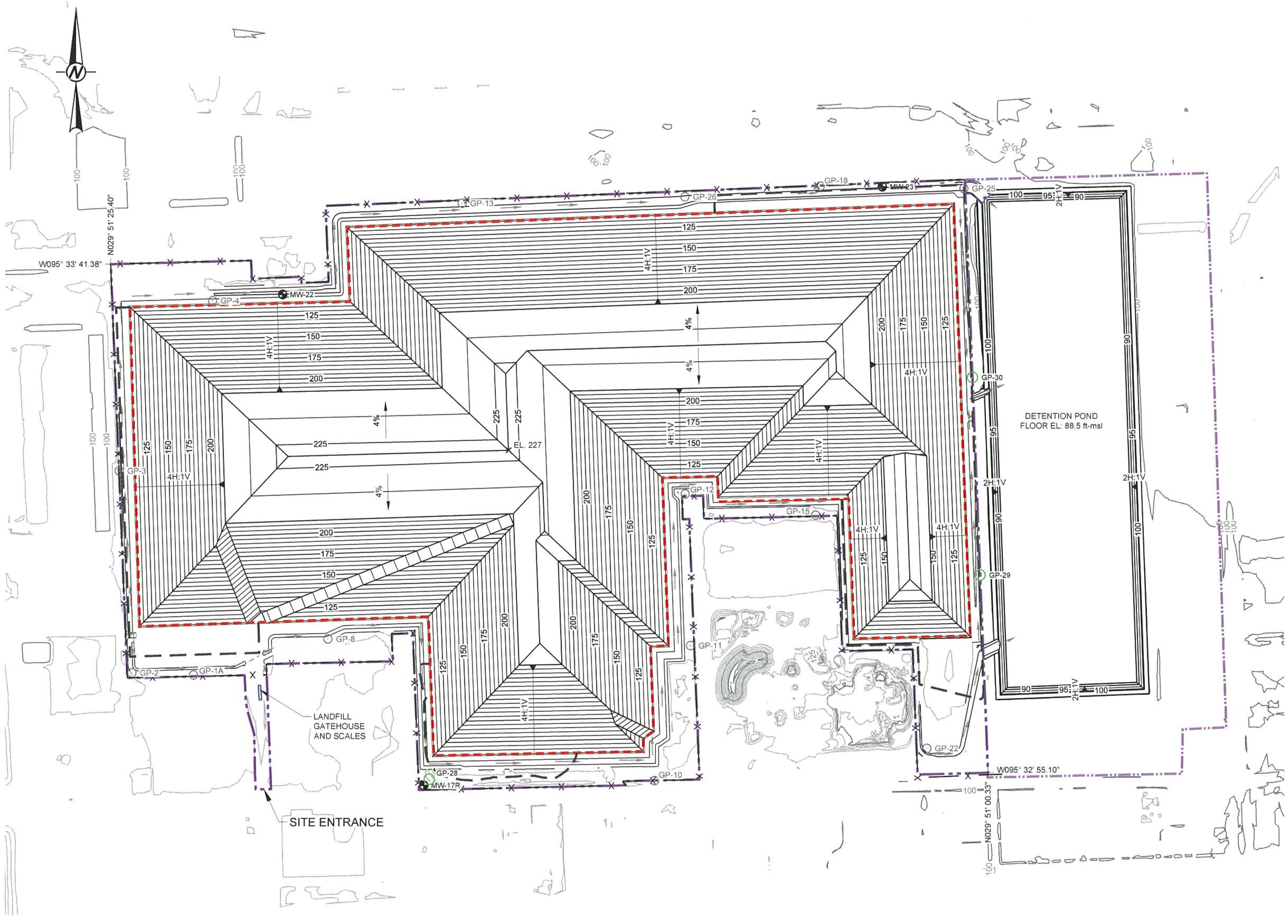

LEGEND

(purple dash-dot line)	PERMIT BOUNDARY
(light purple dash-dot-dot line)	PROPERTY BOUNDARY
(red dashed line)	LIMITS OF WASTE PLACEMENT (MSW-2185A)
(black dashed line)	WASTE FOOTPRINT (PRIOR TO MSW-2185A)
(heavy line)	25-FT CONTOURS
(light line)	5-FT CONTOURS
○ GP-1A	EXISTING GAS PROBE (TO REMAIN)
○ GP-28	PROPOSED GAS PROBE

NOTE(S)

1. EXISTING TOPOGRAPHY COMPILED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPH DATED MARCH 6, 2019.
2. PROPOSED GAS PROBES GP-28, GP-29, AND GP-30 WILL BE INSTALLED UPON APPROVAL OF MSW-2185A.
3. GAS PROBES FOR COMPLIANCE MONITORING ARE GP-1A, GP-2, GP-3, GP-4, GP-8, GP-10, GP-11, GP-12, GP-13, GP-15, GP-18, GP-22, GP-25, GP-26, GP-28, GP-29, AND GP-30.

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0 250 500
1" = 500' FEET

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PROJECT

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TCEQ PERMIT NO. MSW-2185A

TITLE

PROPOSED LANDFILL GAS PERIMETER MONITORING NETWORK

PROJECT NO	APPLICATION SECTION	REV.		FIGURE
1894269	III Attachment 6	0	3 of 4	III-6-3

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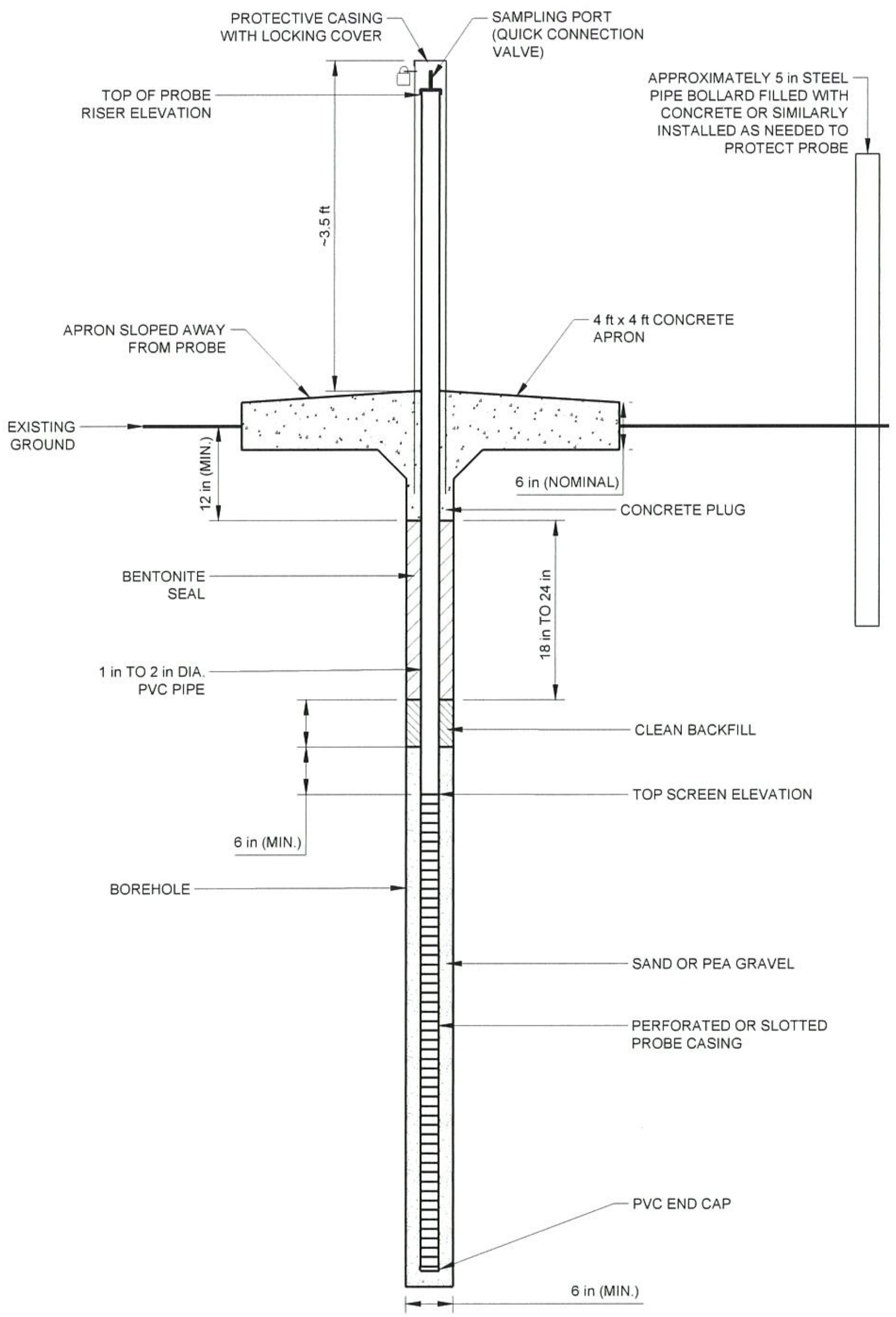
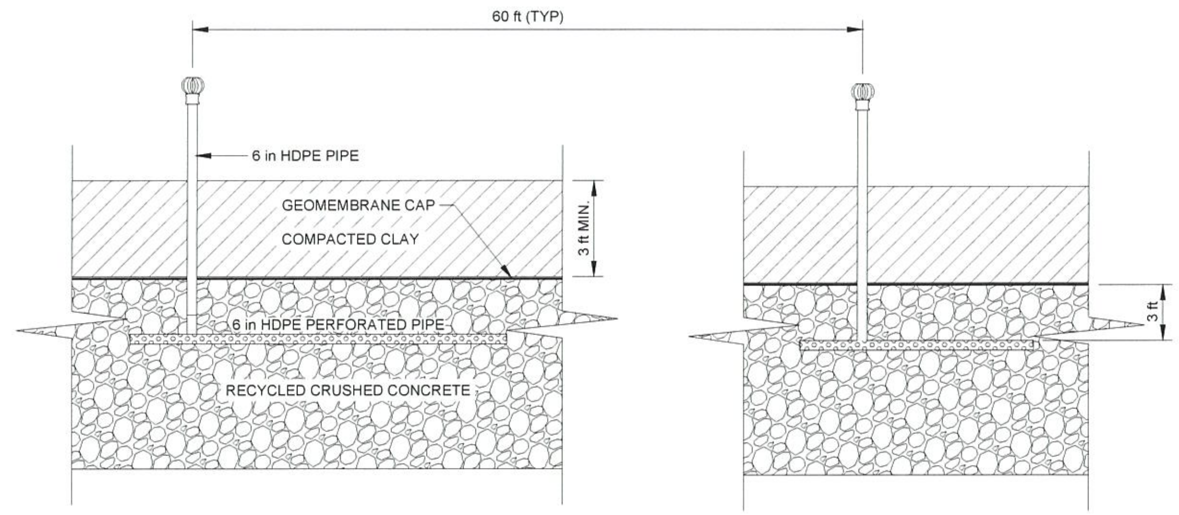


SCALE NTS 1 III-6-4 GAS MONITORING PROBE DETAIL



SCALE NTS 2 III-6-4 LANDFILL GAS INTERCEPTOR TRENCH DETAIL

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REV	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
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2/12/21
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TEXAS REGISTRATION F-2578

CLIENT
WM

CONSULTANT
GOLDER

HOUSTON NORTH OFFICE
14950 HEATHROW FOREST PKWY, STE 280
HOUSTON, TEXAS 77032
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(281) 821-6868
www.golder.com

PROJECT
HAWTHORN PARK RECYCLING & DISPOSAL FACILITY
PERMIT AMENDMENT APPLICATION
TCEQ PERMIT NO. MSW-2185A

TITLE
TYPICAL LANDFILL GAS DETAILS

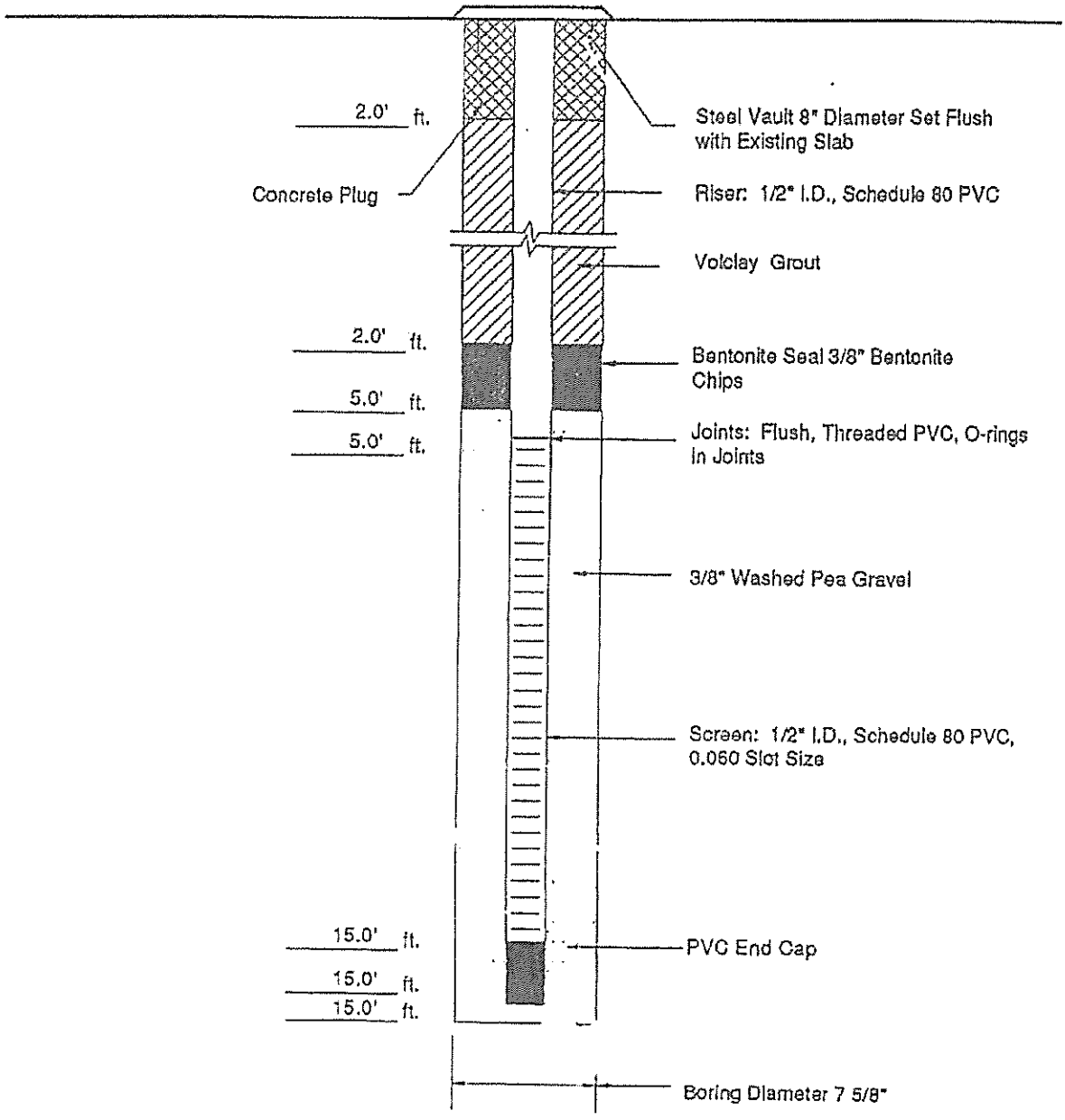
PROJECT NO	APPLICATION SECTION	REV.		FIGURE
1894269	III Attachment 6	0	4 of 4	III-6-4

PART III

APPENDIX III-6A

EXISTING GAS PROBE INSTALLATION DATA

Sanifill of Texas, Inc.
Hauling Company
Harris County, Texas



METHANE GAS PROBE MGP–A1

Project No. 9506-003

PLATE A.2

LOG OF BORING NO. A1

Project Description: Sanifill of Texas, Inc. Hauling Company
Harris County, Texas

Location: See Plate A.1
Surface El.:

Depth, feet	Samples	Symbol / USCS	MATERIAL DESCRIPTION	Pocket Penetrometer, TSF	Penetration Blows / Foot	Recovery %	RQD	Moisture Content, %	Unit Dry Weight, lb/cu ft.	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Unc. Compressive Strength, tsf
			Concrete Slab, with rebar 0.8											
			SAND, light brown (Fill) 3.0											
5			CLAY, dark brown, with rock fragments, with sandy clay layers. (Fill) 8.0											
10			CLAY, Silty, brown, stiff. 12.0											
15			CLAYEY SAND, light brown, moist. 15.0											
20														
25														
30														
35														
40														
45														
60														

Completion Depth: 15.0
Date Boring Started: 6/19/95
Date Boring Completed: 6/19/95
Engineer/Geologist: Stamoulis
Project No.: 9506-003

Remarks: Methane gas probe installed in bore hole. See Plate A.2 for probe specifications.

Hydrogeologic/Engineering of Texas The stratification lines represent approximate strata boundaries. Insitu, the transition may be gradual.

PLATE B.2

LOG OF BORING NO. MGP-2

Project Description: Hawthorn Park #2185 / Sanifill of Texas, Inc.
Harris County, Texas

Location:
Surface El.:

Depth, feet	Samples	Symbol / USCS	MATERIAL DESCRIPTION	Pocket Penetrometer, TSF	Penetration Blows / Foot	Recovery %	RQD	Moisture Content, %	Unit Dry Weight, lb/cu ft.	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Unc. Compressive Strength, tsf
0			SANDY CLAY, dark gray, firm, w/organics, trace calcareous nodules.											
11.5			SANDY CLAY, light brown to tan, w/trace calcareous nodules, trace ferrous stains.											
14.0			SAND, light gray, very fine grained, subrounded to rounded, well graded (wet).											
15.0														

Completion Depth: 15.0
Date Boring Started: 2/24/95
Date Boring Completed: 2/24/95
Engineer/Geologist: Stamoulis
Project No.: 9502-001

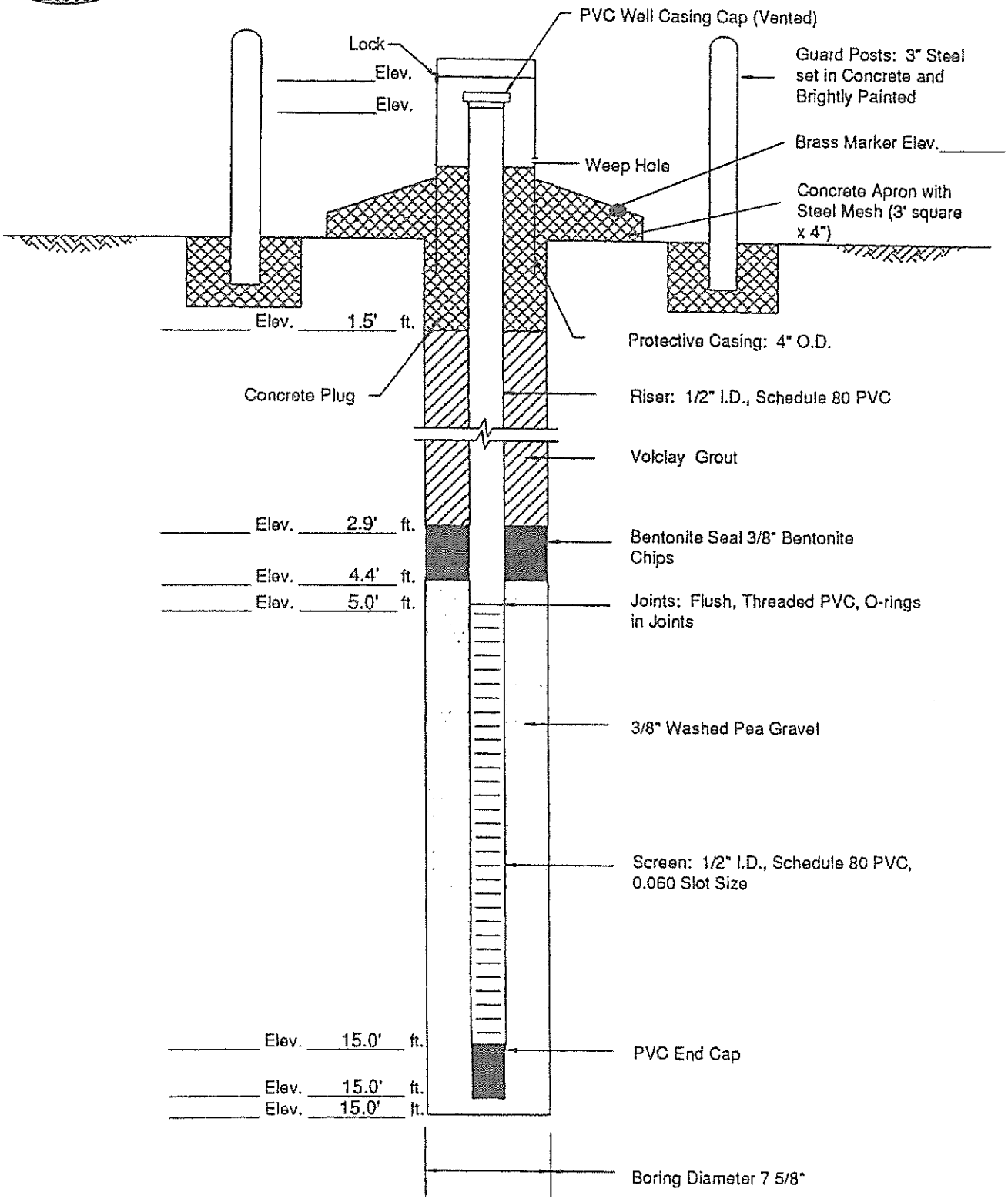
Remarks:

Hydrogeologic/Engineering of Texas

The stratification lines represent approximate strata boundaries. Insitu, the transition may be gradual.

FIGURE 1

Hawthorn Park
Permit No. 2185



METHANE GAS PROBE NO. MGP-2

Project No. 9502-001

PLATE TBA

LOG OF BORING NO. MGP-3

Project Description: Hawthorn Park #2185 / Sanifill of Texas, Inc.
Harris County, Texas

Location:
Surface El.:

Depth, feet	Samples	Symbol / USCS	MATERIAL DESCRIPTION	Pocket Penetrometer, TSF	Penetration Blows / Foot	Recovery %	RQD	Moisture Content, %	Unit Dry Weight, lb/cu ft.	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Unc. Compressive Strength, tsf
0			SANDY CLAY, dark gray, firm, w/organics, w/calcareous nodules, moist (fill). 3.0											
5			SANDY CLAY, gray, soft, w/calcareous nodules (fill). 8.0											
10			SANDY CLAY, light brown to tan, firm, w/calcareous nodules, ferrous stains. 23.0											
25			SILTY CLAY, light brown to tan, w/calcareous nodules (moist). 26.0											
			SAND, light gray, very fine grained to fine grained silty, subrounded to rounded, well graded. 27.0											
30														
35														
40														
45														
50														

Completion Depth: 27.0
Date Boring Started: 2/8/95
Date Boring Completed: 2/8/95
Engineer/Geologist: Stamoulis
Project No.: 9502-001

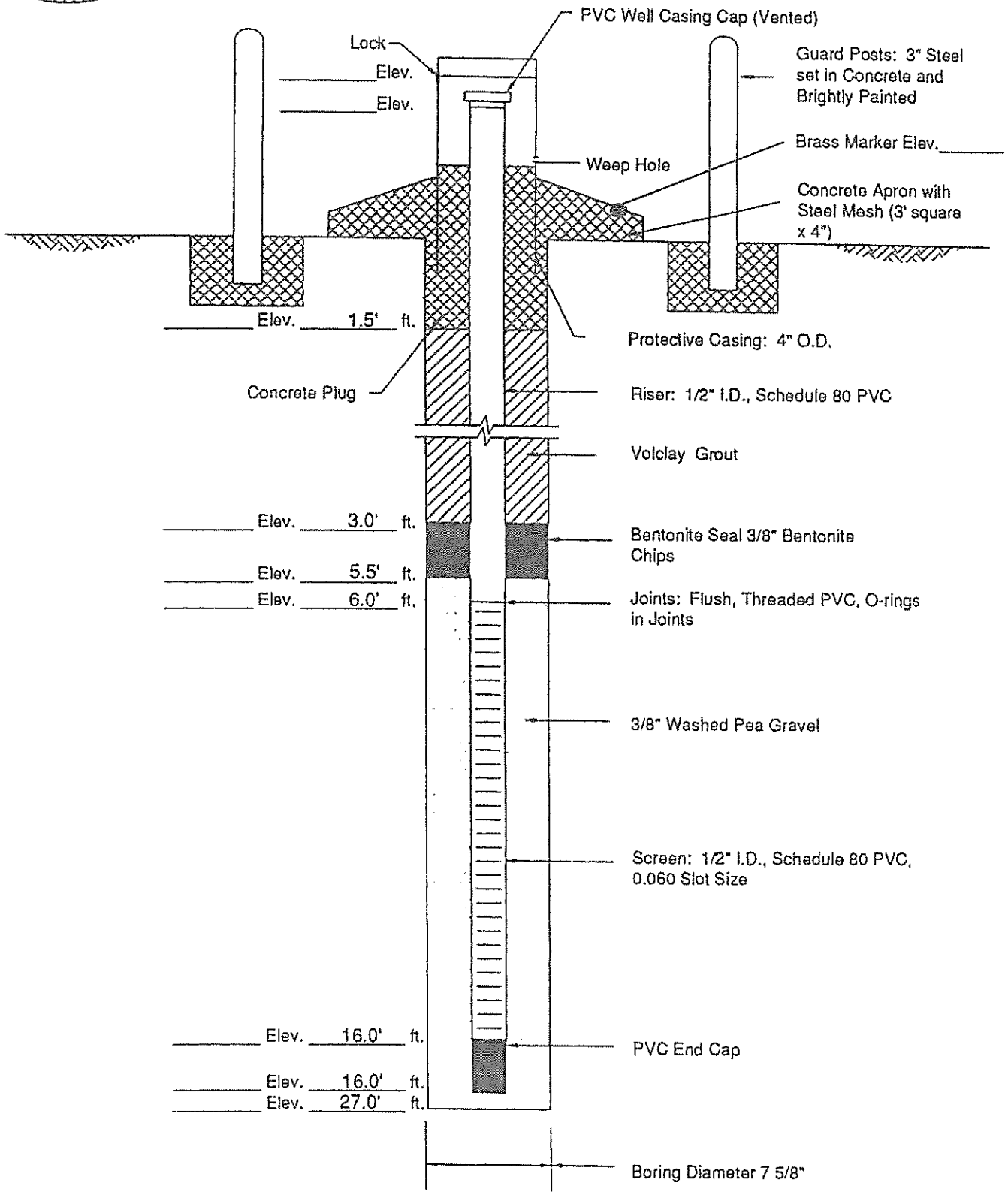
Remarks:

Hydrogeologic/Engineering of Texas

The stratification lines represent approximate strata boundaries. Insitu, the transition may be gradual.

FIGURE 1

Hawthorn Park
Permit No. 2185



METHANE GAS PROBE NO. MGP-3

Project No. 9502-001

PLATE TBA

LOG OF BORING NO. MGP-4

Project Description: Hawthorn Park #2185 / Sanifill of Texas, Inc.
Harris County, Texas

Location:
Surface El.:

Depth, feet	Samples	Symbol / USCS	MATERIAL DESCRIPTION	Pocket Penetrometer, TSF	Penetration Blows / Foot	Recovery %	RQD	Moisture Content, %	Unit Dry Weight, lb/cu ft.	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Unc. Compressive Strength, tsf
0			SANDY CLAY, tan, stiff, w/gray streaks.											
23.0			CLAYEY SAND, light gray, firm.											
26.0			SAND, light gray, very fine grained, subrounded to rounded, well graded.											
28.0														

Completion Depth: 28.0
Date Boring Started: 2/8/95
Date Boring Completed: 2/8/95
Engineer/Geologist: Stamoulis
Project No.: 9502-001

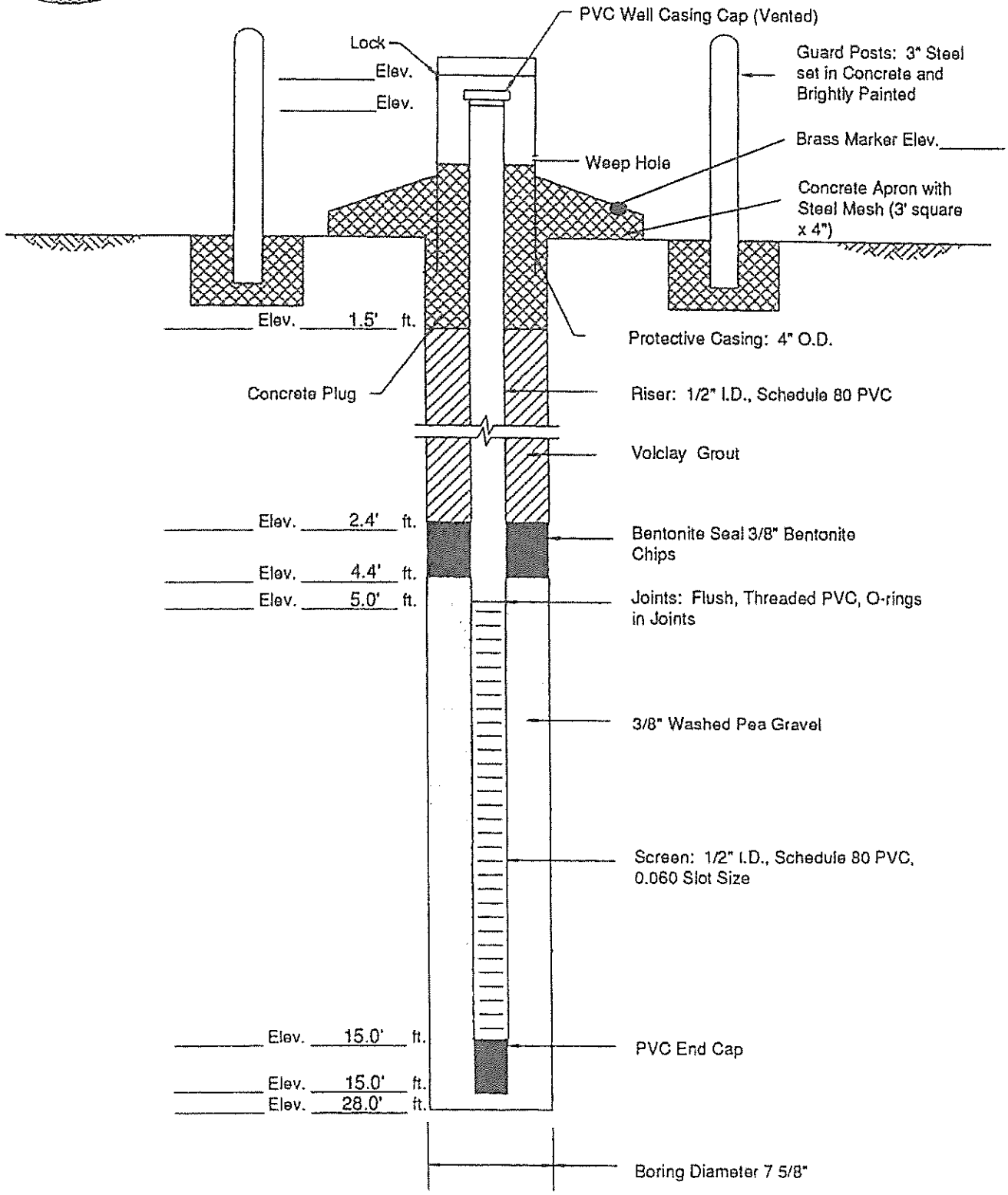
Remarks:

Hydrogeologic/Engineering of Texas

The stratification lines represent approximate strata boundaries. Insitu, the transition may be gradual.

FIGURE 1

Hawthorn Park
Permit No. 2185



METHANE GAS PROBE NO. MGP-4

Project No. 9502-001

PLATE TBA

LOG OF BORING NO. MGP-5

Project Description: Hawthorn Park #2185 / Sanifill of Texas, Inc.
Harris County, Texas

Location:
Surface El.:

Depth, feet	Samples	Symbol / USCS	MATERIAL DESCRIPTION	Pocket Penetrometer, TSF	Penetration Blows / Foot	Recovery %	RQD	Moisture Content, %	Unit Dry Weight, lb/cu ft.	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Unc. Compressive Strength, tsf
0			SANDY CLAY, light brown to tan, w/ferrous stains (fill).											
5			SANDY CLAY, light brown, firm to stiff, w/ferrous stains.											
10														
15														
20			- moist @ 19.0'.											
25														
30														
35														
40														
45														
50														

5.0

20.0

Completion Depth: 20.0
Date Boring Started: 2/8/95
Date Boring Completed: 2/8/95
Engineer/Geologist: Stamoulis
Project No.: 9502-001

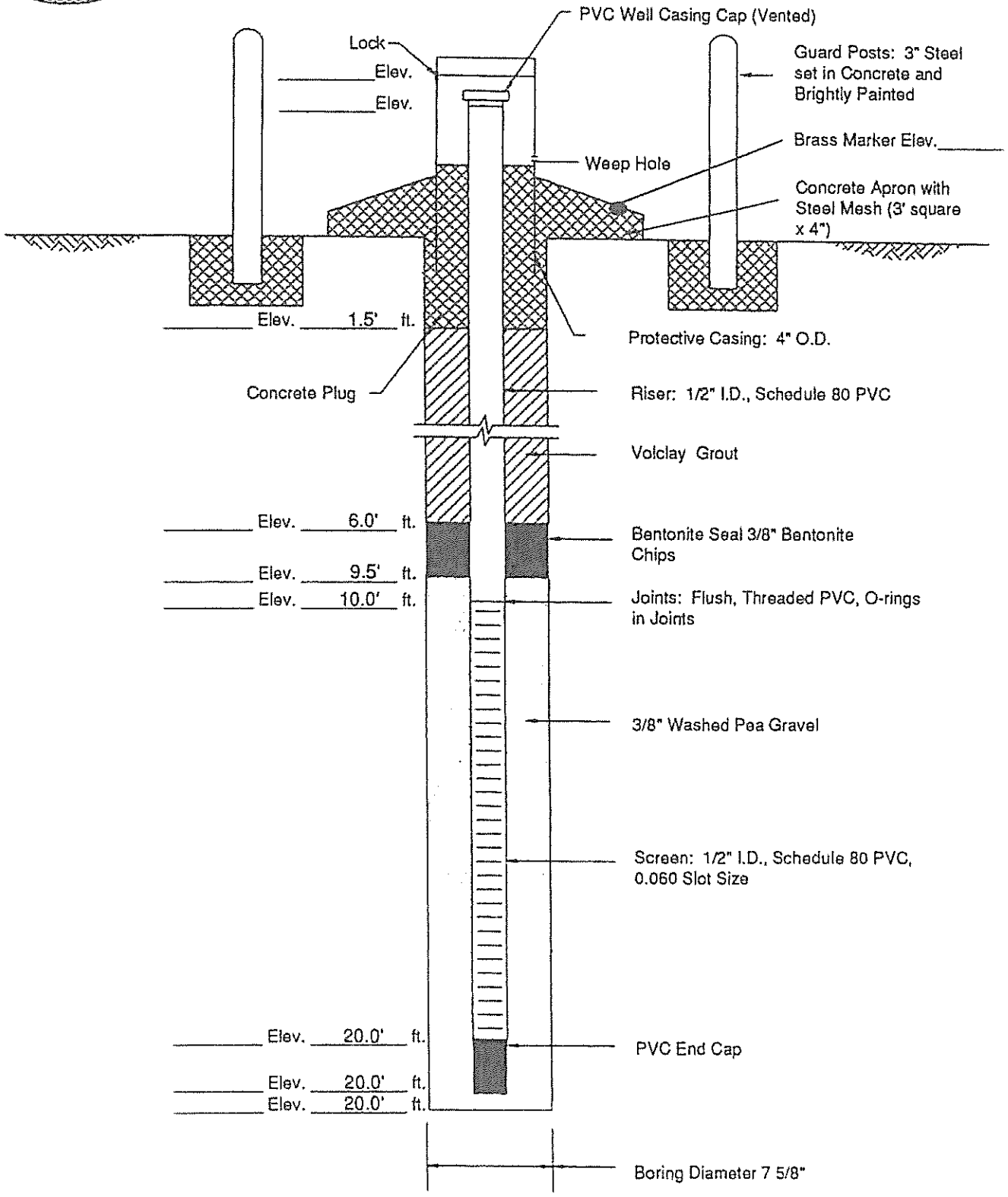
Remarks:

Hydrogeologic/Engineering of Texas

The stratification lines represent approximate strata boundaries. Insitu, the transition may be gradual.

FIGURE 1

Hawthorn Park
Permit No. 2185



METHANE GAS PROBE NO. MGP-5

Project No. 9502-001

PLATE TBA

LOG OF BORING NO. MGP-6

Project Description: Hawthorn Park #2185 / Sanifill of Texas, Inc.
Harris County, Texas

Location:
Surface El.:

Depth, feet	Samples	Symbol / USCS	MATERIAL DESCRIPTION	Pocket Penetrometer, TSF	Penetration Blows / Foot	Recovery %	RQD	Moisture Content, %	Unit Dry Weight, lb/cu ft.	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Unc. Compressive Strength, tsf
			SANDY CLAY, tan, w/calcareous nodules (fill). 2.0											
5			SANDY CLAY, tan to light brown, stiff.											
10			13.0											
15			SAND, light gray, very fine grained to fine grained, subrounded to rounded, well graded. 15.0											
20														
25														
30														
35														
40														
45														
50														

Completion Depth: 15.0
Date Boring Started: 2/9/95
Date Boring Completed: 2/9/95
Engineer/Geologist: Stamoulis
Project No.: 9502-001

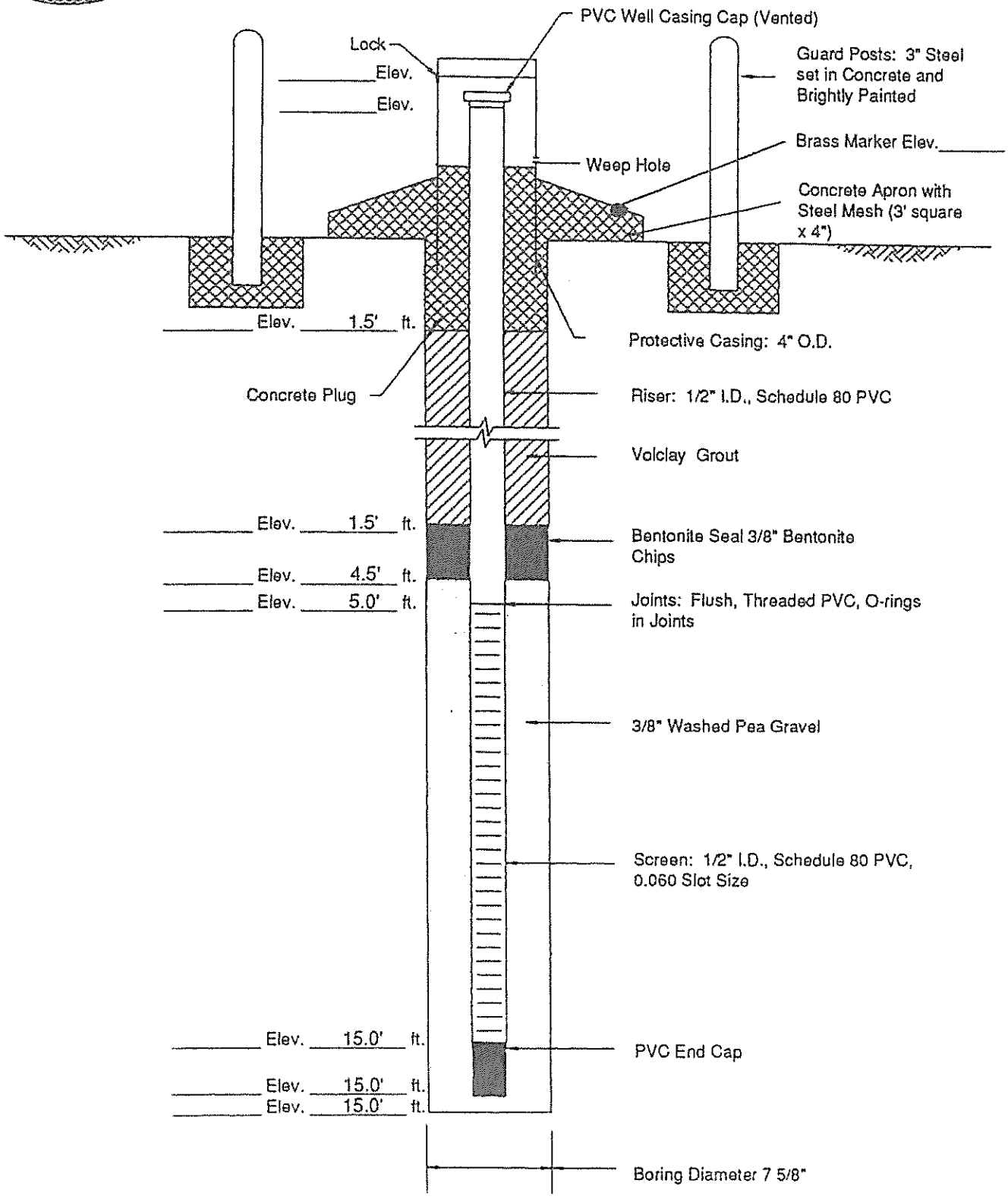
Remarks:

Hydrogeologic/Engineering of Texas

The stratification lines represent approximate strata boundaries. Insitu, the transition may be gradual.

FIGURE 1

Hawthorn Park
Permit No. 2185



METHANE GAS PROBE NO. MGP-6

Project No. 9502-001

PLATE TBA

LOG OF BORING NO. MGP-7

Project Description: Hawthorn Park #2185 / Sanifill of Texas, Inc.
Harris County, Texas

Location: 29°51'08.9"/95°33'27.6"
Surface El.: 103.3'

Depth, feet	Samples	Symbol / USCS	MATERIAL DESCRIPTION	Pocket Penetrometer, TSF	Penetration Blows / Foot	Recovery %	RQD	Moisture Content, %	Unit Dry Weight, lb/cu ft.	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Unc. Compressive Strength, tsf
0			SANDY CLAY, brown, firm, w/calcareous nodules, trace rubble (fill). 3.0											
5			SANDY CLAY, dark gray, firm, w/calcareous nodules.											
10														
15			15.0											
20			SAND, light gray, very fine grained (silty), subrounded to rounded, well graded (moist). 16.0											
25														
30														
35														
40														
45														
50														

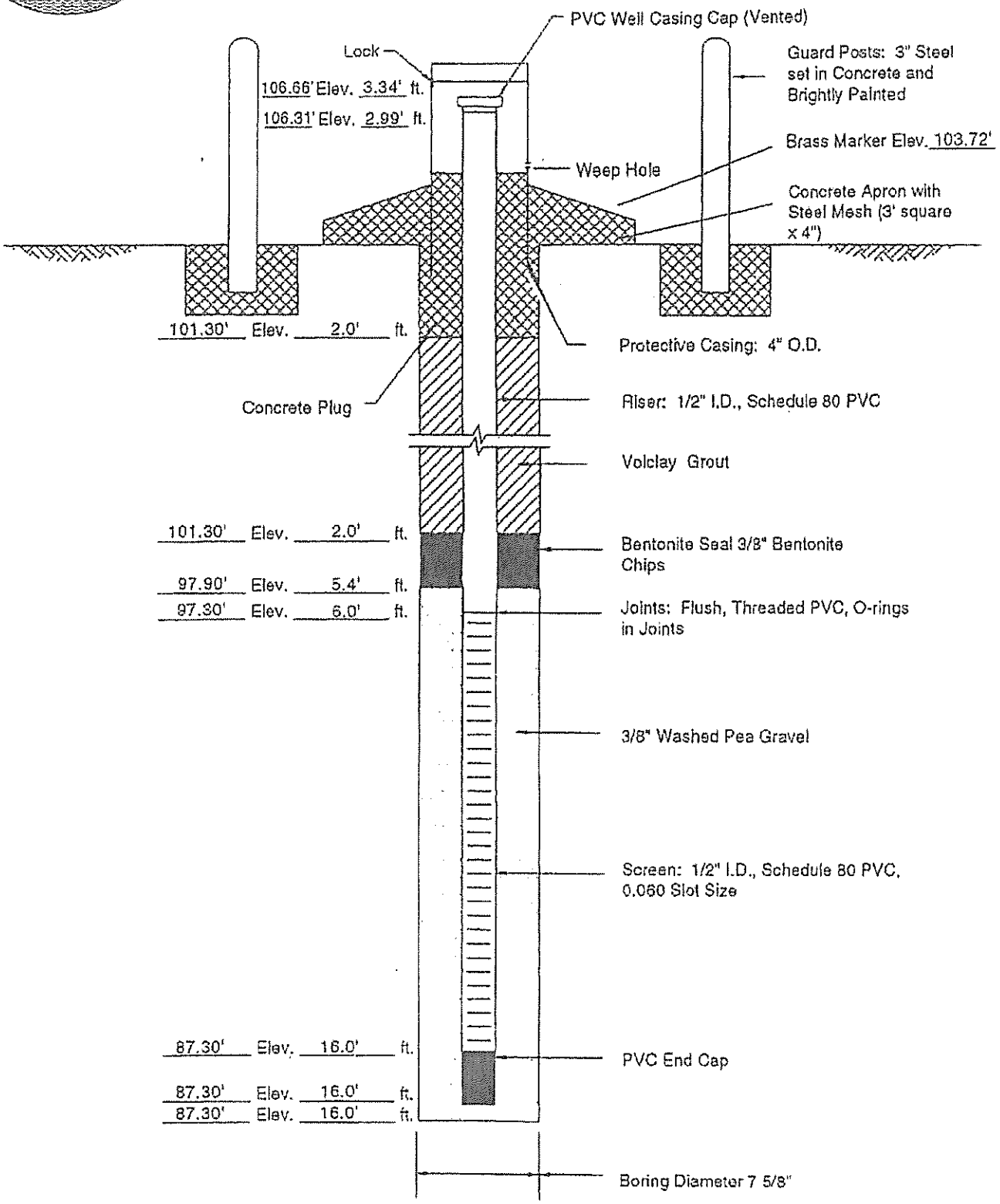
Completion Depth: 16.0
Date Boring Started: 2/9/95
Date Boring Completed: 2/9/95
Engineer/Geologist: Stamoulis
Project No.: 9502-001

Remarks: See methane gas probe data sheets for probe specifications Plate C.7.

Hydrogeologic/Engineering of Texas The stratification lines represent approximate strata boundaries. Insitu, the transition may be gradual.

PLATE B.8

Hawthorn Park Reclamation Project and Recycling Center Permit No. 2185



METHANE GAS PROBE MGP–7

Project No. 9502-001

PLATE C.7

LOG OF BORING NO. MGP-8

Project Description: Hawthorn Park #2185 / Sanifill of Texas, Inc.
Harris County, Texas

Location: 29°51'07.6"/95°33'31.5"
Surface El.: 106.1'

Depth, feet	Samples	Symbol / USCS	MATERIAL DESCRIPTION	Pocket Penetrometer, TSF	Penetration Blows / Foot	Recovery %	RQD	Moisture Content, %	Unit Dry Weight, lb/cu ft.	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Unc. Compressive Strength, tsf
0			SANDY CLAY, brown, stiff, w/calcareous nodules, trace sand, ,brick fragments (fill).											
5			6.0											
			SANDY CLAY, dark gray, firm w/calcareous nodules.											
10														
15			15.5											
			SAND, light gray, very fine grained to fine grained, subrounded to rounded, well graded (moist). 16.0											
20														
25														
30														
35														
40														
45														
50														

Completion Depth: 16.0
Date Boring Started: 2/9/95
Date Boring Completed: 2/9/95
Engineer/Geologist: Stamoulis
Project No.: 9502-001

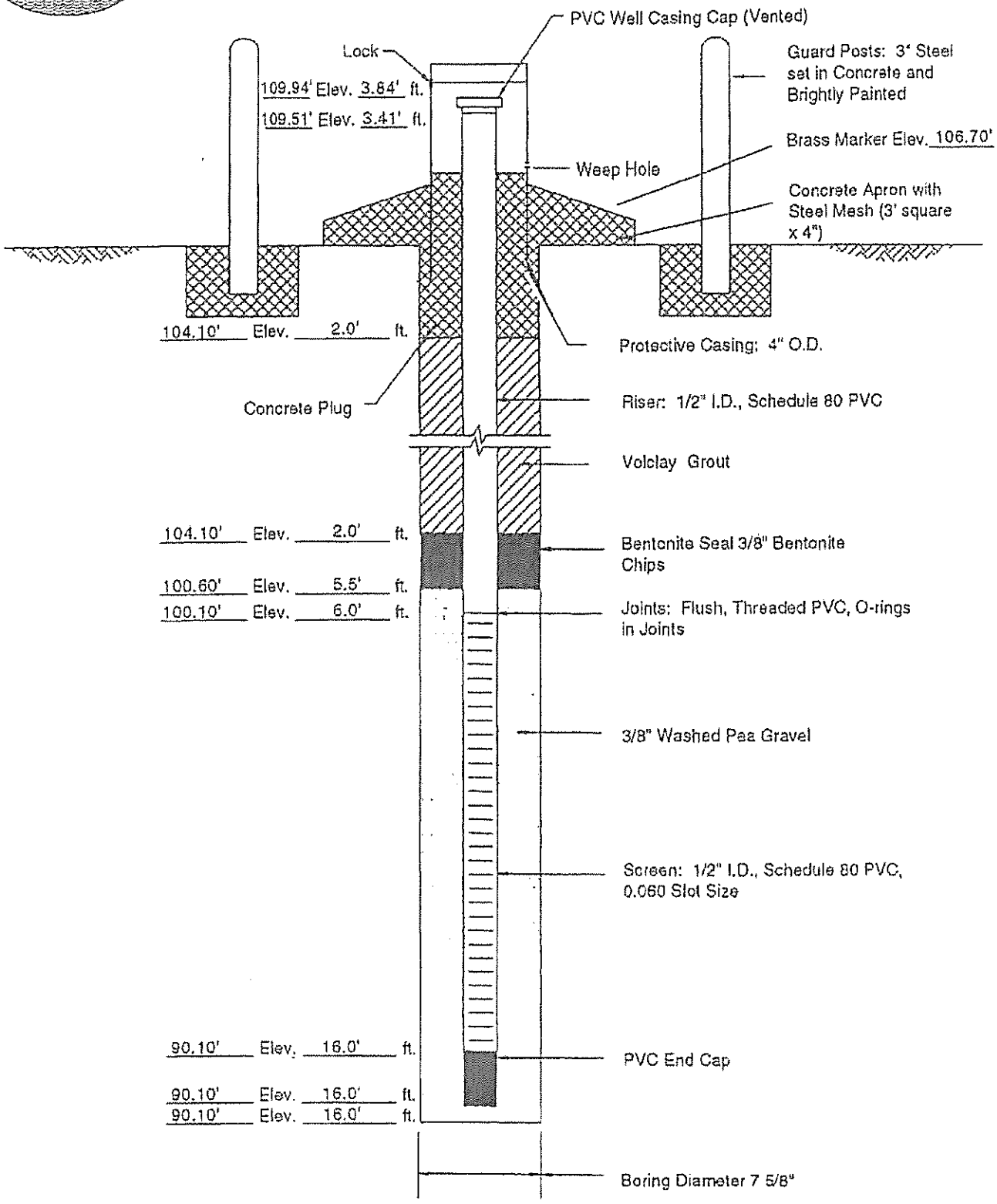
Remarks: See methane gas probe data sheets for probe specifications Plate C.8.

Hydrogeologic/Engineering of Texas

The stratification lines represent approximate strata boundaries. In-situ, the transition may be gradual.

PLATE B.9

Hawthorn Park Reclamation Project and Recycling Center Permit No. 2185



METHANE GAS PROBE MGP-8

Project No. 9502-001

PLATE C.8

LOG OF BORING NO. GP-16

Project Description: WMI - Hawthorn Park (MSWF)
Permit No. 2185, Harris County, Texas

Location: 29°51'12.32"/95°32'46.07"
Surface El.: 99.80'

Depth, feet	Samples	Symbol / USCS	MATERIAL DESCRIPTION	Pocket Penetrometer, TSF	Penetration Blows / Foot	Recovery %	RQD	Moisture Content, %	Unit Dry Weight, lb/cu ft	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Unc. Compressive Strength, tsf
0			**SANDY CLAY**, light grey to brown, stiff with ferrous stains.											
5														
10														
			12.5											
			CLAY, tan, stiff to hard with ferrous stains.											
15														
20														
			23.5											
25														

Completion Depth: 23.5
Date Boring Started: 9/7/04
Date Boring Completed: 9/7/04
Engineer/Geologist: Stamoulis
Project No.: 2004-08-16

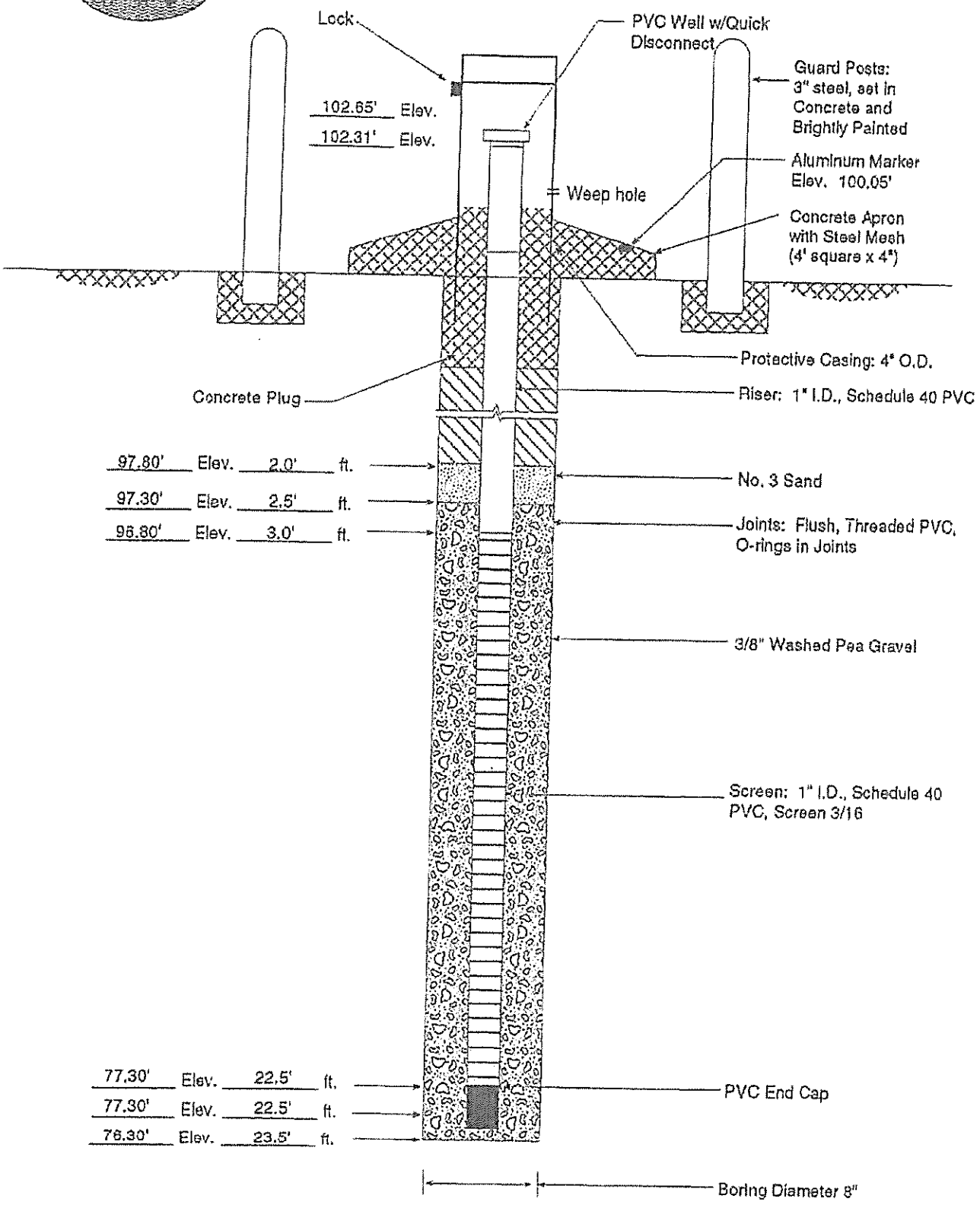
Remarks: Gas Monitoring Probe installed upon completion of borehole.

Hydrogeologic/Engineering of Texas

The stratification lines represent approximate strata boundaries. In situations, the transition may be gradual.

Plate A.3

MWI – Hawthorn Park
(MSWF) Permit No. 2185
Harris County, Texas



Methane Gas Probe No. GP-16

Project No. 2004-08-16

Plate B.1

LOG OF BORING NO. GP-17

Project Description: WMI - Hawthorn Park (MSWF)
Permit No. 2185, Harris County, Texas

Location: 29°51'21.52"/95°32'46.19"
Surface El.: 97.20'

Depth, feet	Samples	Symbol / USCS	MATERIAL DESCRIPTION	Pocket Penetrometer, TSF	Penetration Blows / Foot	Recovery %	RQD	Moisture Content, %	Unit Dry Weight, lb/cu ft	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Unc. Compressive Strength, tsf
			SILTY CLAY, tan to light brown. (Fill)											
			2.0											
			SILTY CLAY, tan to light brown, stiff.											
5														
10			- w/ ferrous stains below 10.0'.											
			15.0											
15			CLAYEY SAND, tan and light reddish brown, stiff											
20			21.5											
25														

Completion Depth: 21.5
Date Boring Started: 9/7/04
Date Boring Completed: 9/7/04
Engineer/Geologist: Stamoulis
Project No.: 2004-08-16

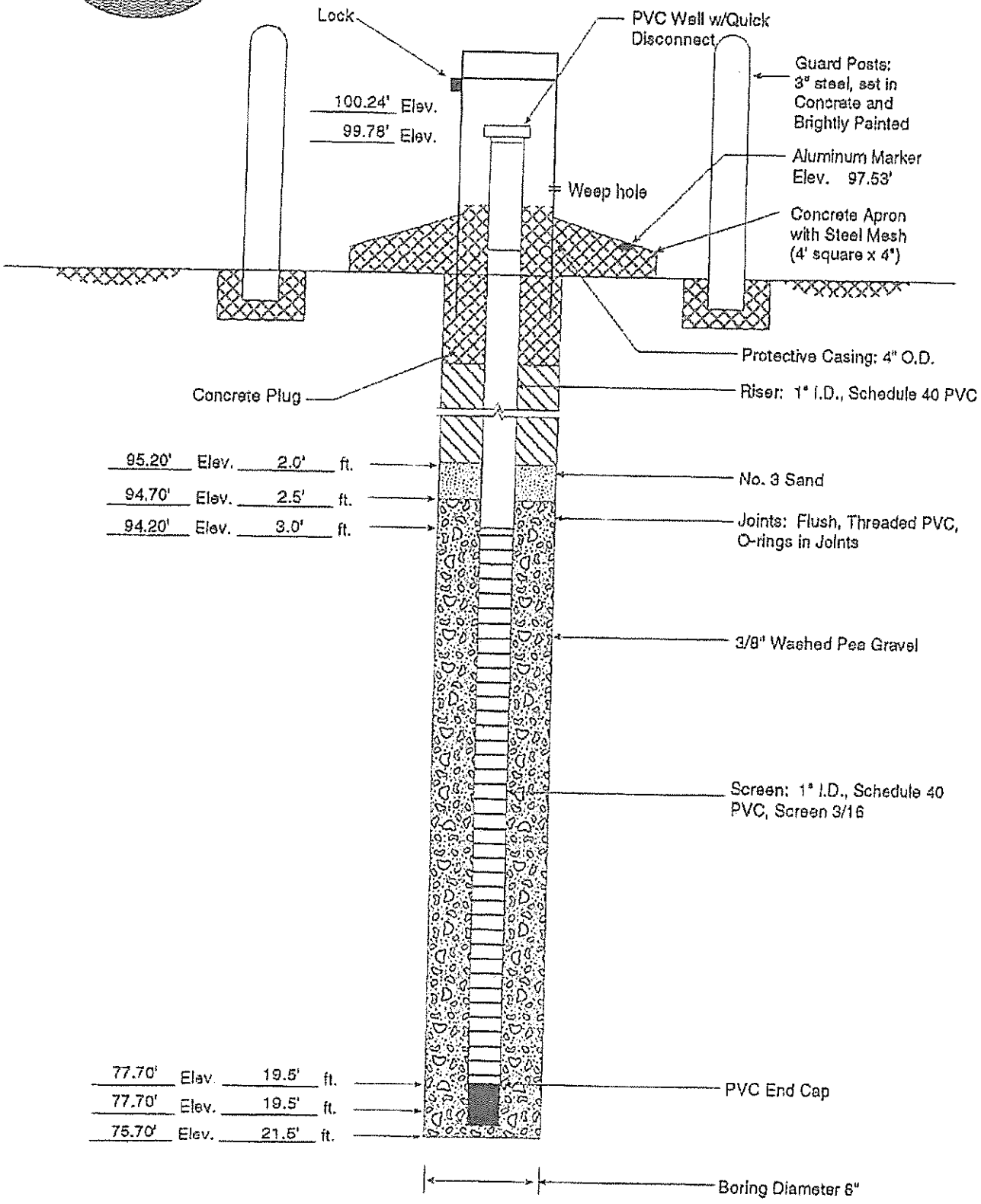
Remarks: Gas Monitoring Probe installed upon completion of borehole.

Hydrogeologic/Engineering of Texas

The stratification lines represent approximate strata boundaries. In situations, the transition may be gradual.

Plate A.4

MWI – Hawthorn Park
(MSWF) Permit No. 2185
Harris County, Texas



Methane Gas Probe No. GP-17

Project No. 2004-08-16

Plate B.2

LOG OF BORING NO. GP-18

Project Description: WMI - Hawthorn Park (MSWF)
Permit No. 2185, Harris County, Texas

Location: 29°51'28.06"/95°33'03.20"
Surface El.: 101.70'

Depth, feet	Samples	Symbol / USCS	MATERIAL DESCRIPTION	Pocket Penetrometer, TSF	Penetration Blows / Foot	Recovery %	RQD	Moisture Content, %	Unit Dry Weight, lb/cu ft.	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Unc. Compressive Strength, tsf
0			SILTY CLAY, grey, hard.											
10			10.0											
			CLAY, reddish brown and tan, hard.											
15			15.0											
			CLAY, tan and light gray, hard, with sandy clay seams.											
26			26.0											
50														

Completion Depth: 26.0
Date Boring Started: 10/20/04
Date Boring Completed: 10/20/04
Engineer/Geologist: Stamoulis
Project No.: 2004-08-16

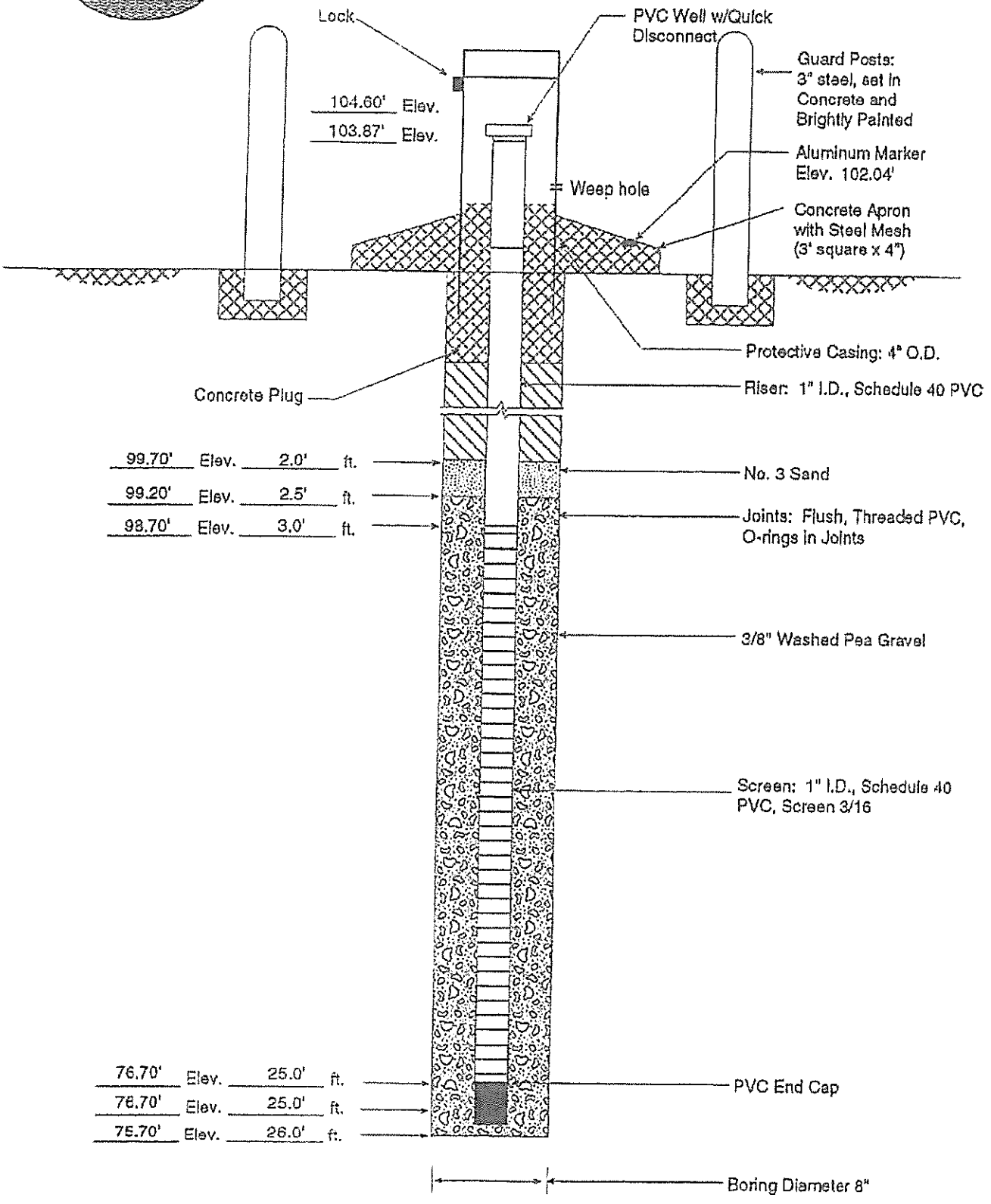
Remarks: Gas probe installed upon completion of borehole. See Plate B.1 for probe specifications.

Hydrogeologic/Engineering of Texas

The stratification lines represent approximate strata boundaries. In situations, the transition may be gradual.

Plate A.3

WMI – Hawthorn Park
(MSWF) Permit No. 2185
Harris County, Texas



Methane Gas Probe No. GP-18

Project No. 2004-08-16

Plate B.1

LOG OF BORING NO. MGP-22

Project Description: Hawthorn Park #2185 / Sanifill of Texas, Inc.
Harris County, Texas

Location: 29°51'01.7"/95°32'59.5'
Surface El.: 103.6'

Depth, feet	Samples	Symbol / USCS	MATERIAL DESCRIPTION	Pocket Penetrometer, TSF	Penetration Blows / Foot	Recovery %	RQD	Moisture Content, %	Unit Dry Weight, lb/cu ft.	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200 Sieve	Unc. Compressive Strength, tsf
			SANDY CLAY, dark gray, firm, w/trace calcareous nodules. 3.5											
5			SANDY CLAY, light brown to tan, calcareous nodules.											
10			- tan below 10.0'. 10.5											
			SAND, light gray, very fine grained to fine grained, subrounded to rounded, well graded. 12.0											
15														
20														
25														
30														
35														
40														
45														
50														

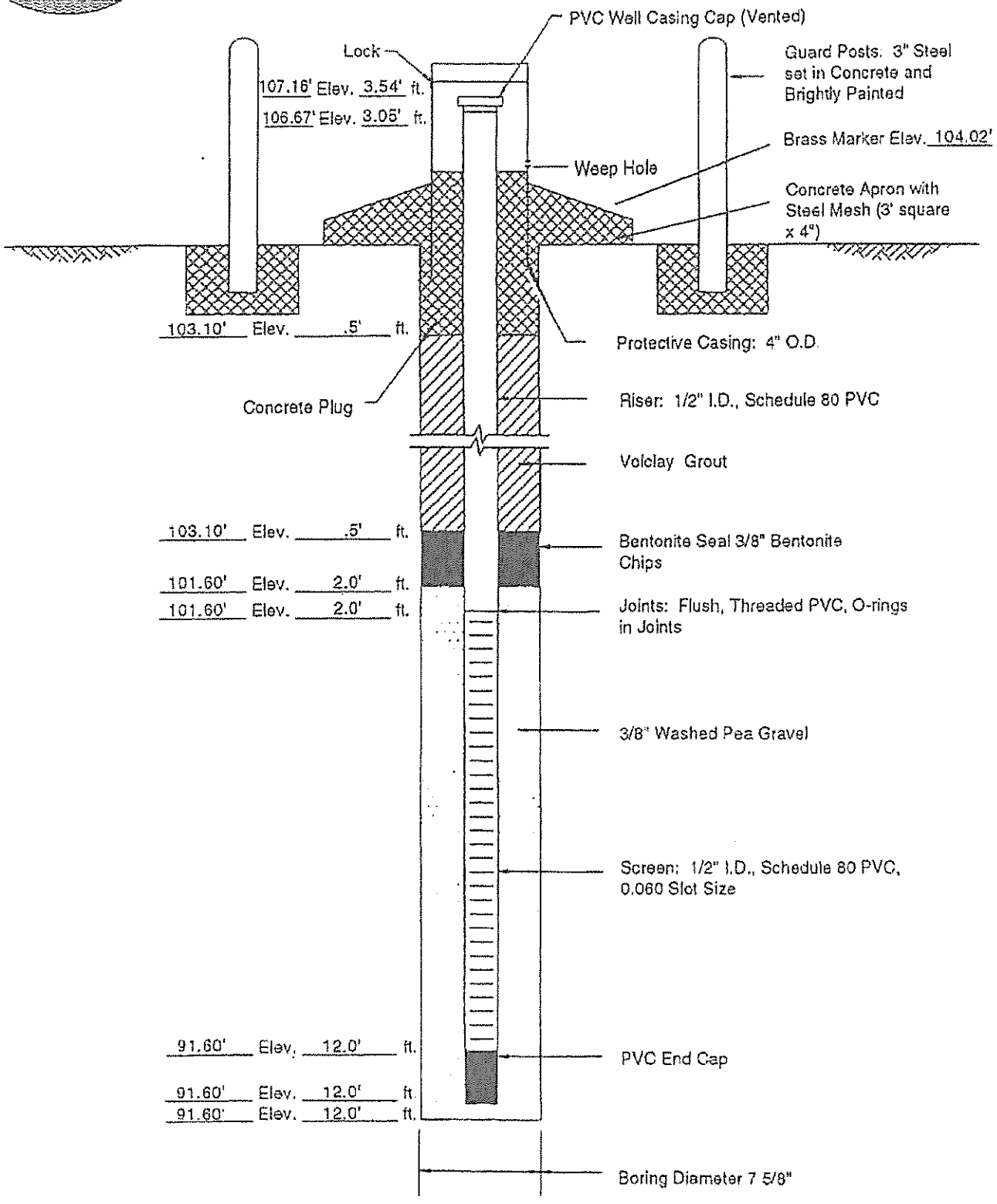
Completion Depth: 12.0
Date Boring Started: 2/9/95
Date Boring Completed: 2/9/95
Engineer/Geologist: Stamoulis
Project No.: 9502-001

Remarks: See methane gas probe data sheets for probe specifications Plate C.9.

Hydrogeologic/Engineering of Texas The stratification lines represent approximate strata boundaries. In-situ, the transition may be gradual.

PLATE B.10

Hawthorn Park Reclamation Project and Recycling Center Permit No. 2185

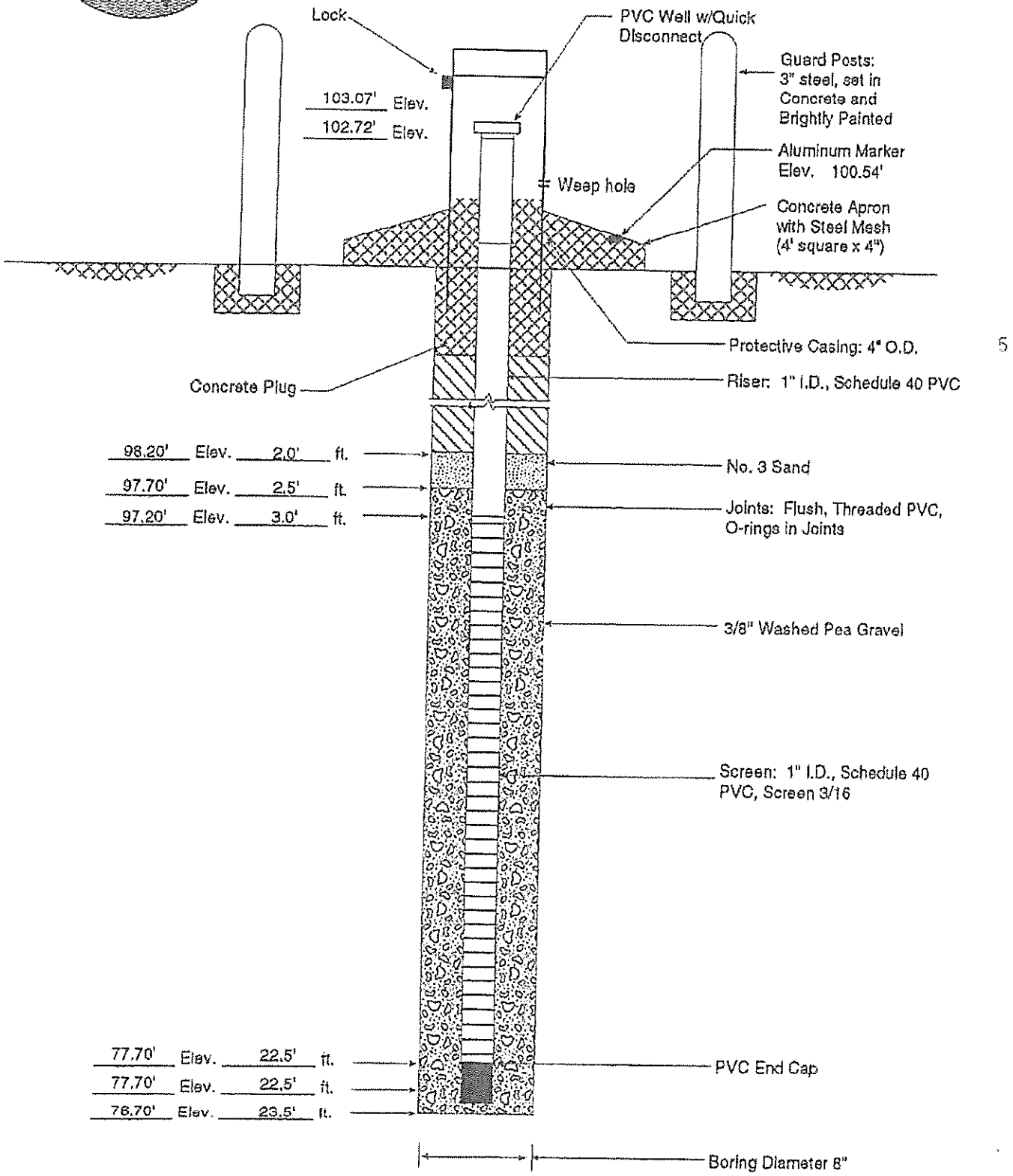


METHANE GAS PROBE MGP–22

Project No. 9502-001

PLATE C.9

MWI – Hawthorn Park
(MSWF) Permit No. 2185
Harris County, Texas



Methane Gas Probe No. GP-23R

Project No. 2004-08-16

Plate B.3

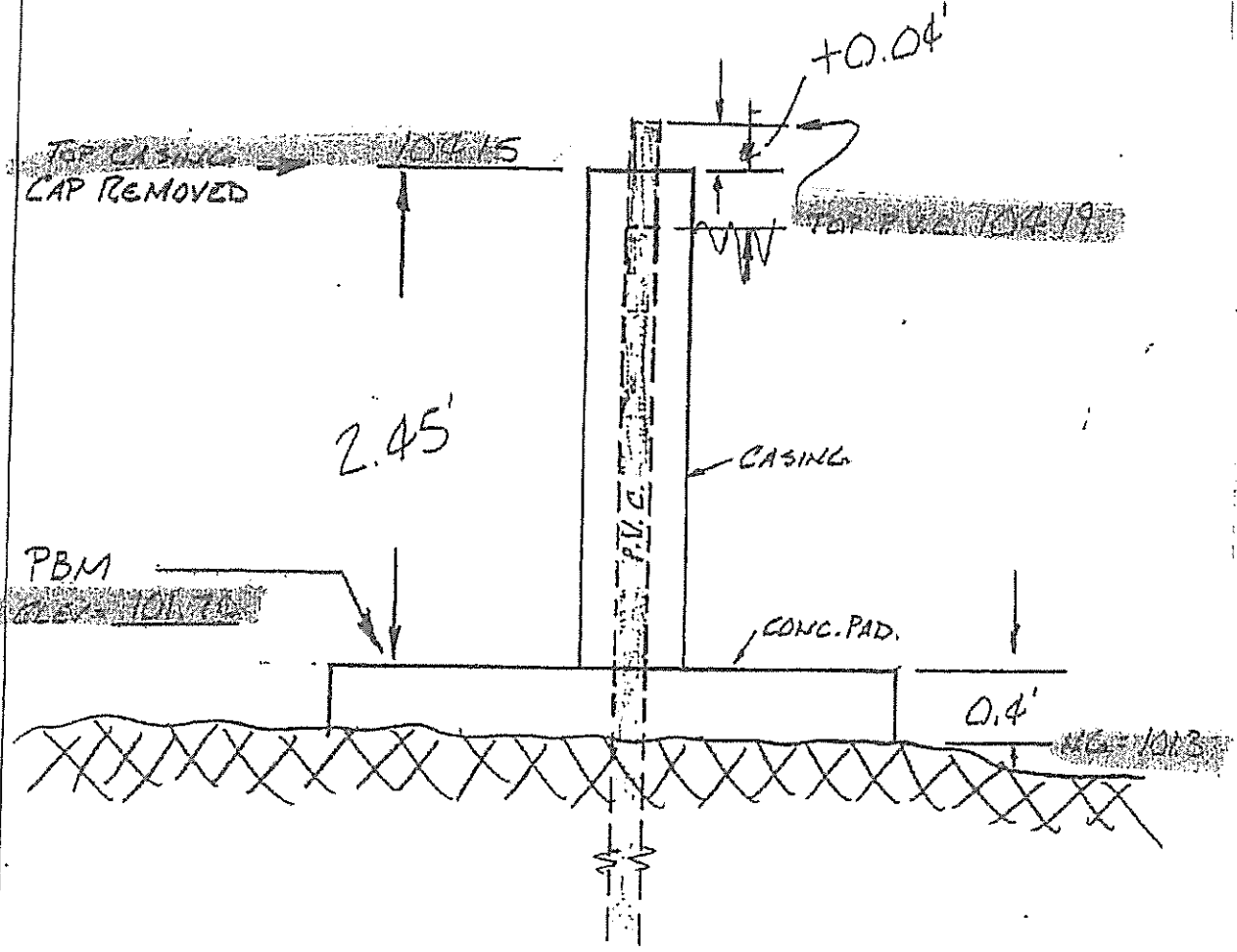
Table 1 Gas Monitoring Probe Information

PROBE NO.	GROUND SURFACE ELEVATION (FT-MSL)	TOP OF PROBE SCREEN (FT-MSL)	BOTTOM OF PROBE SCREEN (FT-MSL)
MGP-24	101.3	91.0	81.0
MGP-25	101.6	97.0	92.0
MGP-26	102.0	94.5	89.5
MGP-27	104.4	97.0	92.0

Source: Gas Monitoring Report forms provided by USAWTX.

HAWTHORNE PARK (SAMFILL, INC)

407-001-



WELL No. MGP-24

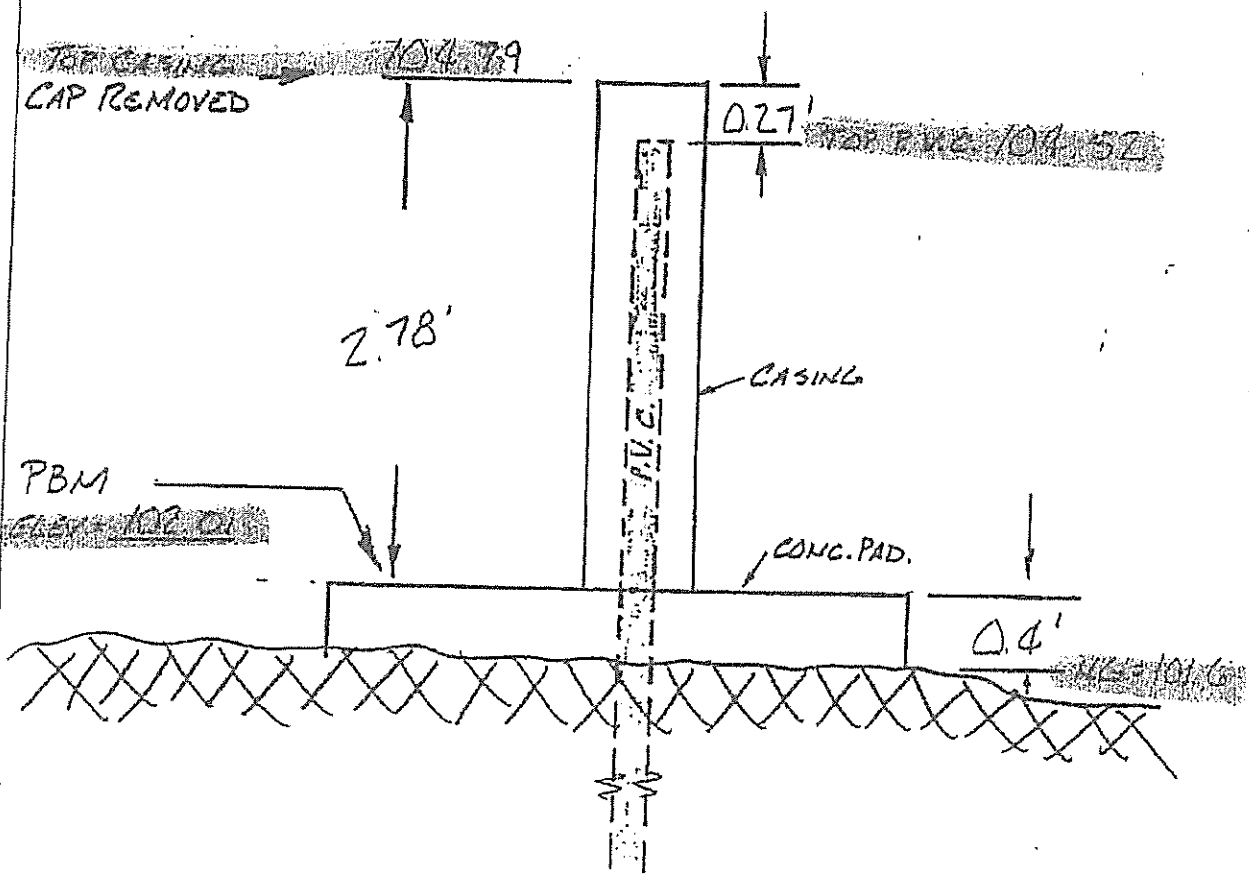
COMPUTER POINT No. 3013 CUT SQUARE

LAT. 29° 51' 00.4"

LONG. 95° 32' 55.7"

HAWTHORNE PARK (SAMFILL, INC.)

407-001-



WELL No. MGP-25

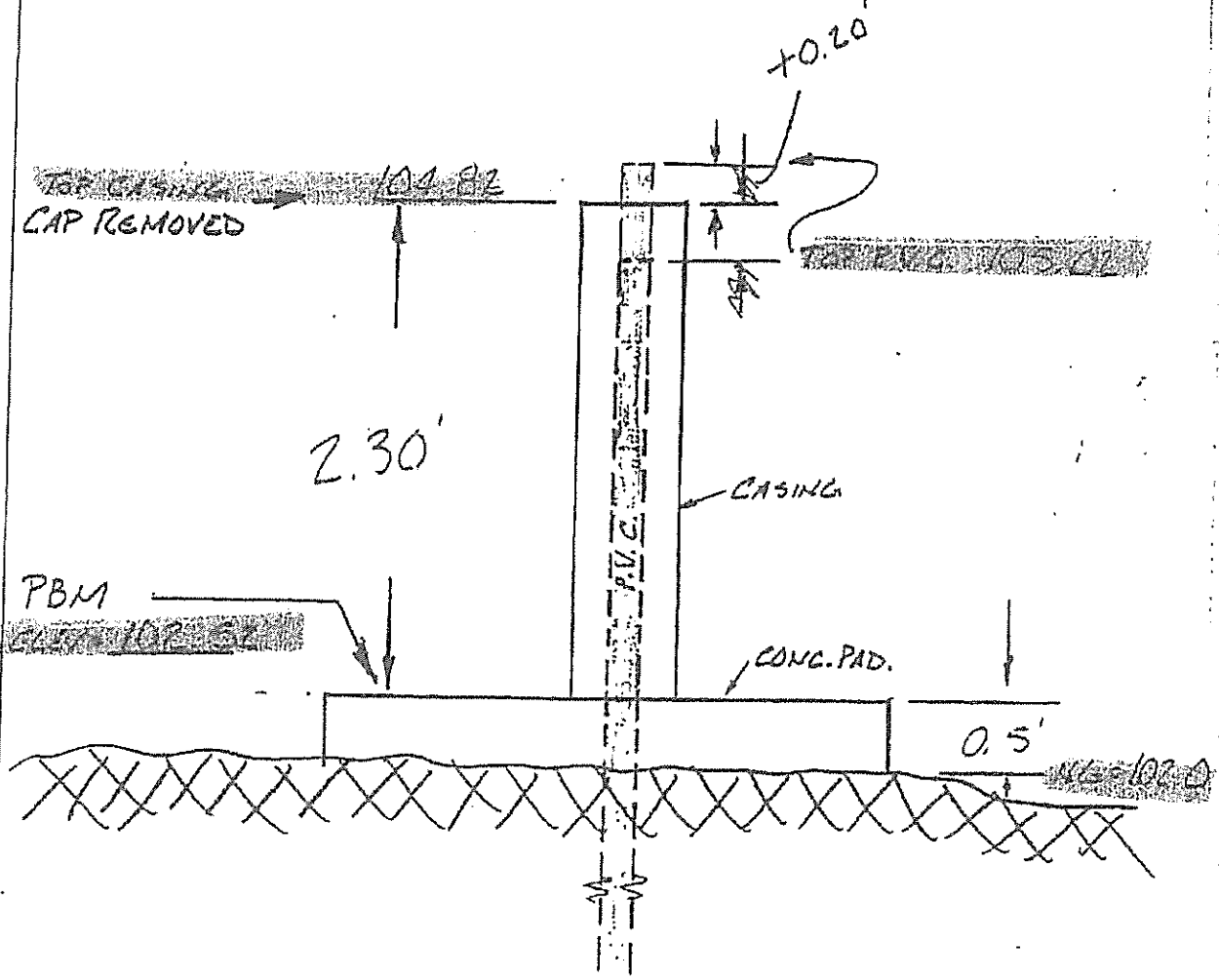
COMPUTER POINT No. 3007

LAT. 39° 31' 27.91"

LONG. 95° 32' 56.74"

HAWTHORNE PARK (SAMFILL, INC.)

407-001-



MGP-26

WELL NO. _____

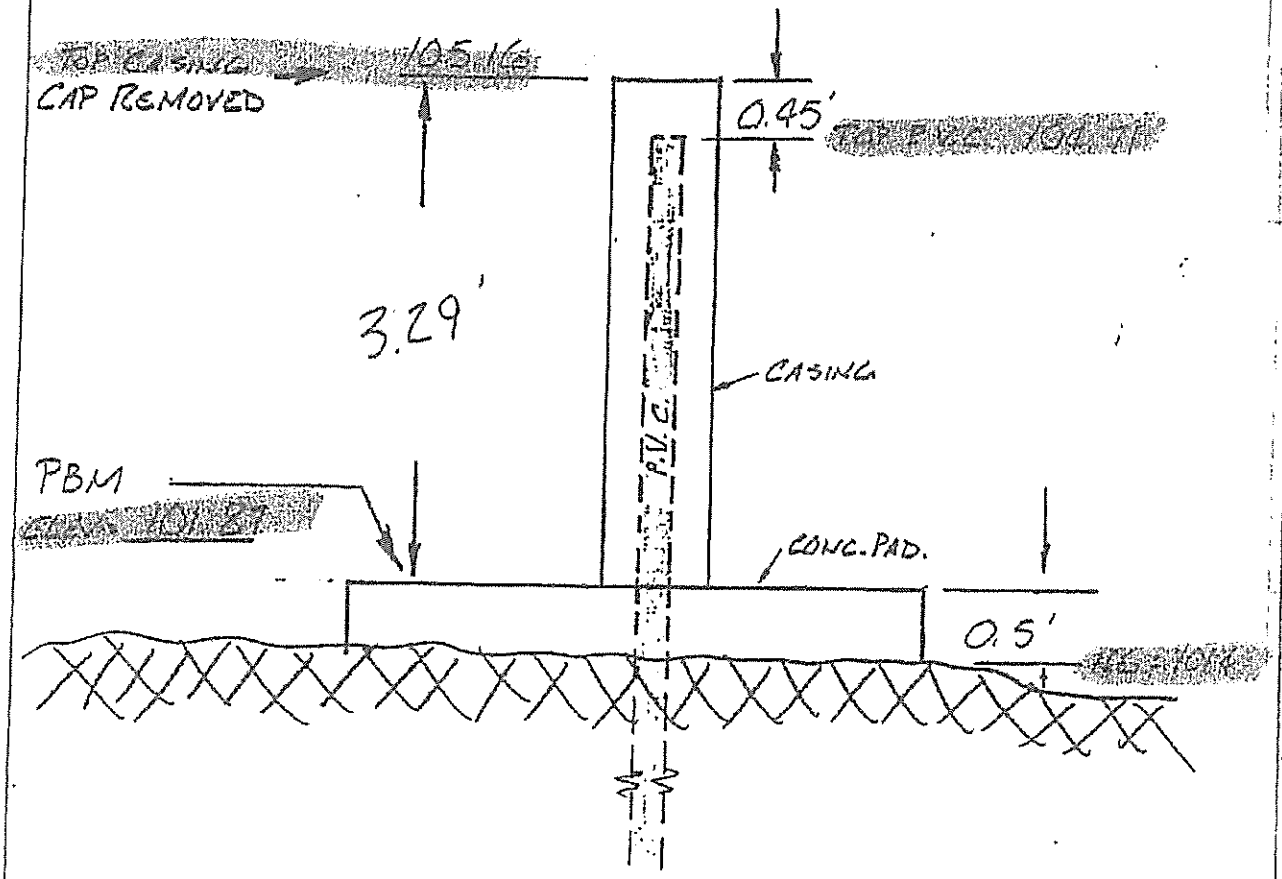
COMPUTER POINT NO. 3005 CUT SQUARE

LAT. 29° 54' 27.8"

LONG. 95° 33' 11.7"

HAWTHORNE PARK (SAM FILL, INC.)

407-001-



WELL NO. MGP-27

COMPUTER POINT NO. 3003

LAT. 29° 51' 23.2"

LONG. 95° 33' 10.5"

PART III

APPENDIX III-6B

GAS MONITORING DATA FORMS

HAWTHORN PARK RDF

GAS MONITORING REPORT

(EXAMPLE FORM, ACTUAL FORM MAY VARY)

Sampled By: _____

Date: _____ Time: _____ Temperature: _____

Weather: _____ Barometric Pressure: _____

Monitoring Equipment: _____ Date of Calibration: _____

Calibration Standards: _____

PROBE NO.	GROUND SURFACE ELEVATION	PROBE SCREEN ELEVATION RANGE	% METHANE		O2%	PRESSURE	LFG TEMP.	WATER LEVEL
			0-5	5-100				

STRUCTURE	% METHANE	
	0-5	5-100
Gatehouse		

GAS WELL CONDITION REPORT

(EXAMPLE FORM, ACTUAL FORM MAY VARY)

Facility: _____ Well ID: _____ Date: _____

Access:

Accessibility: Good _____ Fair _____ Poor _____

Vicinity of well clear of weeds and/or debris: Yes _____ No _____

Remarks: _____

Concrete Pad:

Integrity of Concrete Pad: Good _____ Poor _____

Presence of depressions or standing water around well: Yes _____ No_____

Remarks: _____

Protective Outer Casing: Material = _____

Condition of Protective Casing: Good _____ Damaged _____

Condition of Locking Cap: Good _____ Damaged _____

Condition of Lock: Good _____ Damaged _____

Condition of Weep Hole: Good _____ Damaged _____

Remarks: _____

Well Riser: Material = _____

Condition of Riser: Good _____ Damaged _____

Condition of Riser Cap: Good _____ Damaged _____

Measurement Reference Point: Yes _____ No _____

Remarks: _____

Sample Port: Type: _____

Condition: Good _____ Damaged _____ Missing _____

Remarks: _____

Field Certification: _____

Signed Title Date