Blue, Karen

To: Coker, Cristina
Subject: RE: REVISED Explosive Gas Corrective Action Plan-Two Pine GP-06R

From: Reynolds, Jodi [mailto:jreyno10@wm.com]
Sent: Wednesday, January 13, 2021 1:16 PM
To: Coker, Cristina; Cusher, Annette
Cc: Renfro, Bryant
Subject: REVISED Explosive Gas Corrective Action Plan-Two Pine GP-06R

Apologies! The first document I sent did not have the attachments. Please use the attached document instead. Thanks!

Jodi
JODI REYNOLDS
Environmental Protection Manager, Arkansas
MID★SOUTH Market Area
jreyno10@wm.com

C: 501.993.8966
88 Joyce Lane
Russellville, AR 72802

WASTE MANAGEMENT

Two Pine Landfill
100 Two Pine Drive
North Little Rock, AR 72117
(501) 982.7336 Phone
(501) 982.2606 Fax

January 13, 2021

Arkansas Department of Environmental Quality
Attention: Ms. Christina Coker, Office of Land Resources
5301 Northshore Drive
North Little Rock, Arkansas 72118-5317

Re: Two Pine Landfill – Explosive Gas Monitoring Corrective Action Plan
AFIN 60-00438; Permit Number 0163-S1-R3
Methane Gas Exceedance in GP-06R

Dear Ms. Coker:

Waste Management of Arkansas, Inc. owns and operates the Two Pine Landfill (TPLF) located at 100 Two Pine Drive in North Little Rock, Arkansas. The landfill is regulated under Arkansas Department of Environmental Quality (ADEQ) Permit No. 0163-S1-R3 AFIN #60-00438, issued April 21, 2008. An Explosive Gas Monitoring Plan (EGMP) was prepared and has been in place at the landfill in fulfillment of Arkansas Pollution Control and Ecology Commission (APC&EC) Regulation No. 22 (Arkansas Regulation 22) requirements.

The EGMP presents information including a preliminary action plan outlining immediate steps that will be taken to protect human health and safety should methane gas levels exceed the limits outlined in Reg.22.415 of Arkansas Regulation 22. The Facility monitors explosive gas on a quarterly basis. A copy of the EGMP is included as Attachment A, and includes a general layout of the TPLF Facility and the location of the gas monitoring probes at the site.

During a routine gas monitoring event on December 17, 2020, TPLF detected explosive gas at levels in excess of the regulatory requirement in TPLFGP-06R at 9% methane. GP-06R is located along the southeast boundary of the old landfill. Based upon this reading, TPLF immediately implemented the contingency provisions of the EGMP. On December 18, 2020, TPLF notified ADEQ of the detection via e-mail notification. Since this time, TPLF has made additional efforts to ensure the protection of its workers and neighbors as well as performing testing and additional investigation to determine the source of the issue.

As required by Section 4.0 of the EGMP, TPLF has put together the following Corrective Action Plan, which includes documentation of initial actions taken by TPLF and an outline of the remedial actions that were implemented.

Initial Actions Taken by TPLF

Upon detecting measurements of explosive gas in GP-06R, TPLF took the following initial actions to protect its workers and occupants of nearby residential structures and to determine the source of the gas.

- TPLF gas technician notified Gas Operations Manager and EP Manager of the discovery on December

17, 2020.

- TPLF gas technician verified calibration of the field instrument used for monitoring in an effort to determine if detection was erroneous on December 17, 2020.
- TPLF gas technician verified initial reading by taking three additional readings on December 17, 2020.
- TPLF gas technician advanced bar hole probes to a depth of approximately five feet below ground surface 10' to the north of the probe towards the old landfill and 20' to the east and west of GP-06R. Methane sample results are included as Attachment B.
- TPLF gas technician flagged a 10' perimeter around GP-06R.
- TPLF assembled a team and commenced efforts to identify the potential source of the methane detected on December 17, 2020.
- TPLF notified ADEQ of the detection via e-mail on December 18, 2020.
- TPLF gas technician continued to take daily reading from GP-06R.

Remedial Actions Taken by TPLF

In an effort to determine the source of the methane identified in GP-06R, TPLF reviewed gas well data from the old landfill. Areas exist on the old landfill that were filled with waste prior to the modern solid waste regulations. These areas were sometimes lined with soil liners and were typically located in low lying areas, valleys, and trenches on the site. There is potential that landfill gas generated by this waste could be migrating underground and impacting GP-06R.

After a review of the data, TPLF determined that a recently decommissioned in-waste gas well, TPLFEW-10R, should be put back in service. A well head was re-installed at TPLFEW-10R on December 18, 2020. In addition, the site began pumping water from TPLFEW-10R and TPLFEW-11, which are the closest in-waste gas wells to GP-06R. Wells were pumped for about 60 second each on December 18, 2020 and December 24, 2020. Roughly 200 gallons of water were removed from the wells. Lastly, the gas technician made adjustments to leachate riser LR-3. As of January 11, 2021, GP-06R is in compliance with a gas level of 2.1% methane. We are continuing to tune the well field and have installed an electric pump in TPLFEW-10R to pump water in an effort to further reduce the methane levels.

Thank you for your time and attention in this matter. Should you have further questions, you can reach me at (501)993-8966 by phone, or jreyno10@wm.com by e-mail.

Sincerely,
Waste Management of Arkansas, Inc.

Jodi Reynolds
Environmental Protection Manager - Arkansas

Cc: TPLF POR

Attachment A

Explosive Gas Monitoring Plan

Two Pine Landfill
North Little Rock, AR

Permit No. 0163-S1-R3
AFIN: 60-00438

March 2016

Prepared for:
Two Pine Landfill
100 Two Pine Drive
North Little Rock, Arkansas 72117
(501) 982-7336

Prepared by:
Waste Management of Arkansas, Inc.
100 Two Pine Drive
North Little Rock, Arkansas 72117
(501) 982-7336

Table of Contents

Figures

Attachments

1.0 INTRODUCTION

This Explosive Gas Monitoring Plan for the Two Pine Landfill (Facility) was prepared in general accordance with Regulation 22.415 of *Arkansas Regulation 22* and 40 CFR 258.23. According to EPA 40 CFR 258.23 and Regulation 22.415, owners and/or operators of permitted landfills must ensure that:

- The concentration of methane gas generated by the facility does not exceed 25 percent of the lower explosive limit (LEL)[1] for methane in facility structures (excluding gas control or recovery system components); and
- The concentration of methane gas does not exceed the lower explosive limit for methane at the facility property boundary.

1.1 ADEQ Regulation 22

Section (c) of Regulation 22.415 states "the owner or operator of an existing or new facility shall prepare and submit to the Department for review and approval a gas monitoring plan demonstrating how the requirements of this section will be met. The plan shall include a preliminary action plan outlining immediate steps that will be taken to protect human health and safety should methane gas levels exceeding the limits specified in paragraph (a) of this section are detected. The plan shall include at a minimum the following information:

- Site specific factors affecting landfill gas migration;
- Site conditions, landfill history, site design and construction practices;
- Proximity and construction of on-site and off-site structures within 1/4 mile of the limits of refuse;
- Monitoring system design rationale and methodology that includes detailed location and design plans for in-soil gas probes; narrative description of rationale for location and depths of the gas probes; narrative, schedules and specifications for the construction of the probes and implementation of an approved monitoring routine;
- A description of the monitoring points in structures, and equipment locations;
- Monitoring procedures including permanent probe monitoring, barhole probe description, monitor calibration, recordkeeping, etc.

[1] "Lower explosive limit" means the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25˚C and atmospheric pressure.

2.0 SITE INFORMATION

The Facility currently owns, operates, and maintains a Class 1 Landfill facility (Two Pine Landfill) which is located approximately at the junction of the North Belt Freeway (I-440) and Highway 67/167, between Highway 67/167 and the Union Pacific Railroad, and between the City of Sherwood and the City of Jacksonville. The Class 1 Landfill operated under the Arkansas Department of Environmental Quality (ADEQ) Solid Waste Permit No. 0163-S1-R3, issued on April 21, 2008. The permitted waste disposal area is 239.5± acres. Total property area is 530± acres.

Condition 7 of the Solid Waste Permit (0163-S1-R3) states "The permittee shall implement the Landfill Gas Monitoring Plan (LGMP) presented in Solid Waste Management Division DIN 36562. In addition to the implementation of the approved Landfill Gas Monitoring Plan, the facility shall fully meet all requirements of Regulation 22.415 regarding the control of explosive gases. The facility shall monitor each of the gas monitoring probes detailed in the approved Landfill Gas Monitoring Plan and within all structures at the facility on a quarterly basis. The results shall be submitted to the Department within 14 days of each monitoring event."

2.1 Landfill History and Configuration

The Brushy Island Landfill was issued a permit to construct and operate a solid waste landfill in 1973; however, that permit was voided and superseded by a new solid waste permit issued to Waste Management of Arkansas, Inc. in 1992. The landfill was re-named Two Pine Landfill, and the disposal area has subsequently expanded in phases over the years. A summary of expansion activities is presented in the table, below. In addition, a diagram of the Landfill is included as **Figure 1**.

Permit Number	Date Issued	Permit Action
S-0029	12.11.73	Voided
S-0163	11.16.79	135± acres permitted for waste disposal
0163-S1-R1	7.23.92	Revision to S-0163
0163-S1-R2	3.29.01	Vertical expansion
0163-S1-R3	4.21.08	Lateral expansion – expansion to 239.5± acres

2.2 Site-Specific Factors Affecting Landfill Gas Migration

The facility is located near the margin of two principal geologic areas, separated by a northeast-southeast treading Fall Line, a transition zone characterized by waterfalls and rapids, between highlands to the west and low lying areas to the east. The facility lies to the east of the Fall Line, within the Coastal Plains Physiographic Province.

Two Pine Landfill is located on the edge of the Mississippi Embayment near the Gulf Coastal Plain, the Arkansas Valley and the Ouachita Mountains regions. The site represents a relatively complex geological setting. The surficial deposits at the site consist of Quaternary Age alluvium. These deposits consist of mainly clays and silty clays, with the basal portion of the Quaternary alluvium being a discontinuous zone

of sand with some gravel. Tertiary Age Wilcox Group deposits underlay the alluvial zone. The Wilcox Group is composed of interbedded layers of clay, sand and lignite. These sands are typically fine grained with a high silt or clay content. The thicknesses of the Tertiary units are on the order of 40 to 50 feet. The Tertiary deposits are underlain by shales of the Pennsylvanian Age Jackfork foundation.

2.3 Potential for Gas Migration

Because the design and construction of some of the existing Two Pine Landfill waste disposal units predated Arkansas Regulation 22 and Subtitle D, a potential exists for lateral gas migration. However, the clay residuum in the vicinity of the site is not readily conducive to liquid or gas migration. Because expansion areas are constructed with a composite liner system and the facility operates a landfill gas collection and control system (GCCS), the potential for gas migration from the site should be minimal. Additionally, the potential for gas migration to impact local residences is unlikely.

The probability for gas migration through the base liner system will increase during the post-closure period, as the entire landfill will have received final cover, thus restricting gas migration through the surface of the landfill. Anaerobic gas activity and associated pressure build up will increase initially during the post closure period and taper off as the waste material decomposes and the landfill stabilizes. The Facility's GCCS reduces the potential for subsurface migration of landfill gas from the waste disposal areas.

2.4 Proximity and Construction of Structures within ¼ Mile of Refuse Limits

The Two Pine Landfill is located on the outskirts of a metropolitan area between the cities of Sherwood and Jacksonville, Arkansas. The Landfill was first developed in 1979 on a tract of residential farmland, which was converted from wetlands by the use of a system of levees to block floodwaters of the Bayou Meto. Although the area was sparsely populated in the late 1970's, residential and commercial development in the area increased through the early 2000's. The Landfill is adjoined to the west by Highway 67/167 and to the north by the Bayou Meto and undeveloped wooded land that frequently floods. Commercial and single-family residential properties are located to the south and east.

3.0 LANDFILL GAS MONITORING PROGRAM

Owners or operators of permitted landfills must implement a routine methane monitoring program to ensure that the standards provided in Section 1.0 are met. The type and frequency of monitoring must be determined based on the following factors:

- Soil conditions;
- The hydrogeologic conditions surrounding the facility;
- The hydraulic conditions surrounding the facility; and
- The location of facility structures and property boundaries.

Regular quarterly landfill gas monitoring has been performed at the Landfill and will continue throughout the active life of the Facility and during the post-closure period.

3.1 Monitoring System Design Rationale and Methodology

The accumulation of methane in landfill structures can potentially result in fire and explosions that can endanger employees, users of the disposal site, and occupants of nearby structures, or cause damage to landfill containment structures. In accordance with 40 CFR 258.23 and *Arkansas Regulation 22*, the following information outlines the procedures that will be implemented at the facility to help ensure that hazardous/dangerous levels of methane are not exceeded at the facility property boundary and/or in structures on site.

- Quarterly monitoring for landfill related landfill gas in gas probes and landfill structures (methane);
- Immediate steps are to be taken to protect human health in the event of methane gas levels exceeding 25% of the LEL in the facility structures and/or the concentration of methane gas exceeds the LEL of methane at the facility property boundary (*Reg.22.415 (d)*);
- Immediate notification to the ADEQ if methane levels exceed 25% of the LEL in facility structures or the LEL at methane monitoring probes installed at the property boundary (see **Figure 1**) (*Reg.22.415 (d)*);
- Within seven days of detection, a letter will be submitted to the ADEQ summarizing the results and the emergency response action taken. A copy of the letter will be retained in the facility permanent operating record. The contingency plan, as outlined in later sections will be immediately implemented; and
- Within 60 days of detection, the facility will implement a corrective action plan for the methane gas migration, notify the ADEQ, and place a copy of the corrective action plan in the facility permanent operating record. The plan shall describe the nature and extent of the problem and the proposed remedy.

3.2 Methane Monitoring Points

As stated in Section 2.0, the Two Pine Landfill monitors 20 permanent gas probes located across the Facility, as well as the gas-to-energy plant (GP-17), office (GP-18) and maintenance shop (GP-19). Gas monitoring probes (GMP) 1R, 2R, 3R , 6R, 7, 8, 9, 13 and 17 are situated around the old landfill. GMP-5 is located near the maintenance shop, to the south. GMP-10R and 11R are located at the west property boundary, near the can yard. GMP-4, 18, 19 and 20 are situated at the north/northwest property boundary between the flood relief channel and Highway 67/167. GMP-21 and 22 are located to the east of the new landfill at the edge of the wooded wetland area. GMP-23 and 24 were placed at the south property boundary, near the new landfill.

Gas Probe	Location Description
GMP-1R	NW property boundary, old landfill
GMP-2R	NW property boundary, old landfill
GMP-3R	NW property boundary, old landfill
GMP-4	NW property boundary, flood channel
GMP-5	South property boundary, shop
GMP-6R	South property boundary, old landfill
GMP-7	South property boundary, old landfill
GMP-8	SW property boundary, old landfill
GMP-9	SW property boundary, old landfill
GMP-10R	West property boundary, can yard
GMP-11R	West property boundary, can yard
GMP-BH-12	West property boundary, GTE plant
GMP-17	North side of old landfill
GMP-18	NW property boundary, flood channel
GMP-19	NW property boundary, flood channel
GMP-20	NW property boundary, flood channel
GMP-21	East of new landfill, wooded area
GMP-22	East of new landfill, wooded area
GMP-23	South property boundary, new landfill
GMP-24	South property boundary, new landfill
GP-17	Gas-to-Energy plant
GP-18	Office/scalehouse
GP-19	Maintenance shop

3.3 Methane Monitoring Procedures

To demonstrate compliance with the requirements of 40 CFR 258.23, and *Arkansas Regulation 22*, the Facility routinely monitors air quality inside the scalehouse, office/breakroom, maintenance building, and other facility structures where methane gas could potentially accumulate. The person

conducting the monitoring is trained in the proper use of the gas monitoring equipment, including calibration procedures. Prior to performing each quarterly landfill gas monitoring event, the qualified operator calibrates the methane detector and record the applicable weather conditions. WM has developed and trained gas technicians on Standard Operating Procedures (SOP) for explosive gas monitoring. A copy of the SOP is included as **Attachment 3**.

Monitoring within facility structures will consist of recording the concentration of methane (in % LEL) in each room of the facility utilizing an explosive gas analyzer calibrated to methane. When possible, readings are taken in enclosed areas, near electrical outlets, or floor drains, which could potentially be sites for landfill gas migration into the structure. At each location, the operator records the time, methane (% LEL), and oxygen (%). If no methane is detected in the room, a "non- detect (ND)" will be entered for that point on the landfill gas record form.

Routine sampling procedures are exercised at the 16 gas monitoring probe locations, and includes at least the following procedures:

- Record the date, weather conditions, and monitoring equipment operator;
- Calibrate explosive gas analyzer to methane and oxygen;
- Inspect and record the integrity of gas probe;
- Unlock padlocks and take off the protective hood;
- Open the well or valve and allow the well sufficient time to equilibrate;
- Place explosive gas analyzer on the probe opening or place the end of the meter's input tube and record gas concentration in % LEL and % oxygen;
- Record gas and oxygen concentrations;
- Close well opening once all measurements have been completed; and
- Detach explosive gas analyzer and put protective hood casing back over the gas probe and secure casing with padlocks.

3.4 Landfill Gas Monitoring Equipment

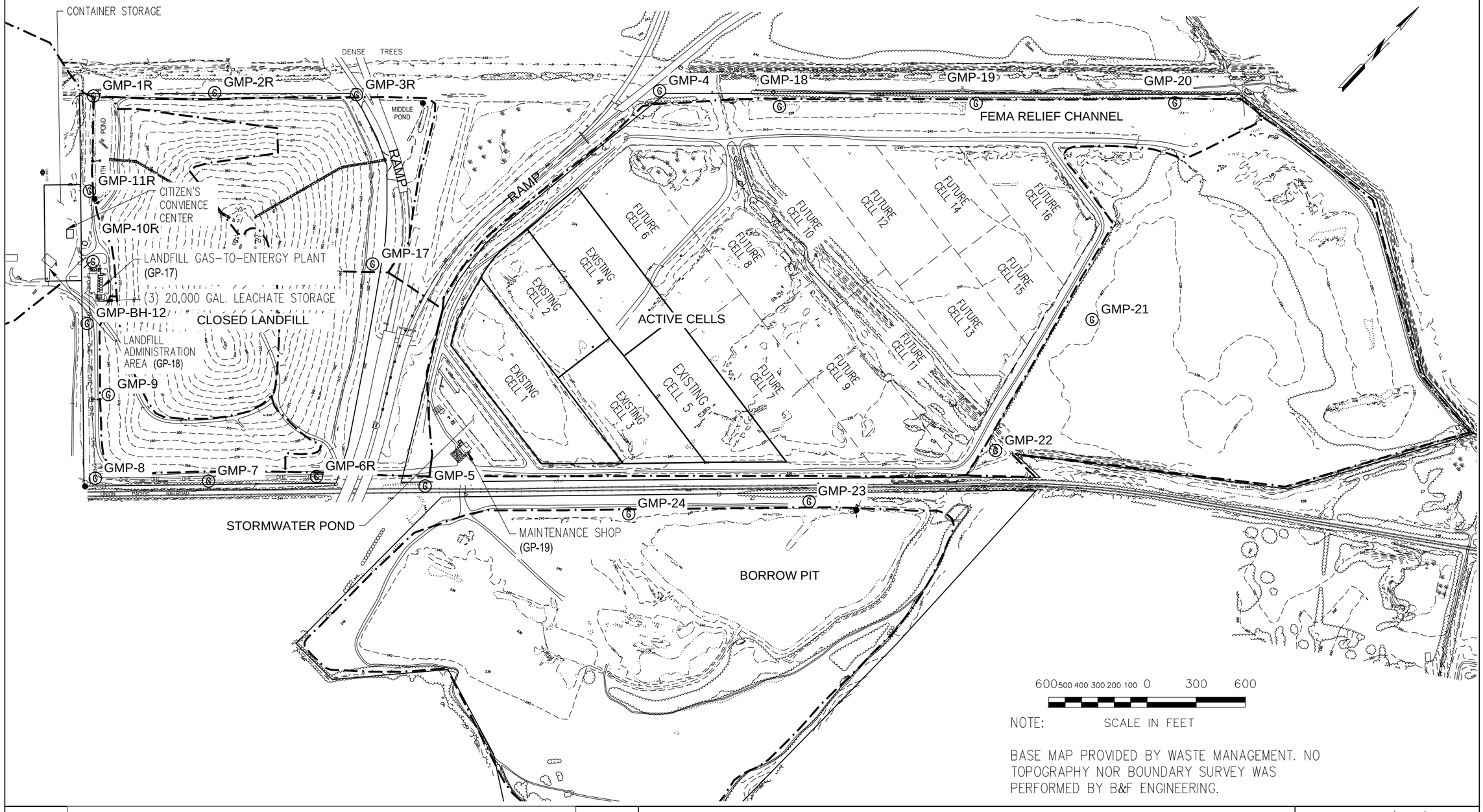
Landfill gas measurements are collected at each location with an infrared gas monitoring instrument (Landtec GEM 500, an equivalent or better). The instrument is capable of recording the concentration of methane in "percent LEL". The instrument is calibrated to methane prior to each monitoring event as outlined in the equipment manufacturer's literature. Manufacturers' information

and specifications associated with the landfill gas detection equipment is maintained in the facility permanent operating record and/or the LGMS system. This information includes calibration procedures and maintenance information that helps to ensure the equipment is in proper working condition.

4.0 CONTINGENCY PLANS

If methane concentrations exceed 25% of the LEL in the buildings or 100% of the LEL (50,000 ppm or 5% in air) at the specified monitoring locations, the ADEQ will be notified (as described in Section 3.1) and the following steps will be taken:

- The surrounding area corresponding to the monitoring point that indicates an explosive hazard will be evacuated and flagged with warning tape. The outer extremities of the "exclusion zone" will be defined by taking surface readings with the portable gas monitor. If there are no concentrations above 25% LEL at the surface in the vicinity of the monitoring location, then the exclusion zone tape will be flagged in a 10 foot radius around the location in question. No one will be allowed in the "Explosive Danger" area without prior approval from the landfill supervisor until corrective measures have been taken and the areas is considered "safe".
- Any monitoring points with readings in excess of the established criteria (25% LEL in buildings and 100% LEL at the property boundary) will be monitored again on an hourly basis. This process will continue until either: 1) three consecutive readings below the criteria are recorded, or 2) three consecutive readings above the criteria are recorded. If scenario (1) takes place, the monitoring point will be checked again the following day, and an explanation of the possible reason for the initial excessive reading will be placed in the facility permanent operating record (i.e., equipment failure, etc.). If scenario (2) occurs, the facility will proceed to the next step as described below and the ADEQ will be notified of the potential hazard within 7 days.
- If it is determined that an "explosive hazard" exists at any of the locations described above, a corrective action plan will be submitted to the ADEQ within 60 days which will include steps that will be implemented to reduce or eliminate excessive gas buildup within the landfill unit and related potential migration to areas that could pose danger to human health and the environment.



CHIMNEY ROCK CONSULTING

EXPLOSIVE GAS PROBE MONITORING SYSTEM
TWO PINE CLASS I LANDFILL FACILITY

WASTE MANAGEMENT OF ARKANSAS, INC.

PULASKI COUNTY ARKANSAS

REVISED: 3/22/2016	
JOB NO: 7-4005-0101	
ACAD NO: 031	
DWN.	EGB 3/16
SCALE: 1" = 600'	
DATE: MARCH 2016	

Attachment A

Landfill Gas Monitoring Record Form

Monitoring Forms are automatically generated from LGMS when data is downloaded into the program.

Attachment B
Landfill Gas Probe As-Builts

CHIMNEY ROCK CONSULTING

FIELD BOREHOLE LOG

BOREHOLE NO.: **GMP-1R**
TOTAL DEPTH: **15'**

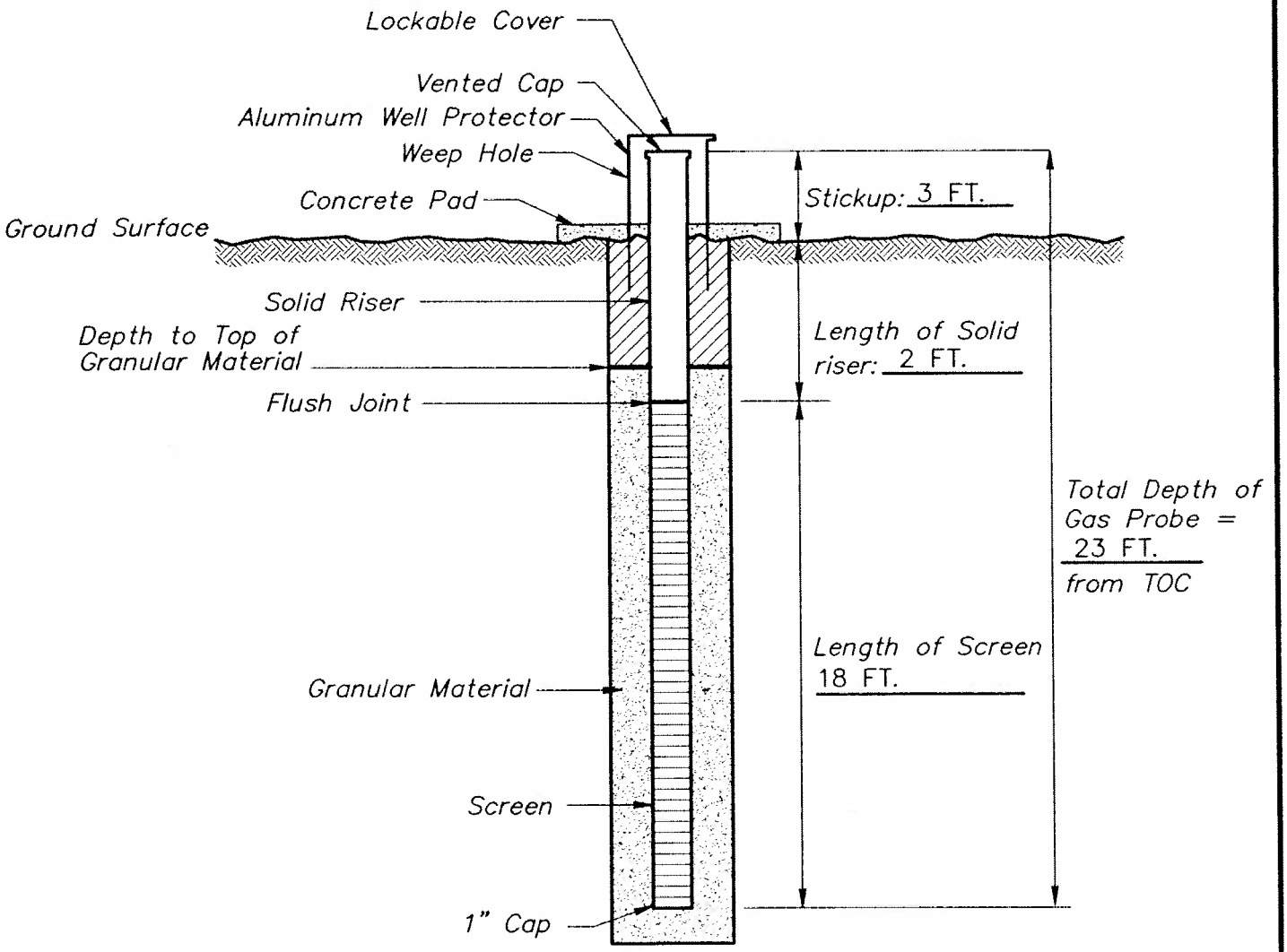
PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**WM Two Pine Landfill**	DRILLING CO.:	**Anderson Engineering**
SITE LOCATION:	**100 Two Pine Drive**	DRILLER:	**Ricky Bradbury**
JOB NO.:	**10-002**	RIG TYPE:	**CME 55**
LOGGED BY:	**Dan McCullough**	METHOD OF DRILLING:	**6" Flight Augers**
PROJECT MANAGER:	**Dan McCullough**	SAMPLING METHODS:	**Drill Cuttings**
DATES DRILLED:	**5/19/10**	HAMMER WT./DROP	

NOTES: N: 182822.61; E: 1264399.47; TOC elev. 253.59

DEPTH	SOIL SYMBOLS	LITHOLOGIC DESCRIPTION	BORING COMPLETION	WELL DESCRIPTION
0		CLAY: Brown; Fat, Dry		0-3' - 2" PVC Riser ; Bentonite
-5		CLAY Gray, Fat, Dry		3'-15' - 2" PVC Screen (3/16 drilled holes); Pea Gravel
-10				
-15				

GAS PROBE INSTALLATION RECORD

Job Name WASTE MANAGEMENT — Well Number GP-2R
Installation Date 6-11-03 — Location TWO PINE LANDFILL
Datum Elevation TOC 254.50 — Surface Elevation 250.98
Screen Diameter & Material 1" PVC — Borehole Diameter 6"
Riser Diameter & Material 1" PVC — GEC Representative QUIN BABER
Granular Backfill Material PEA GRAVEL — Northing 183192.99 — Easting 1264796.87
Drilling Method AUGERS — Drilling Contractor ANDERSON ENGINEERING



Grout (Bentonite Chip)

Granular Material (Pea Gravel)

(Not to Scale)

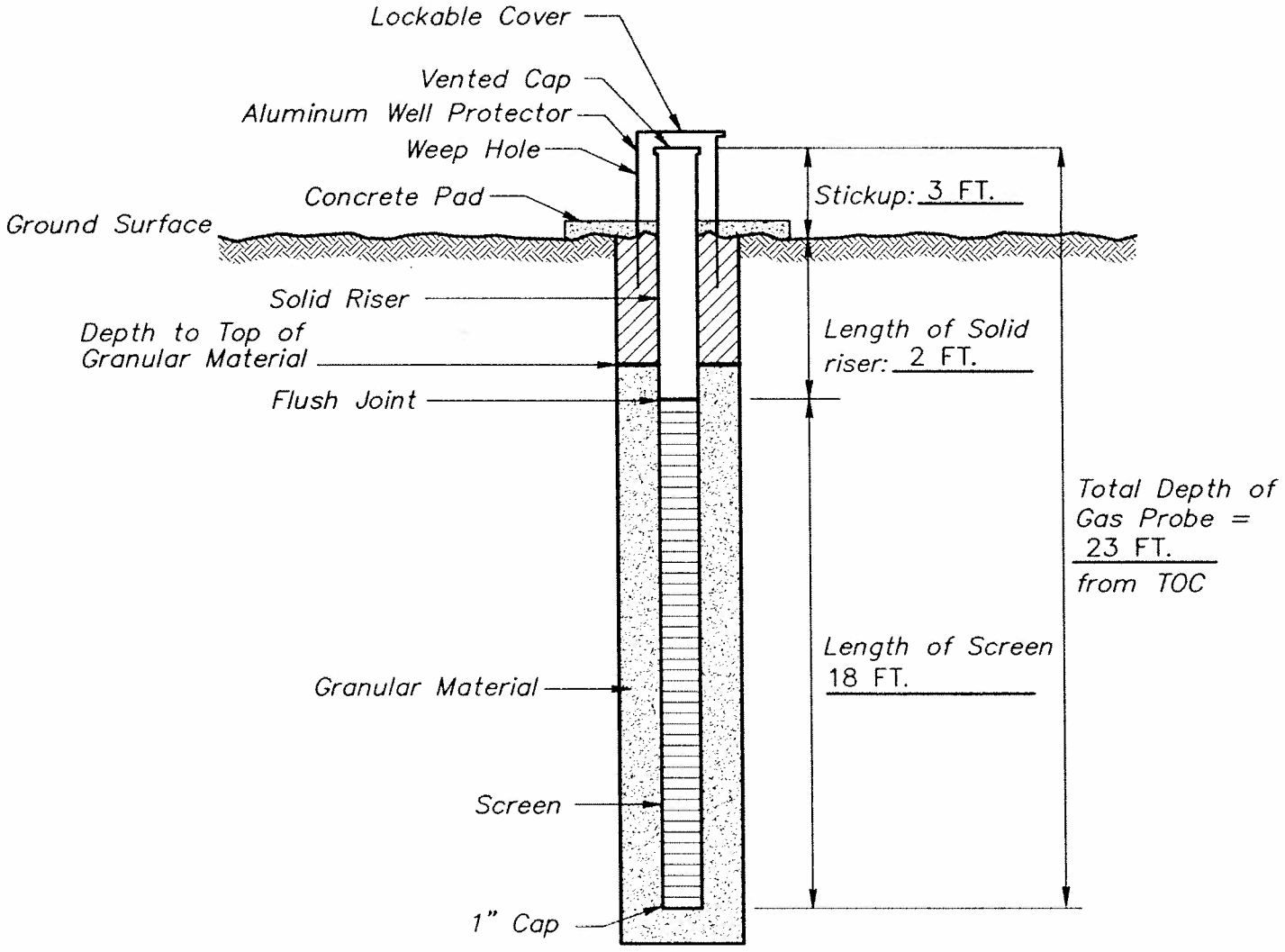
GENESIS ENVIRONMENTAL CONSULTING, INC.
11400 WEST BASELINE ROAD
LITTLE ROCK, ARKANSAS 72209
PH. (501) 455-2199
FAX. (501) 455-4547

GAS PROBE INSTALLATION RECORD

PROJECT NUMBER: 062-015-03063
WELL NUMBER: GP-2R
DRAWING NUMBER: 001
CHECKED BY: QUIN BABER

GAS PROBE INSTALLATION RECORD

Job Name WASTE MANAGEMENT Well Number GP-3R
Installation Date 6-11-03 Location TWO PINE LANDFILL
Datum Elevation TOC 252.92 Surface Elevation 249.44
Screen Diameter & Material 1" PVC Borehole Diameter 6"
Riser Diameter & Material 1" PVC GEC Representative QUIN BABER
Granular Backfill Material PEA GRAVEL Northing 183907.76 Easting 126554.27
Drilling Method AUGERS Drilling Contractor ANDERSON ENGINEERING



Grout (Bentonite Chip)

Granular Material (Pea Gravel)

(Not to Scale)

GENESIS ENVIRONMENTAL CONSULTING, INC.
11400 WEST BASELINE ROAD
LITTLE ROCK, ARKANSAS 72209
PH. (501) 455-2199
FAX. (501) 455-4547

GAS PROBE INSTALLATION RECORD

PROJECT NUMBER: 062-015-03063
WELL NUMBER: GP-3R
DRAWING NUMBER: 002 CHECKED BY: QUIN BABER

SOIL BOREHOLE LOG

SITE NAME AND LOCATION:

Brushy Island L. R. C.
Jacksonville, Arkansas 72071
WMA. Brushy Island-Gas Probe.
87459.100

Located approximately
2.8 miles northeast of
North Little Rock, east of
Hwy. 167/67 at Kiehl Road exit

DATUM: MSL ELEVATION: 250.30

DRILLING METHOD: Dry, Hollow-Stem Auger (HSA), 8.25 O.D.

SAMPLING METHOD: Continuous, Split Spoon

BORING NUMBER: GMP-4

Sheet 1 of 1

DRILLING

	INI			STATIC	START	FINISH
WATER LEVEL	DRY			16.67	TIME	TIME
TIME	12:32			18:12	11:45	12:32
DATE	6/23/95			6/28/95	DATE	DATE
CASING DEPTH					6/23/95	6/23/95

DRILL RIG: CME 590

SURFACE CONDITIONS: Dry, flat, grassy berm

ANGLE: Vertical BEARING: ---

SAMPLE HAMMER TORQUE: 140 ft.-lbs.

DRILLING CONTRACTOR CCI Houston, Tx

DEPTH IN FEET (ELEVATION)	BLOWS/6" ON SAMPLER	RECOVERY %	SYMBOL	DESCRIPTION OF MATERIAL	SAMPLER AND BIT	SAMPLE TYPE	BLOWS/FT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
0				Dark gray (10YR 3/1) CLAY; slightly silty; moderately plastic; firm; moist (CL)								
12				Reddish brown (5YR 4/4) CLAY; plastic; slightly stiff; moist; occasional thin beds of coarse sand, poorly sorted (CH)								
18				Yellowish brown (10YR 5/6); and mottled gray (10YR 5/1) CLAY; moderately plastic; slightly stiff moist to damp @ 17.1' (CL)								
20				T.D. @ 20 feet								

LOGGED BY Emmett Hudson CHECKED BY

DATE 6/23/95

WELL No. GMP-4

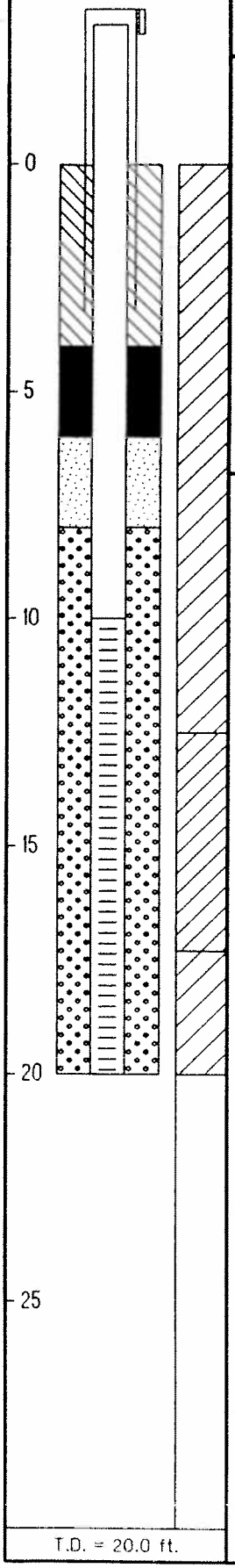
Boring No X-Ref. GMP-4

LANDFILL GAS MONITORING PROBE CONSTRUCTION SUMMARY

Survey Coords N = 185144.9655
E = 1266846.0052

Elevation Ground Level 250.30

Top of Casing 253.39



Drilling Summary

Total Depth (ft): 20.0
Borehole Diameter (in): 8.25
Casing Stickup Height (ft): 3.09
Driller: C.C.I. Alliance, A. Lewis
Ar. Lic. # 2621

Rig: CME 590
Bit (s): Button, HSA

Drilling Fluid: NONE

Protective Casing: 4" X 5' Gold Anodized Aluminium

Probe Design & Specifications

Basis: Geologic Log ☒ Geophysical Log ☐
Casing String (s): C = Casing S = Screen

Depth	String (s)	Elevation
+3.44 - 1.56	C_1	253.74 -248.74
+3.09 - 10.0	C_2	253.39 -240.30
10.0 - 20.0	S_1	240.30 -230.30
-		-
-		-

Casing: C1 4" X 5' anodized aluminium

Casing: C2 Sch.40, 2 inch. P.V.C. Flush-thread

Screen: S1 Sch. 40 2 inch. P.V.C. .020" slot

Grout Seal: Bentonite/Portland cement, 0' to 4'

Bentonite Seal: 1/2" bentonite pellets, 4'to 6'

Filter Pack: 3/8" gravel, 8' to 20'
Fine sand, 6' to 8'

Construction Time Log

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling:0 to 20 feet	6/23/95	11: 45	6/23/95	12: 32
Geophys.Logging:				
Casing:				
C_2, S_1	6/23/95	12: 35	6/23/95	12: 42
C_1	6/27/95	14: 38	6/27/95	14: 52
Filter Placement:	6/23/95	12: 43	6/23/95	12: 49
Cementing:	6/27/95	14: 38	6/27/95	14: 56
Development:	NA			

Probe Comments

All dates 1995

SITE NAME *Brushy Island Landfill and Recycling Center*
LOCATION *Jacksonville, Ar. 72071*

WL 000-1

SUPERVISED BY *Emmett Hudson* CHECKED BY
DATE *6/23/95*

SOIL BOREHOLE LOG

SITE NAME AND LOCATION:

Brushy Island L. R. C.
Jacksonville, Arkansas 72071
WMA. Brushy Island-Gas Probe.
87459.100

Located approximately
2.8 miles northeast of
North Little Rock, east of
Hwy. 167/67 at Kiehl Road exit

DATUM: MSL ELEVATION: 244.81

DRILLING METHOD: Dry, Hollow-Stem Auger 8.25 O.D.

SAMPLING METHOD: Continuous, Split Spoon

BORING NUMBER: GMP-5

Sheet 1 of 1

	INI			STATIC	DRILLING START	DRILLING FINISH
WATER LEVEL	DRY			8.96	TIME	TIME
TIME	12:12			17:47	09:38	12:11
DATE	12/13/94			6/28/95	DATE	DATE
CASING DEPTH					12/13/94	12/13/94

DRILL RIG: Mobil B-57 A.T.V.

SURFACE CONDITIONS: Saturated, tall weeds, low flat

ANGLE: Vertical BEARING: ---

SAMPLE HAMMER TORQUE: ft.-lbs.

DRILLING CONTRACTOR _____

DEPTH IN FEET (ELEVATION)	BLOWS/6" ON SAMPLER	RECOVERY %	SYMBOL	DESCRIPTION OF MATERIAL	SAMPLER AND BIT	SAMPLE TYPE	BLOWS/FT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
2				Dark gray (10YR 3/1) slightly silty CLAY; plastic; moderately stiff; moist (CL)								
4				Dark yellowish brown (10YR 4/4); CLAY; plastic; moderately stiff; moist (CL)								
6				Reddish brown (5YR 4/4); CLAY; plastic; moderately stiff (CH)								
8												
10												
12												
14												
16												
18				Reddish brown (5YR 4/4); CLAY and SILT; plastic; moderately stiff (CL-ML)								
20												
22												
24												
26				Gray (10YR 5/1) with yellowish brown (10YR 5/4) mottling; CLAY, slightly silty, damp, plastic (CL)								
28												
30				T.D. @ 30 feet								
32												

LOGGED BY *Emmett Hudson* CHECKED BY _____

DATE _____

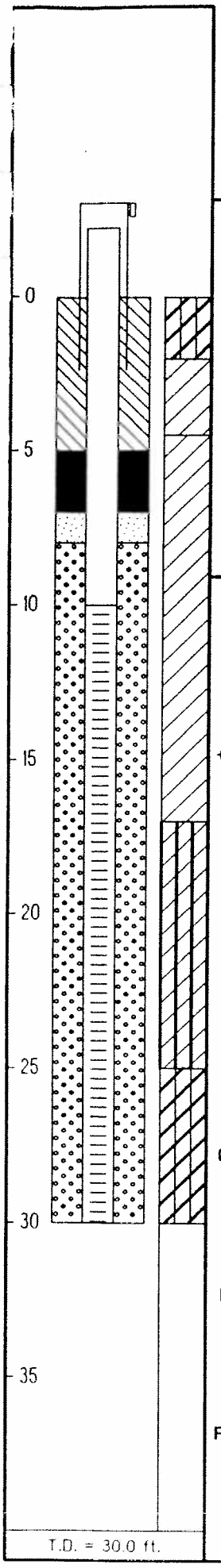
WELL No. GMP-5

Boring No X-Ref. GMP-5

LANDFILL GAS MONITORING PROBE CONSTRUCTION SUMMARY

Survey Coords N = 182567.0459
E = 1267549.0699

Elevation Ground Level 244.81
Top of Casing 247.59



Drilling Summary

Total Depth (ft): 30.0
Borehole Diameter (in): 8.25
Casing Stickup Height (ft): 2.78
Driller: .C.I. Alliance, A. Lewis
Ar. Lic. # 2621

Rig: Mobile B-57 A.T.V.
Bit (s): Button, HSA

Drilling Fluid: NONE

Protective Casing: 4" X 5' Gold Anodized Aluminium

Probe Design & Specifications

Basis: Geologic Log ☒ Geophysical Log ☐
Casing String (s): C = Casing S = Screen

Depth	String (s)	Elevation
+ 3.12 - 1.88	C_1	247.93 -242.93
+2.78 - 10.0	C_2	247.59 -237.59
10.0 - 30.0	S_1	237.59 -217.59
-		-
-		-

Casing: C1 4" anodized aluminium

Casing: C2 Sch.40, 2 inch. P.V.C. Flush-thread

Screen: S1 Sch. 40 2 inch. P.V.C. .020" slot

Grout Seal: Bentonite/Portland cement, 0' to 5'

Bentonite Seal: 1/2" bentonite pellets, 5'to 7'

Filter Pack: 3/8" gravel, 8' to 30'
Fine sand, 7' to 8'

Construction Time Log

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling:0 to 30 feet	12/13	09: 38	12/13	12: 11
Geophys.Logging:				
Casing:				
C_2,S_1	12/13	13: 20	12/13	13: 25
C_1	12/15	14: 25	12/15	14: 30
Filter Placement:	12/13	13: 45	12/13	13: 50
Cementing:	12/15	14: 08	12/15	14: 30
Development:				

Probe Comments

All dates 1994

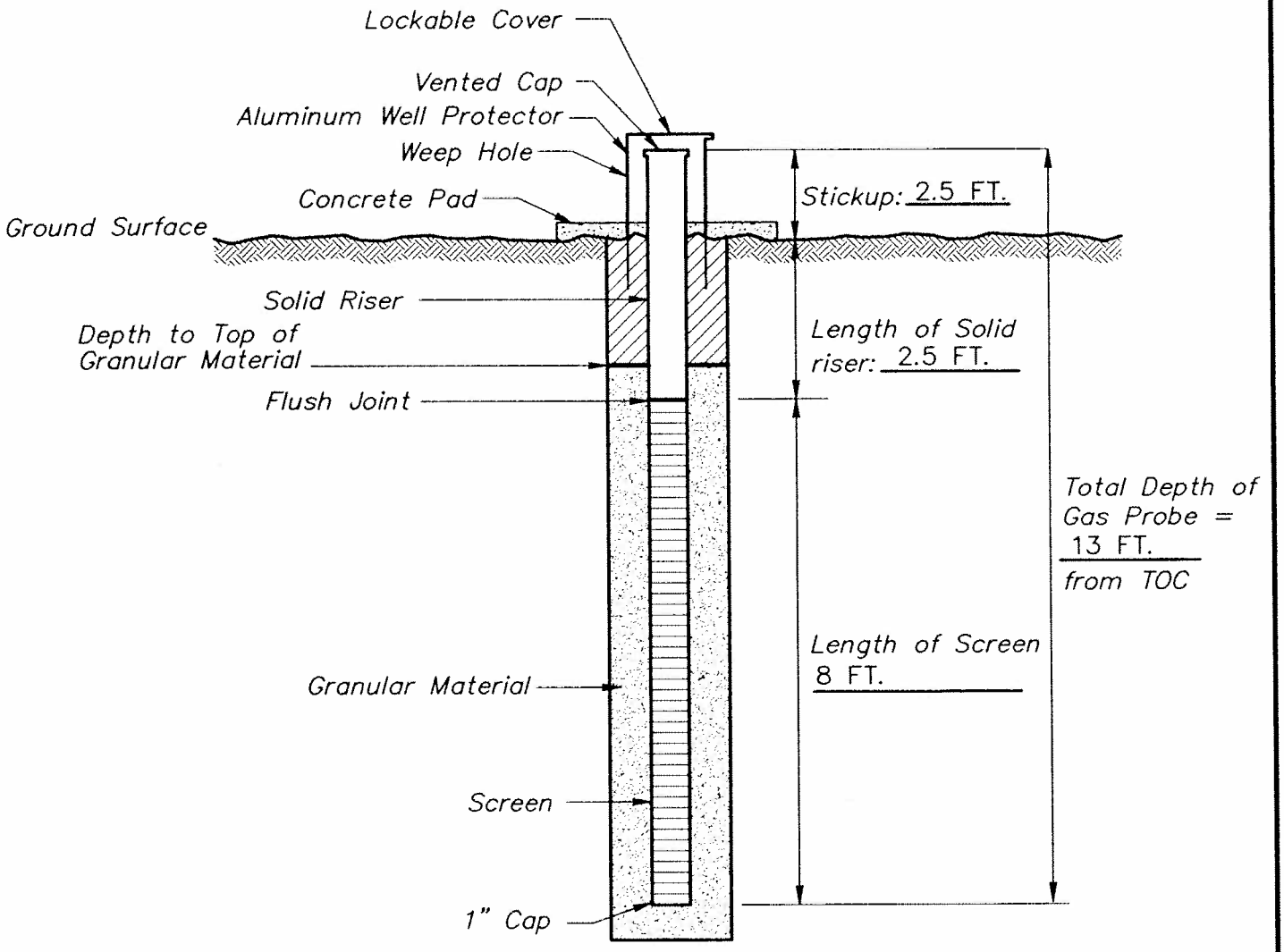
SITE NAME *Brushy Island Landfill and Recycling Center*
LOCATION *Jacksonville, Ar. 72071*

WL 000-1

SUPERVISED BY *Emmett Hudson* CHECKED BY
DATE *12/13/94*

GAS PROBE INSTALLATION RECORD

Job Name WASTE MANAGEMENT Well Number GP-6R
Installation Date 6-16-03 Location TWO PINE LANDFILL
Datum Elevation TOC 251.13 Surface Elevation 247.16
Screen Diameter & Material 1" PVC Borehole Diameter 6"
Riser Diameter & Material 1" PVC GEC Representative QUIN BABER
Granular Backfill Material PEA GRAVEL Northing 181969.30 Easting 1266914.49
Drilling Method AUGERS Drilling Contractor ANDERSON ENGINEERING



Grout (Bentonite Chip)

Granular Material (Pea Gravel)

(Not to Scale)

GENESIS ENVIRONMENTAL CONSULTING, INC.
11400 WEST BASELINE ROAD
LITTLE ROCK, ARKANSAS 72209
PH. (501) 455-2199
FAX. (501) 455-4547

GAS PROBE INSTALLATION RECORD

PROJECT NUMBER: 062-015-03063
WELL NUMBER: GP-6R
DRAWING NUMBER: 003 CHECKED BY: QUIN BABER

SOIL BOREHOLE LOG

SITE NAME AND LOCATION:

Brushy Island L. R. C.
Jacksonville, Arkansas 72071
WMA. Brushy Island-Gas Probe.
87459.100

Located approximately
2.8 miles northeast of
North Little Rock, east of
Hwy. 167/67 at Kiehl Road exit

DATUM: MSL ELEVATION: 244.54

DRILLING METHOD: Dry, Hollow-Stem Auger 8.25" O.D.

SAMPLING METHOD: Continuous, Split Spoon

BORING NUMBER: GMP-7

Sheet 1 of 1

	INI			STATIC	DRILLING START	DRILLING FINISH
WATER LEVEL	DRY			6.51	TIME	TIME
TIME	10:30			18:29	08:00	10:27
DATE	12/14/94			6/28/95	DATE	DATE
CASING DEPTH	open			37	12/14/94	12/14/94

DRILL RIG: Mobil B-57 A.T.V.

SURFACE CONDITIONS:

ANGLE: Vertical BEARING: ---

SAMPLE HAMMER TORQUE: ft.-lbs.

DRILLING CONTRACTOR _____

DEPTH IN FEET (ELEVATION)	BLOWS/6" ON SAMPLER	RECOVERY %	SYMBOL	DESCRIPTION OF MATERIAL	SAMPLER AND BIT	SAMPLE TYPE	BLOWS/FT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
0				Dark gray (10YR 3/1) CLAY; slightly silty; moderately plastic; firm; moist (CH)								
6				Reddish brown (5YR 4/4) CLAY; plastic; slightly stiff; moist; occasional very thin beds of coarse sand with occasional pebbles to 1/4"; poorly sorted (CH)								
20				Yellowish brown (10YR 5/6); and mottled gray (10YR 5/1) CLAY; moderately plastic; slightly stiff; moist; slightly sandy (CL)								
30				Gray (10YR 5/1) and mottled yellowih brown (10YR 5/1) CLAY; slightly silty; moderately plastic; slightly stiff; moist (CL)								
36				Gray (10YR 5/1) CLAY; slightly silty; moist; moderately plastic; stiff (CL)								
37				T.D. @ 37 feet								
40												

LOGGED BY *Emmett Hudson* CHECKED BY _____

DATE _____

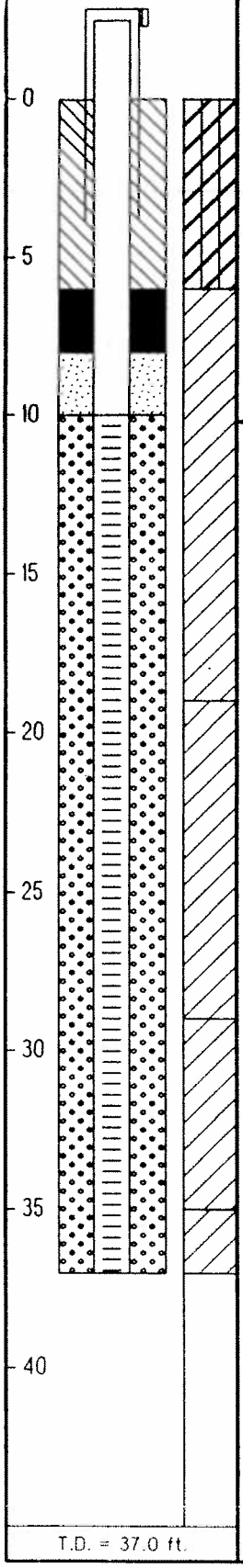
WELL No. GMP-7

Boring No X-Ref. GMP-7

LANDFILL GAS MONITORING PROBE CONSTRUCTION SUMMARY

Survey Coords N = 181571.9084
E = 1266513.8135

Elevation Ground Level 244.54
Top of Casing 247.03



Drilling Summary

Total Depth (ft): 37.0
Borehole Diameter (in): 8.25
Casing Stickup Height (ft): 2.49
Driller: C.C.I. Alliance, A. Lewis
Ar. Lic. # 2621

Rig: Mobile B-57 A.T.V.
Bit (s): Button, HSA

Drilling Fluid: NONE

Protective Casing: 4" X 5' Gold Anodized Aluminium

Probe Design & Specifications

Basis: Geologic Log ☒ Geophysical Log ☐
Casing String (s): C = Casing S = Screen

Depth	String (s)	Elevation
+2.87 - 2.13	C_1	247.41 -242.41
+2.49 - 12.0	C_2	247.03 -232.54
12.0 - 37.0	S_1	232.54 -207.54
-		-
-		-

Casing: C1 4" anodized aluminium

Casing: C2 Sch.40, 2 inch. P.V.C. Flush-thread

Screen: S1 Sch. 40 2 inch. P.V.C. .020" slot

Grout Seal: Bentonite/Portland cement, 0' to 6'

Bentonite Seal: 1/2" bentonite pellets, 6'to 8'

Filter Pack: 3/8" gravel, 10' to 37'
Fine sand, 8' to 10'

Construction Time Log

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling:0 to 37 feet	12/14	08: 00	12/14	10: 27
Geophys.Logging:				
Casing:				
C_2,S_1	12/14	10: 30	12/14	10: 38
C_1	12/15	15: 30	12/15	15: 40
Filter Placement:	12/14	10: 38	12/14	10: 52
Cementing:	12/15	15: 14	12/15	15: 44
Development:				

Probe Comments

All dates 1994

SITE NAME *Brushy Island Landfill and Recycling Center*
LOCATION *Jacksonville, Ar. 72071*

WL 000-1

SUPERVISED BY *Emmett Hudson* CHECKED BY
DATE *12/14/94*

SOIL BOREHOLE LOG

SITE NAME AND LOCATION:

Brushy Island L. R. C.
Jacksonville, Arkansas 72071
WMA. Brushy Island-Gas Probe.
87459.100

Located approximately
2.8 miles northeast of
North Little Rock, east of
Hwy. 167/67 at Kiehl Road exit

DATUM: MSL ELEVATION: 242.50

DRILLING METHOD: Dry, Hollow-Stem Auger 8.25 O.D.

SAMPLING METHOD: Continuous, Split Spoon

BORING NUMBER: GMP-8

Sheet 1 of 1

	INI			STATIC	DRILLING START	DRILLING FINISH
WATER LEVEL	DRY			5.89	TIME	TIME
TIME	12:20			18.31	10:30	12:19
DATE	12/14/95			6/28/95	DATE	DATE
CASING DEPTH					12/14/94	12/14/94

DRILL RIG: Mobil B-57 A.T.V.

SURFACE CONDITIONS: Wet, low, high weeds

ANGLE: Vertical BEARING: ---

SAMPLE HAMMER TORQUE: ft.-lbs.

DRILLING CONTRACTOR _____

DEPTH IN FEET (ELEVATION)	BLOWS/6" ON SAMPLER	RECOVERY %	SYMBOL	DESCRIPTION OF MATERIAL	SAMPLER AND BIT	SAMPLE TYPE	BLOWS/FT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
2				Dark gray (10YR 3/1) CLAY; plastic; moderately stiff; damp; roots (CL)								
4												
6				Redish brown (5YR 4/4) CLAY; plastic; soft; thin bedding planes; rare gravel to 3/8" (CH)								
8												
10												
12												
14												
16												
18												
20				Yellowish brown (10YR 5/6); and mottled gray (10YR 5/1) CLAY; moderately plastic; slightly stiff; sandy; moist; (CL)								
22												
24												
26												
28				Light brown (5YR 5/6) SAND; medium grain; medium sorted; loose (SM-ML)								
30				T.D. @ 30 feet								
32												

LOGGED BY *Emmett Hudson* CHECKED BY _____

DATE _____

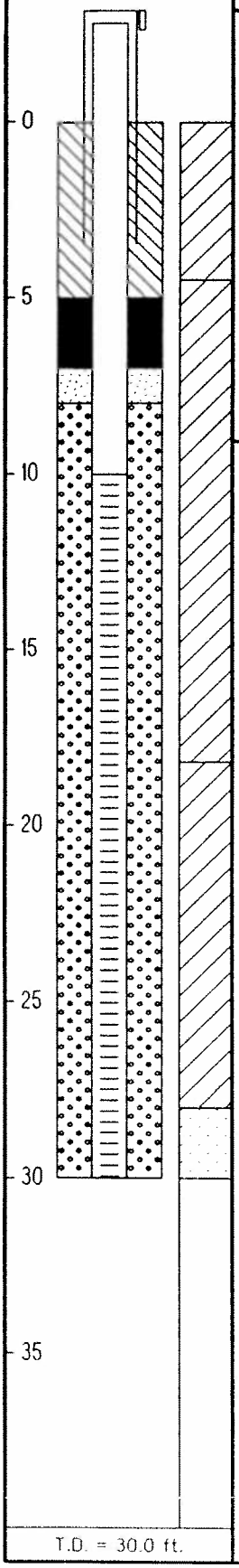
WELL No. GMP-8

Boring No X-Ref. GMP-8

LANDFILL GAS MONITORING PROBE CONSTRUCTION SUMMARY

Survey Coords N = 181088.2617
E = 1266008.2458

Elevation Ground Level 242.50
Top of Casing 245.35



Drilling Summary

Total Depth (ft): 30.0
Borehole Diameter (in): 8.25"
Casing Stickup Height (ft): 2.85
Driller: C.C.I. Alliance, A. Lewis
Ar. Lic. # 2621

Rig: Mobile B-57 A.T.V.
Bit (s): Button, HSA

Drilling Fluid: NONE

Protective Casing: 4" X 5' Gold Anodized Aluminium

Probe Design & Specifications

Basis: Geologic Log ☒ Geophysical Log ☐
Casing String (s): C = Casing S = Screen

Depth	String (s)	Elevation
+3.21 - 1.79	C_1	245.71 -240.71
+2.85 - 10.0	C_2	245.35 - 232.5
10.0 - 30.0	S_1	232.5 - 212.5
-		-
-		-

Casing: C1 4" anodized aluminium

Casing: C2 Sch.40, 2 inch. P.V.C. Flush-thread

Screen: S1 Sch. 40 2 inch. P.V.C. .020" slot

Grout Seal: Bentonite/Portland cement, 0' to 5'

Bentonite Seal: 1/2" bentonite pellets, 5'to 7'

Filter Pack: 3/8" gravel, 8' to 30'
Fine sand, 7' to 8'

Construction Time Log

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling:0 to 30 feet	12/14	10: 30	12/14	12: 19
Geophys.Logging:				
Casing:				
C_2, S_1	12/14	12: 21	12/14	12: 29
C_1	12/15	16: 28	12/15	16: 30
Filter Placement:	12/14	12: 28	12/14	12: 50
Cementing:	12/15	15: 55	12/15	16: 30
Development:				

Probe Comments

All dates 1994

SITE NAME *Brushy Island Landfill and Recycling Center*
LOCATION *Jacksonville, Ar. 72071*

WL 000-1

SUPERVISED BY *Emmett Hudson* CHECKED BY
DATE *12/14/94*

SOIL BOREHOLE LOG

SITE NAME AND LOCATION:

Brushy Island L. R. C.
Jacksonville, Arkansas 72071
WMA. Brushy Island-Gas Probe.
87459.100

Located approximately
2.8 miles northeast of
North Little Rock, east of
Hwy. 167/67 at Kiehl Road exit

DATUM: MSL ELEVATION: 243.08

DRILLING METHOD: Dry, Hollow-Stem Auger 8.25 O.D.

SAMPLING METHOD: Continuous, Split Spoon

BORING NUMBER: GMP-9

Sheet 1 of 1

	INI			STATIC	DRILLING START	DRILLING FINISH
WATER LEVEL	DRY			5.69	TIME	TIME
TIME	16:20			18:42	13:41	16:15
DATE	12/14/94			6/28/95	DATE	DATE
CASING DEPTH					12/14/94	12/14/94

DRILL RIG: Mobil B-57 A.T.V.

SURFACE CONDITIONS: Wet, low

ANGLE: Vertical BEARING: ---

SAMPLE HAMMER TORQUE: ft.-lbs.

DRILLING CONTRACTOR

DEPTH IN FEET (ELEVATION)	BLOWS/6" ON SAMPLER	RECOVERY %	SYMBOL	DESCRIPTION OF MATERIAL	SAMPLER AND BIT	SAMPLE TYPE	BLOWS/FT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
0				Dark gray (10YR 3/1) CLAY; moderatly plastic; very stiff; moist; (CL)								
2				Yellowish brown (10YR 5/6) CLAY; and mottled gray (10YR 5/1) CLAY; moderatly plastic; stiff; moist (CL)								
4				Reddish brown (5YR 4/4); CLAY; plastic; soft (CH)								
6												
8												
10												
12												
14												
16												
18												
20				Yellowish brown (10YR 5/6) and mottled gray (10YR 5/1) CLAY; moderately plastic; slightly stiff; moist (CL)								
22												
24												
26												
28				T.D. @ 28 feet								
30												
32												

LOGGED BY Emmett Hudson CHECKED BY

DATE

WELL No. GMP-9

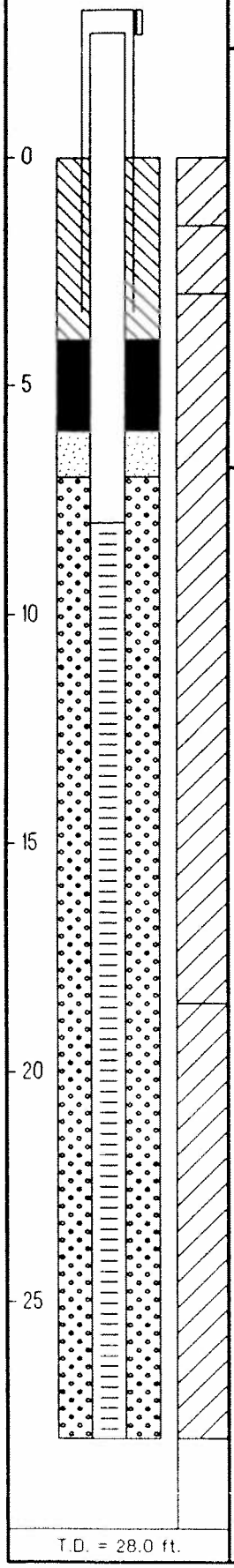
Boring No X-Ref. GMP-9

LANDFILL GAS MONITORING PROBE CONSTRUCTION SUMMARY

Survey Coords N = 181433.7781
E = 1265660.0149

Elevation Ground Level 243.06

Top of Casing 245.83



Drilling Summary

Total Depth (ft): 28.0
Borehole Diameter (in): 8.25
Casing Stickup Height (ft): 2.77
Driller: C.C.I. Alliance, A. Lewis
Ar. Lic. # 2621

Rig: Mobile B-57 A.T.V.
Bit (s): Button, HSA

Drilling Fluid: NONE

Protective Casing: 4" X 5' Gold Anodized Aluminium

Probe Design & Specifications

Basis: Geologic Log ☒ Geophysical Log ☐
Casing String (s): C = Casing S = Screen

Depth	String (s)	Elevation
+3.28 - 1.72	C_1	246.34 -241.34
+2.77 - 8.0	C_2	245.83 -235.06
8.0 - 28.0	S_1	235.06 -215.06
-		-
-		-

Casing: C1 4" anodized aluminium

Casing: C2 Sch.40, 2 inch. P.V.C. Flush-thread

Screen: S1 Sch. 40 2 inch. P.V.C. .020" slot

Grout Seal: Bentonite/Portland cement, 0' to 4'

Bentonite Seal: 1/2" bentonite pellets, 4'to 6'

Filter Pack: 3/8" gravel, 7' to 28'
Fine sand, 6' to 7'

Construction Time Log

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling:0 to 28 feet	12/14	13: 41	12/14	16: 15
Geophys.Logging:				
Casing:				
C_2,S_1	12/14	16: 20	12/14	16: 27
C_1	12/15	16: 29	12/15	16: 38
Filter Placement:	12/14	16: 30	12/14	16: 50
Cementing:	12/15	16: 00	12/15	16: 40
Development:				

Probe Comments

All dates 1994

SITE NAME *Brushy Island Landfill and Recycling Center*
LOCATION *Jacksonville, Ar. 72071*

WL 000-1

SUPERVISED BY *Emmett Hudson* CHECKED BY
DATE *12/14/94*

Terracon
Consulting Engineers and Scientists
25809 I-30 SOUTH BRYANT, AR. 72022
PH. (501) 847-9292 FAX. (501) 847-9210

FIELD BORING LOG

BORING NO.: GMP-10R PAGE: 1 of 1

TOTAL DEPTH: 15 FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT	PROJECT: TWO PINE LANDFILL
JOB NO.: 062-015-35097060-001	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: ROBERT FOWLER	DRILLER: GARY MOYER
DATE DRILLED: 4/7/09	RIG TYPE: BUGGY MOUNTED CME 55

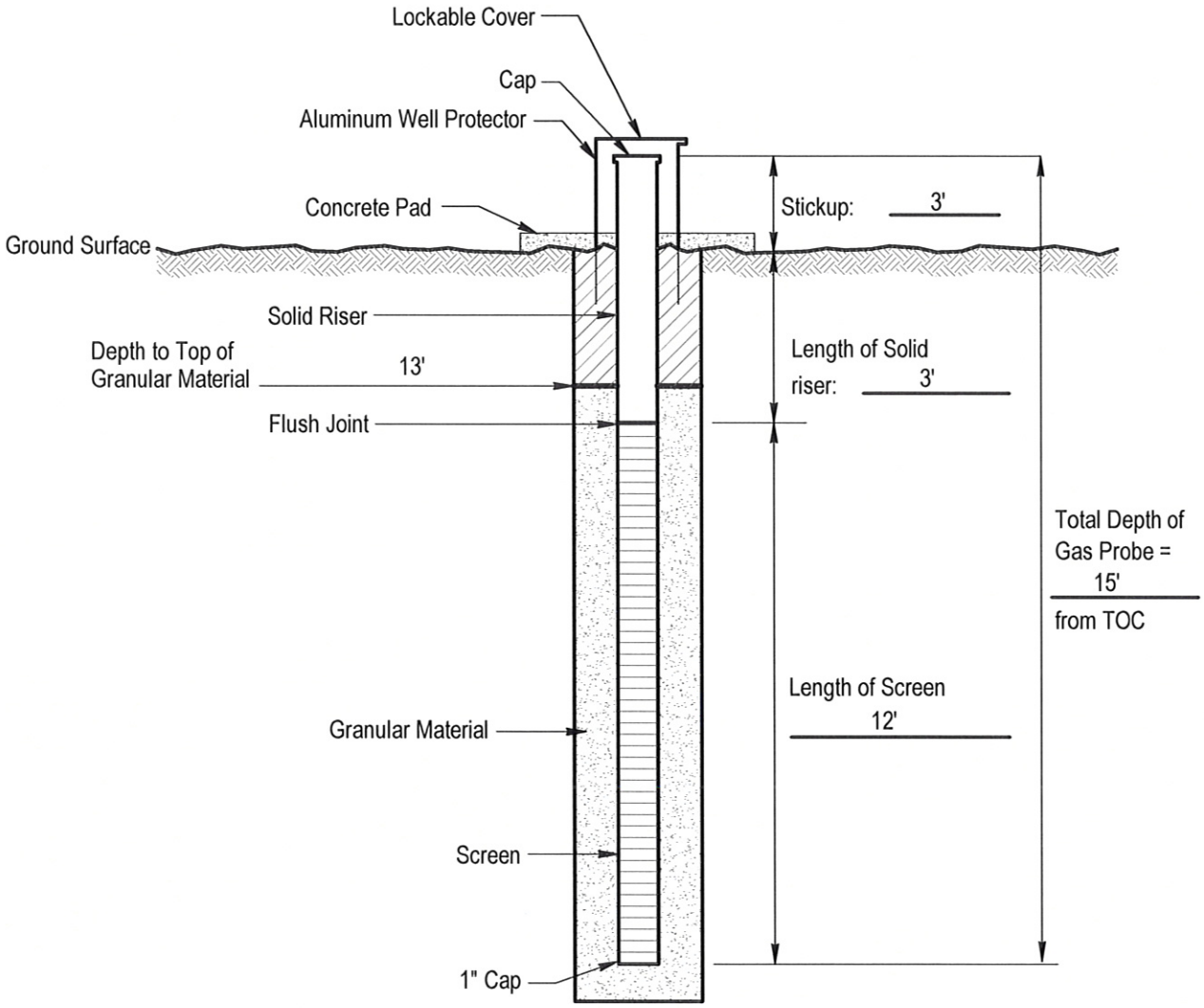
DRILLING METHOD: 4.25 FLIGHT AUGERS

SAMPLING METHOD: GRAB SAMPLE

Depth BGS	Sample Interval	N: N/A E: N/A ELEV: N/A DESCRIPTION	Litho. Symbol	P.I.D. (ppm)	Comments
0		0" - 6" TOPSOIL dark brown, moist			
		6" - 15' CLAY reddish brown, plastic			
16		Total Depth at 15' bgs			

GAS PROBE INSTALLATION RECORD

Job Name WASTE MANAGEMENT — Well Number GMP-10R
Installation Date 4/7/09 — Location TWO PINE LANDFILL
Datum Elevation N/A — Surface Elevation N/A
Screen Diameter & Material 1.25 PVC — Borehole Diameter 4.25"
Riser Diameter & Material 1.25 PVC — Terracon Representative ROBERT FOWLER
Granular Backfill Material PEA GRAVEL — Northing N/A — Easting N/A
Drilling Method 4.25" FLIGHT AUGER — Drilling Contractor ANDERSON ENGINEERING



Grout (Bentonite Chip)

Granular Material (Pea Gravel)

(Not to Scale)

Terracon
Consulting Engineers and Scientists
25809 Interstate 30 South — BRYANT, AR. 72022
PH. (501) 847-9292 — FAX. (501) 847-9210

GAS PROBE INSTALLATION RECORD

PROJECT NUMBER: 062-015-35097060
WELL NUMBER: GMP-10R
DRAWING NUMBER: 003 — CHECKED BY: RWF

Terracon
Consulting Engineers and Scientists
25809 I-30 SOUTH BRYANT, AR. 72022
PH. (501) 847-9292 FAX. (501) 847-9210

FIELD BORING LOG

BORING NO.: GMP-11R PAGE: 1 of 1

TOTAL DEPTH: 15 FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT	PROJECT: TWO PINE LANDFILL
JOB NO.: 062-015-35097060-002	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: ROBERT FOWLER	DRILLER: GARY MOYER
DATE DRILLED: 4/7/09	RIG TYPE: BUGGY MOUNTED CME 55

DRILLING METHOD: 4.25 FLIGHT AUGERS

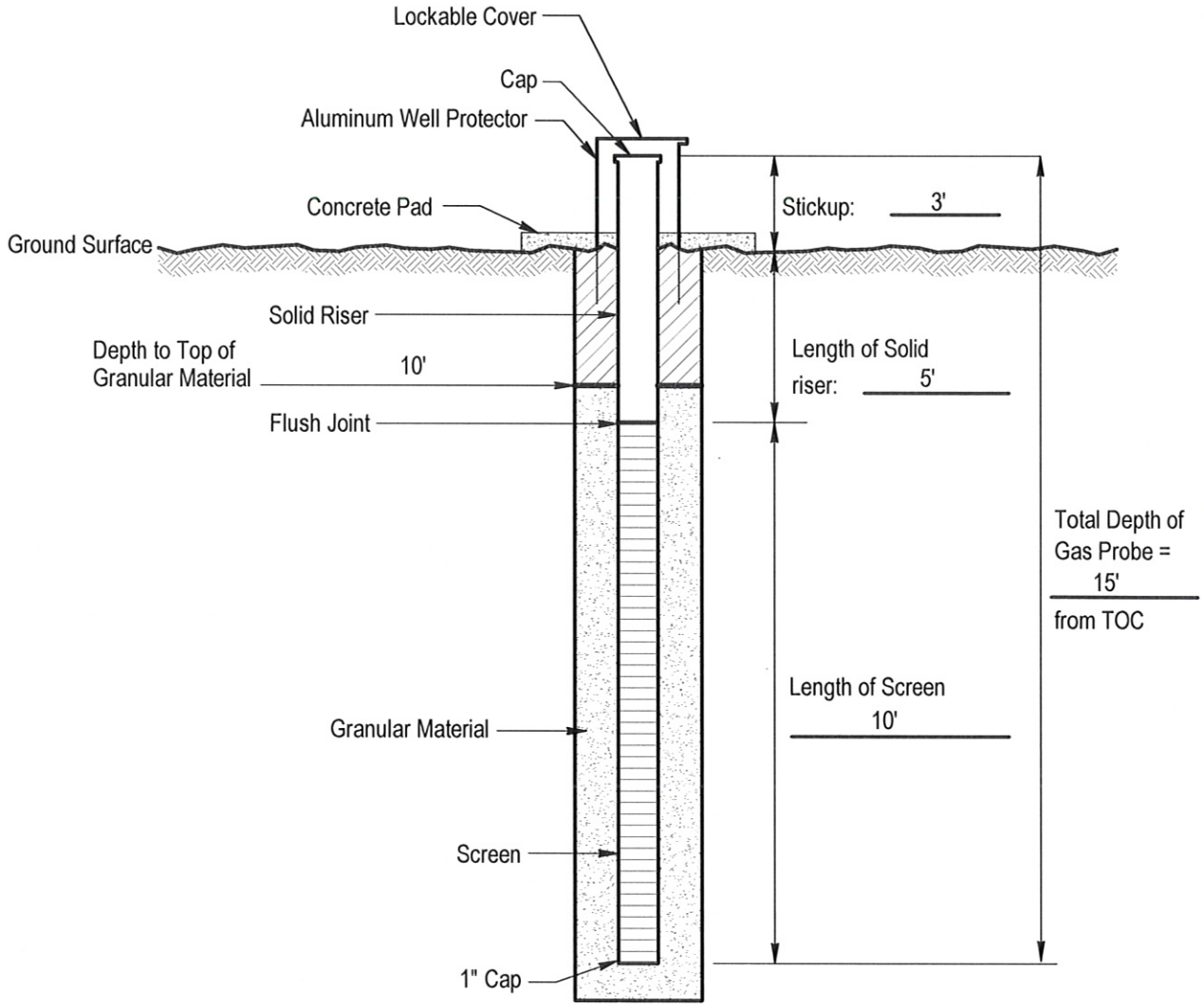
SAMPLING METHOD: GRAB SAMPLE

N: N/A E: N/A ELEV: N/A

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	P.I.D. (ppm)	Comments
0		0' - 4' FILL dark brown with organics, wet			
4		4' - 15' CLAY reddish brown, plastic			
16		Total Depth at 15' bgs			

GAS PROBE INSTALLATION RECORD

Job Name WASTE MANAGEMENT — Well Number GMP-11R
Installation Date 4/7/09 — Location TWO PINE LANDFILL
Datum Elevation N/A — Surface Elevation N/A
Screen Diameter & Material 1.25 PVC — Borehole Diameter 4.25"
Riser Diameter & Material 1.25 PVC — Terracon Representative ROBERT FOWLER
Granular Backfill Material PEA GRAVEL — Northing N/A — Easting N/A
Drilling Method 4.25" FLIGHT AUGER — Drilling Contractor ANDERSON ENGINEERING



Grout (Bentonite Chip)

Granular Material (Pea Gravel)

(Not to Scale)

Terracon
Consulting Engineers and Scientists
25809 Interstate 30 South — BRYANT, AR 72022
PH. (501) 847-9292 — FAX. (501) 847-9210

GAS PROBE INSTALLATION RECORD

PROJECT NUMBER: 062-015-35097060
WELL NUMBER: GMP-11R
DRAWING NUMBER: 004 — CHECKED BY: RWF

LOG OF WELL NO. GMP-BH12

CLIENT: **Waste Management**

SITE: **Pulaski County, Jacksonville, Arkansas**

PROJECT: **Two Pine Landfill**

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: FIELD VAPOR TEST (PPM)*	TESTS: SOIL SAMPLE SENT TO LABORATORY
	CLAY dark brown, plastic				FA					
					FA					
					FA					
4										
	FILL compacted shale and clay fill	5			FA					
10										
	CLAY reddish brown, plastic	10			FA					
		15			FA					
		20			FA					
	▽									
25		25								
	BOTTOM OF BORING AT 25 FEET									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual

* ND indicates a reading of less than the field detection limit (FDL) of one (1) part per million isobutylene equivalents (ppmi)

WATER LEVEL OBSERVATIONS, ft		
WL	▽ 23 46	▼
WL	▼	▼
WL		

Terracon

BORING STARTED			6-20-08
BORING COMPLETED			6-20-08
RIG	CME 55	FOREMAN	GM
APPROVED	RF	JOB #	35087096

BOREHOLE 99 35087096.GPJ TERRACON.GDT 6/30/08

SOIL BOREHOLE LOG

SITE NAME AND LOCATION:

Brushy Island L. R. C.
Jacksonville, Arkansas 72071
WMA. Brushy Island-Gas Probe.
87459.100

Located approximately
2.8 miles northeast of
North Little Rock, east of
Hwy. 167/67 at Kiehl Road exit

DATUM: MSL ELEVATION: 241.41

DRILLING METHOD: Dry, Hollow-Stem Auger 8.25 O.D.

SAMPLING METHOD: Continuous, Split Spoon

BORING NUMBER: GMP-17

Sheet 1 of 1

	INI			STATIC	DRILLING START	DRILLING FINISH
WATER LEVEL	DRY				TIME	TIME
TIME	8:56				08:30	08:55
DATE	12/15/95				DATE	DATE
CASING DEPTH					12/15/94	12/15/94

DRILL RIG: Mobil B-57 A.T.V.

SURFACE CONDITIONS: Wet, flat

ANGLE: Vertical BEARING: ---

SAMPLE HAMMER TORQUE: ft.-lbs.

DRILLING CONTRACTOR _____

DEPTH IN FEET (ELEVATION)	BLOWS/6" ON SAMPLER	RECOVERY %	SYMBOL	DESCRIPTION OF MATERIAL	SAMPLER AND BIT	SAMPLE TYPE	BLOWS/FT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
0				Dark gray (10YR 3/1) CLAY; slightly silty; modrately stiff; plastic; moist (CL)								
2												
4				Dark yellowish brown (10YR 4/4) CLAY; moderately stiff; plastic; moist (CL)								
6				Reddish brown (5YR 4/4) CLAY; plastic; stiff; moist (CH)								
8												
10												
12												
14												
16												
18				T.D. @ 17 feet								
20												
22												
24												
26												
28												
30												
32												

LOGGED BY *Emmett Hudson* CHECKED BY _____

DATE _____

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FIELD BORING LOG

BORING NO.: GMP-18 PAGE: 1 of 1

TOTAL DEPTH: 14' FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT - TWO PINE LANDFILL	PROJECT: TWO PINE LANDFILL - JACKSONVILLE, AR.
JOB NO.: 062-015-35087096-078	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: ROBERT FOWLER	DRILLER: GARY MOYER
DATE DRILLED: 6/20/08	RIG TYPE: CME 55

DRILLING METHOD: 8.25" HOLLOW STEM AUGER

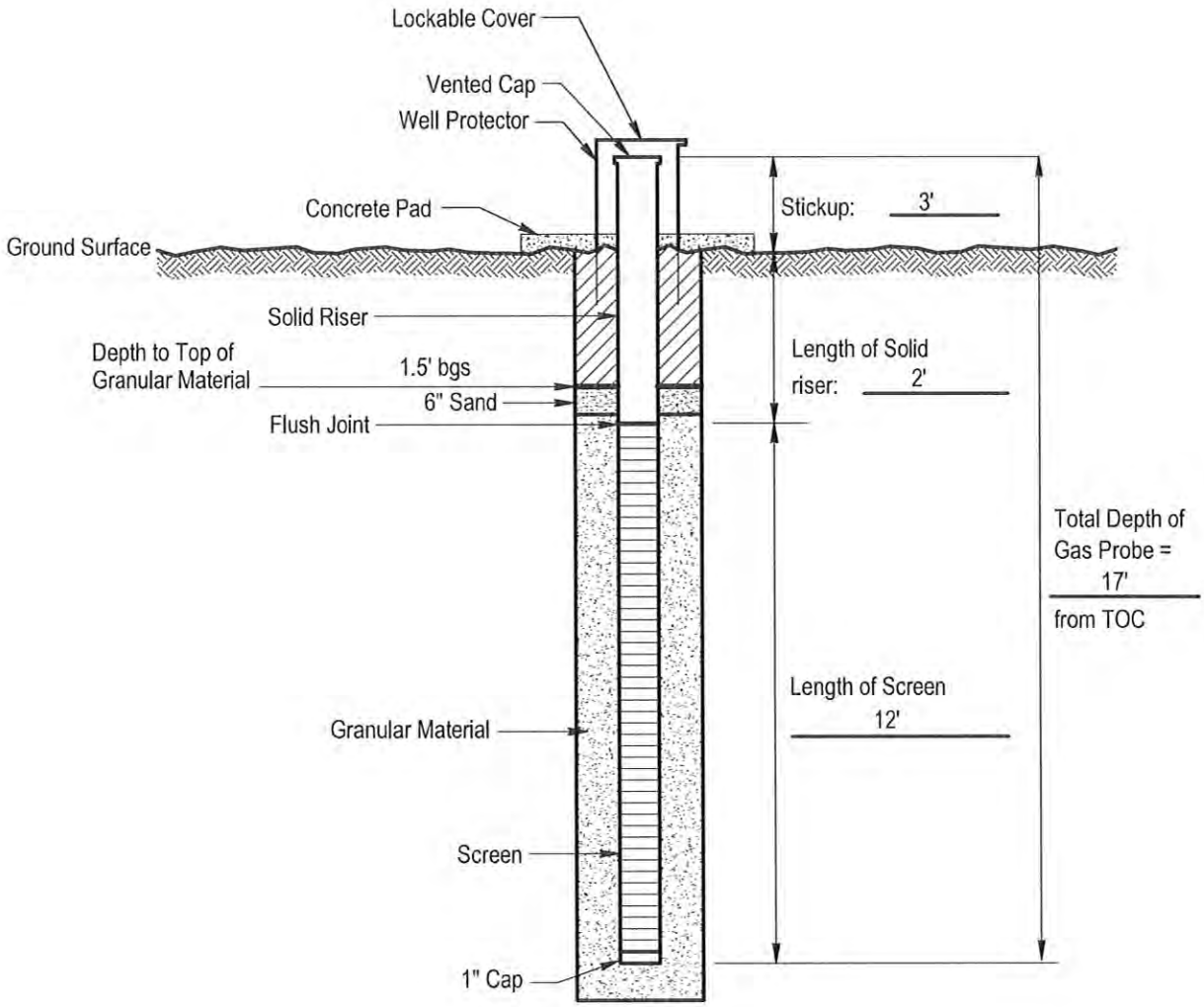
SAMPLING METHOD: CUTTINGS

N: N/A E: N/A TOC: N/A

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	% Recovery	Comments
0		0'-8' CLAY brown			
5					
10		8'-13' CLAY brown with orange mottling			
		13'-14' CLAY reddish brown with orange mottling			
15		Total Depth = 14' bgs.			
20					

GAS PROBE INSTALLATION RECORD

Job Name WASTE MANAGEMENT - TWO PINE LANDFILL Well Number GMP-18
Installation Date 6/4/08 Location TWO PINE LANDFILL - JACKSONVILLE, AR.
Datum Elevation 248.94' Surface Elevation 246.06'
Screen Diameter & Material 1.25" Borehole Diameter 6.25"
Riser Diameter & Material 1.25" Terracon Representative ROBERT FOWLER
Granular Backfill Material PEA GRAVEL - 10-20 SAND Northing 185699.63' Easting 1267429.30'
Drilling Method FLIGHT AUGER Drilling Contractor ANDERSON ENGINEERING



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GAS PROBE INSTALLATION RECORD
PROJECT NUMBER: 062-015-35087096
WELL NUMBER: GMP-18
DRAWING NUMBER: 002 CHECKED BY: RWF

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FIELD BORING LOG

BORING NO.: GMP-19 PAGE: 1 of 1

TOTAL DEPTH: 18' FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT - TWO PINE LANDFILL	PROJECT: TWO PINE LANDFILL - JACKSONVILLE, AR.
JOB NO.: 062-015-35087096-079	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: ROBERT FOWLER	DRILLER: GARY MOYER
DATE DRILLED: 6/4/08	RIG TYPE: CME 55

DRILLING METHOD: 8.25" HOLLOW STEM AUGER

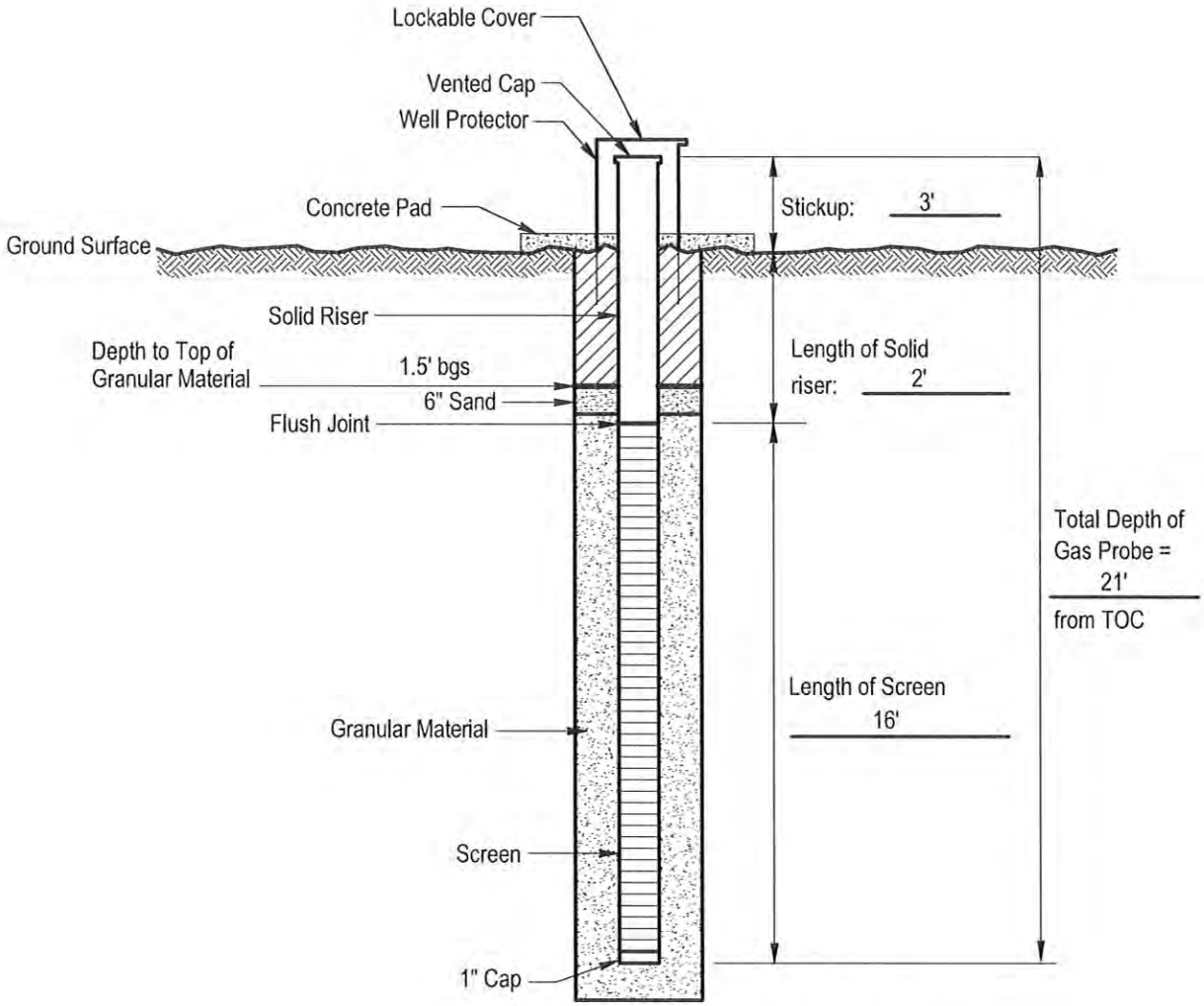
SAMPLING METHOD: CUTTINGS

N: N/A E: N/A TOC: N/A

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	% Recovery	Comments
0		0'-13' CLAY brown with orange			
5					
10					
15		13'-18' SILTY CLAY reddish brown			
20		Total Depth = 18' bgs.			

GAS PROBE INSTALLATION RECORD

Job Name WASTE MANAGEMENT - TWO PINE LANDFILL Well Number GMP-19
Installation Date 6/4/08 Location TWO PINE LANDFILL - JACKSONVILLE, AR.
Datum Elevation 248.98' Surface Elevation 246.17'
Screen Diameter & Material 1.25" Borehole Diameter 6.25"
Riser Diameter & Material 1.25" Terracon Representative ROBERT FOWLER
Granular Backfill Material PEA GRAVEL - 10-20 SAND Northing 186491.80' Easting 1268276.72'
Drilling Method FLIGHT AUGER Drilling Contractor ANDERSON ENGINEERING



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GAS PROBE INSTALLATION RECORD
PROJECT NUMBER: 062-015-35087096
WELL NUMBER: GMP-19
DRAWING NUMBER: 003 CHECKED BY: RWF

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FIELD BORING LOG

BORING NO.: GMP-20 PAGE: 1 of 1

TOTAL DEPTH: 12' FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT - TWO PINE LANDFILL	PROJECT: TWO PINE LANDFILL - JACKSONVILLE, AR.
JOB NO.: 062-015-35087096-080	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: ROBERT FOWLER	DRILLER: GARY MOYER
DATE DRILLED: 6/12/08	RIG TYPE: CME 55

DRILLING METHOD: 8.25" HOLLOW STEM AUGER

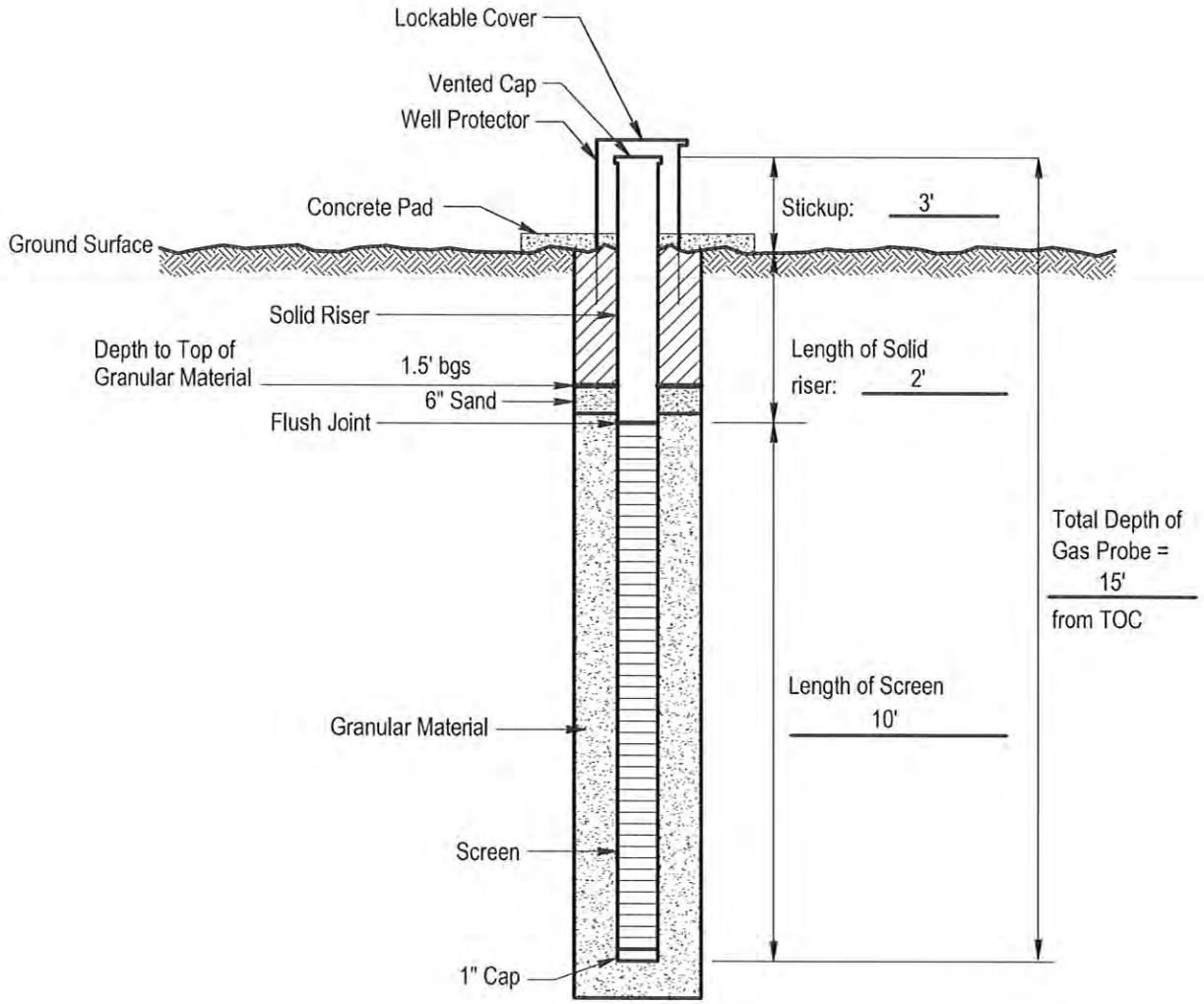
SAMPLING METHOD: CUTTINGS

N: N/A E: N/A TOC: N/A

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	% Recovery	Comments
0		0'-4' CLAY brown			
5		4'-12' CLAY reddish brown			
10					
15		Total Depth = 12' bgs.			
20					

GAS PROBE INSTALLATION RECORD

Job Name WASTE MANAGEMENT - TWO PINE LANDFILL Well Number GMP-20
Installation Date 6/4/08 Location TWO PINE LANDFILL - JACKSONVILLE, AR.
Datum Elevation 248.43' Surface Elevation 245.57'
Screen Diameter & Material 1.25" Borehole Diameter 6.25"
Riser Diameter & Material 1.25" Terracon Representative ROBERT FOWLER
Granular Backfill Material PEA GRAVEL - 10-20 SAND Northing 187347.90' Easting 1269178.48'
Drilling Method FLIGHT AUGER Drilling Contractor ANDERSON ENGINEERING



Grout (Bentonite Chip)

Granular Material (Pea Gravel)

(Not to Scale)

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GAS PROBE INSTALLATION RECORD
PROJECT NUMBER: 062-015-35087096
WELL NUMBER: GMP-20
DRAWING NUMBER: 004 CHECKED BY: RWF

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FIELD BORING LOG

BORING NO.: GMP-21 PAGE: 1 of 1

TOTAL DEPTH: 10' FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT - TWO PINE LANDFILL	PROJECT: TWO PINE LANDFILL - JACKSONVILLE, AR.
JOB NO.: 062-015-35087096-081	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: ROBERT FOWLER	DRILLER: GARY MOYER
DATE DRILLED: 6/4/08	RIG TYPE: CME 55

DRILLING METHOD: 8.25" HOLLOW STEM AUGER

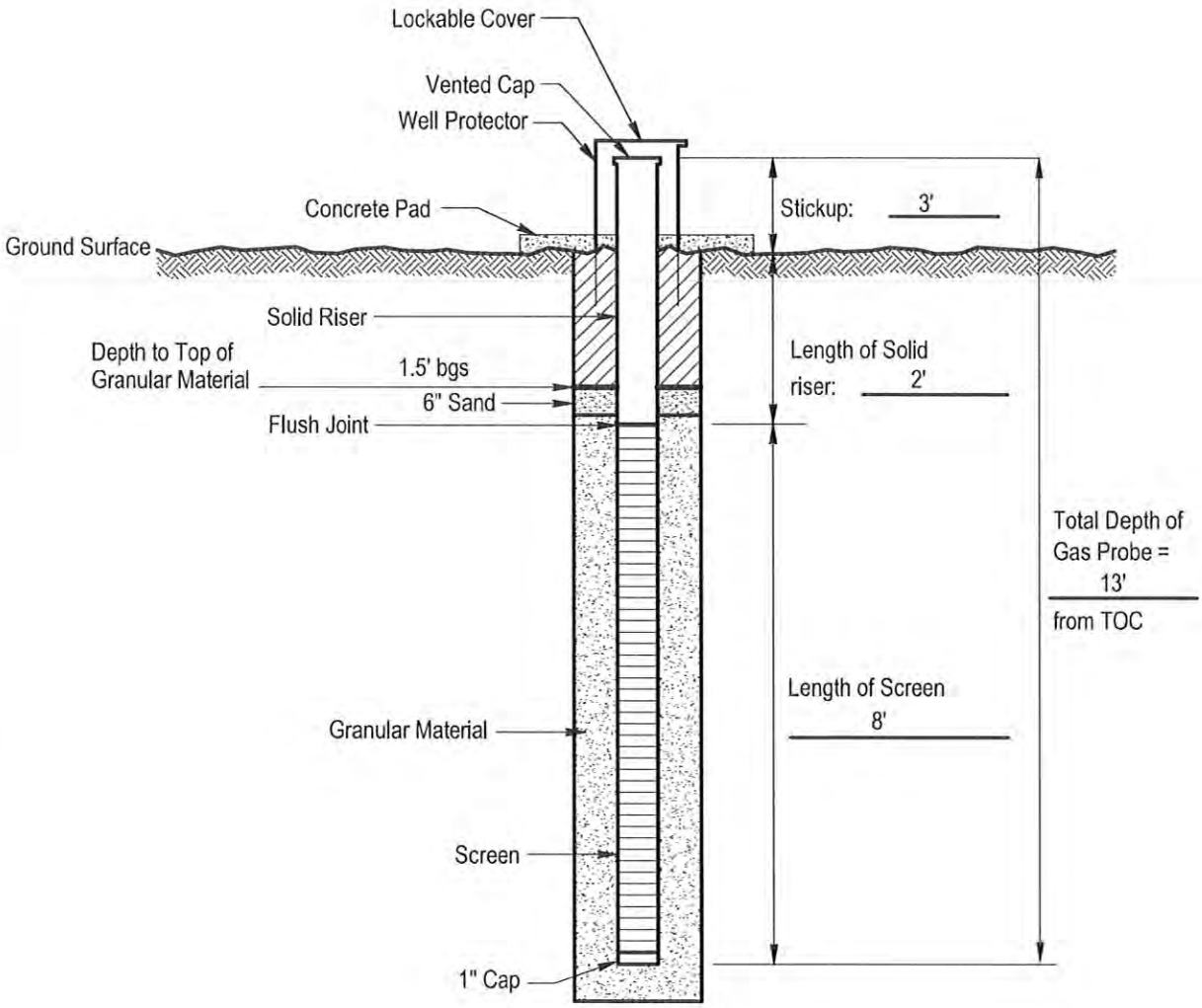
SAMPLING METHOD: CUTTINGS

N: N/A E: N/A TOC: N/A

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	% Recovery	Comments
0		0'-7' CLAY dark brown, plastic			
5		7'-10' CLAY reddish brown with iron nodules			
10		Total Depth = 10' bgs.			
15					
20					

GAS PROBE INSTALLATION RECORD

Job Name WASTE MANAGEMENT - TWO PINE LANDFILL Well Number GMP-21
Installation Date 6/4/08 Location TWO PINE LANDFILL - JACKSONVILLE, AR.
Datum Elevation 242.01' Surface Elevation 239.30'
Screen Diameter & Material 1.25" Borehole Diameter 6.25"
Riser Diameter & Material 1.25" Terracon Representative ROBERT FOWLER
Granular Backfill Material PEA GRAVEL - 10-20 SAND Northing 185965.50' Easting 1269562.04'
Drilling Method FLIGHT AUGER Drilling Contractor ANDERSON ENGINEERING



Grout (Bentonite Chip)

Granular Material (Pea Gravel)

(Not to Scale)

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GAS PROBE INSTALLATION RECORD
PROJECT NUMBER: 062-015-35087096
WELL NUMBER: GMP-21
DRAWING NUMBER: 005 CHECKED BY: RWF

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FIELD BORING LOG

BORING NO.: GMP-22 PAGE: 1 of 1

TOTAL DEPTH: 14' FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT - TWO PINE LANDFILL	PROJECT: TWO PINE LANDFILL - JACKSONVILLE, AR.
JOB NO.: 062-015-35087096-082	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: ROBERT FOWLER	DRILLER: GARY MOYER
DATE DRILLED: 6/3/08	RIG TYPE: CME 55

DRILLING METHOD: 8.25" HOLLOW STEM AUGER

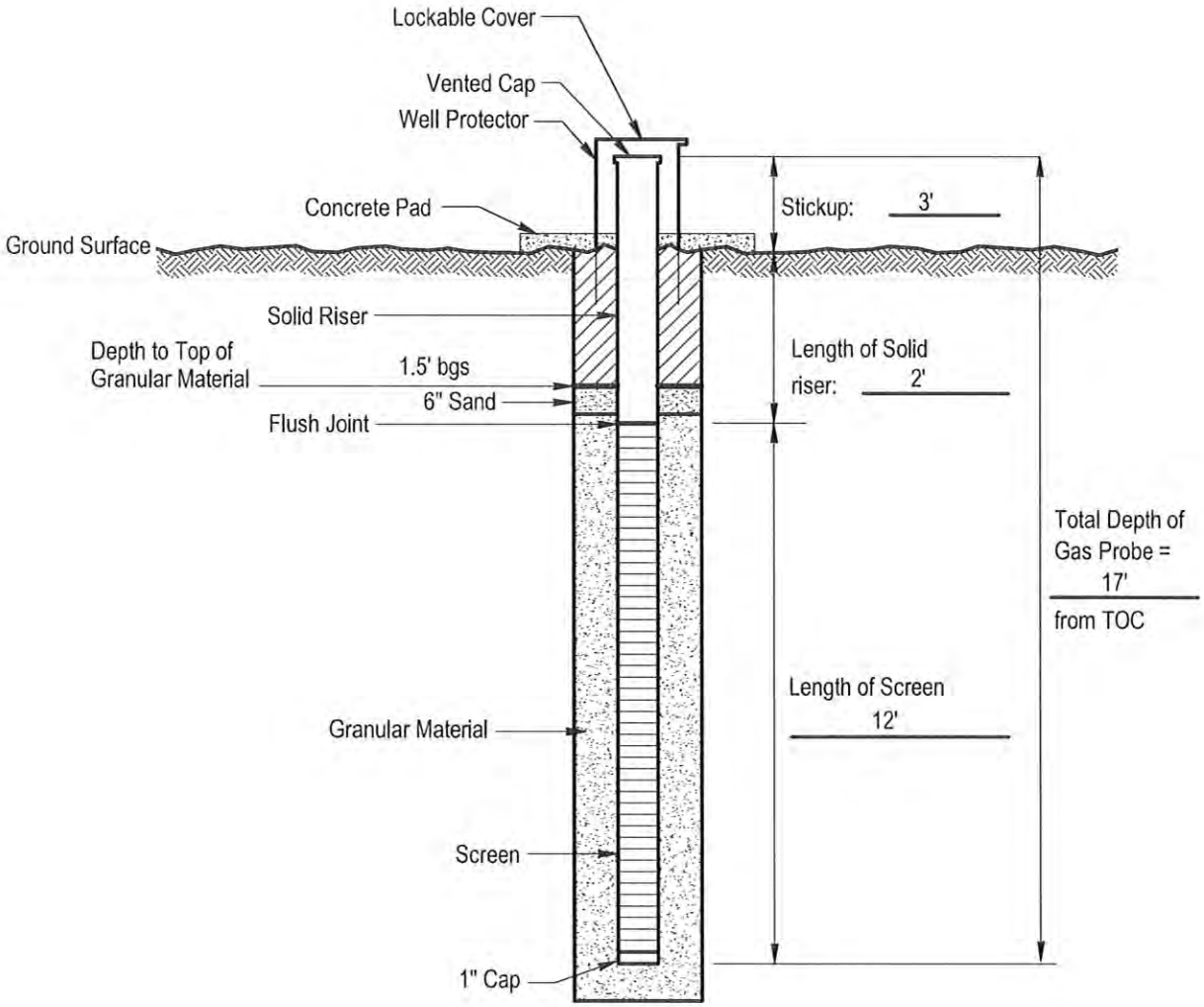
SAMPLING METHOD: CUTTINGS

N: N/A E: N/A TOC: N/A

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	% Recovery	Comments
0		0'-3' CLAY dark brown, plastic			
5		3'-14' CLAY reddish brown			
10					
15		Total Depth = 14' bgs.			
20					

GAS PROBE INSTALLATION RECORD

Job Name WASTE MANAGEMENT - TWO PINE LANDFILL Well Number GMP-22
Installation Date 6/3/08 Location TWO PINE LANDFILL - JACKSONVILLE, AR.
Datum Elevation 241.98' Surface Elevation 239.01'
Screen Diameter & Material 1.25" Borehole Diameter 6.25"
Riser Diameter & Material 1.25" Terracon Representative ROBERT FOWLER
Granular Backfill Material PEA GRAVEL - 10-20 SAND Northing 184989.35' Easting 1269794.89'
Drilling Method FLIGHT AUGER Drilling Contractor ANDERSON ENGINEERING



Grout (Bentonite Chip)

Granular Material (Pea Gravel)

(Not to Scale)

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GAS PROBE INSTALLATION RECORD

PROJECT NUMBER: 062-015-35087096
WELL NUMBER: GMP-22
DRAWING NUMBER: 006 CHECKED BY: RWF

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FIELD BORING LOG

BORING NO.: GMP-23 PAGE: 1 of 1

TOTAL DEPTH: 10' FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT - TWO PINE LANDFILL	PROJECT: TWO PINE LANDFILL - JACKSONVILLE, AR.
JOB NO.: 062-015-35087096-083	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: ROBERT FOWLER	DRILLER: GARY MOYER
DATE DRILLED: 6/3/08	RIG TYPE: CME 55

DRILLING METHOD: 8.25" HOLLOW STEM AUGER

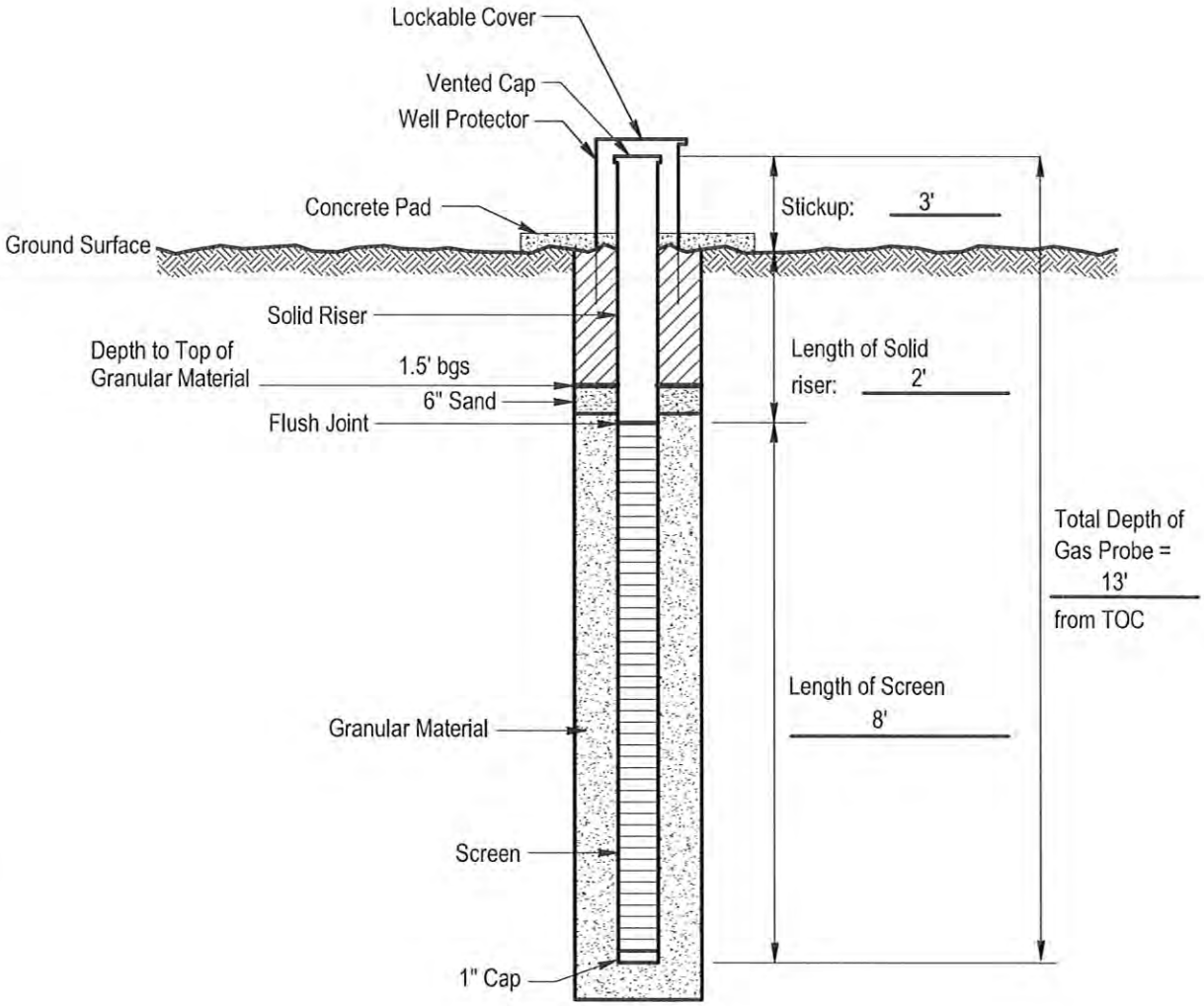
SAMPLING METHOD: CUTTINGS

N: N/A E: N/A TOC: N/A

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	% Recovery	Comments
0		0'-1' CLAY dark brown			
		1'-2' CLAY reddish brown			
		2'-10' CLAY reddish brown with gray mottles			
10		Total Depth = 10' bgs.			
15					
20					

GAS PROBE INSTALLATION RECORD

Job Name WASTE MANAGEMENT - TWO PINE LANDFILL Well Number GMP-23
Installation Date 6/3/08 Location TWO PINE LANDFILL - JACKSONVILLE, AR.
Datum Elevation 245.25' Surface Elevation 242.38'
Screen Diameter & Material 1.25" Borehole Diameter 6.25"
Riser Diameter & Material 1.25" Terracon Representative ROBERT FOWLER
Granular Backfill Material PEA GRAVEL - 10-20 SAND Northing 184036.93' Easting 1269251.47'
Drilling Method FLIGHT AUGER Drilling Contractor ANDERSON ENGINEERING



Grout (Bentonite Chip)

Granular Material (Pea Gravel)

(Not to Scale)

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GAS PROBE INSTALLATION RECORD
PROJECT NUMBER: 062-015-35087096
WELL NUMBER: GMP-23
DRAWING NUMBER: 007 CHECKED BY: RWF

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FIELD BORING LOG

BORING NO.: GMP-24 PAGE: 1 of 1

TOTAL DEPTH: 7' FEET BELOW GROUND SURFACE (BGS)

CLIENT: WASTE MANAGEMENT - TWO PINE LANDFILL	PROJECT: TWO PINE LANDFILL - JACKSONVILLE, AR.
JOB NO.: 062-015-35087096-084	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: ROBERT FOWLER	DRILLER: GARY MOYER
DATE DRILLED: 6/3/08	RIG TYPE: CME 55

DRILLING METHOD: 8.25" HOLLOW STEM AUGER

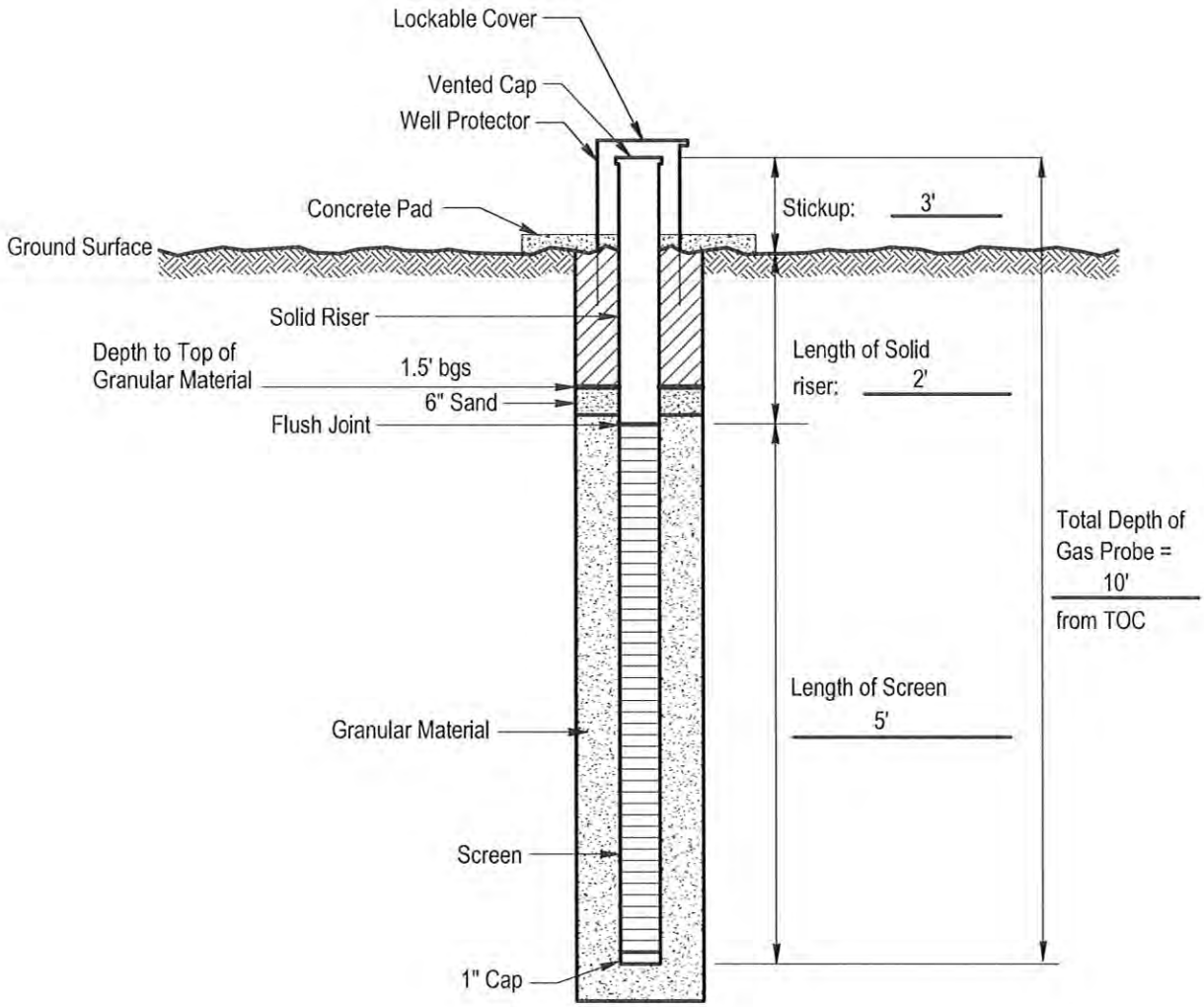
SAMPLING METHOD: CUTTINGS

N: N/A E: N/A TOC: N/A

Depth BGS	Sample Interval	DESCRIPTION	Litho. Symbol	% Recovery	Comments
0		0'-1' CLAY dark brown			
		1'-7' CLAY reddish brown			
5					
		Total Depth = 7' bgs.			
10					
15					
20					

GAS PROBE INSTALLATION RECORD

Job Name WASTE MANAGEMENT - TWO PINE LANDFILL Well Number GMP-24
Installation Date 6/3/08 Location TWO PINE LANDFILL - JACKSONVILLE, AR.
Datum Elevation 246.43' Surface Elevation 243.55'
Screen Diameter & Material 1.25" Borehole Diameter 6.25"
Riser Diameter & Material 1.25" Terracon Representative ROBERT FOWLER
Granular Backfill Material PEA GRAVEL - 10-20 SAND Northing 183410.15' Easting 1268598.23'
Drilling Method FLIGHT AUGER Drilling Contractor ANDERSON ENGINEERING



Grout (Bentonite Chip)

Granular Material (Pea Gravel)

(Not to Scale)

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GAS PROBE INSTALLATION RECORD
PROJECT NUMBER: 062-015-35087096
WELL NUMBER: GMP-24
DRAWING NUMBER: 008 CHECKED BY: RWF

Attachment C

WM Landfill Gas Migration Monitoring SOP (SOP-LFG-1)

WASTE MANAGEMENT **SOP-LFG-1**	**Landfill Gas Migration Monitoring** **Standard Operating Procedure**	**Rev:** 0 **Date:** 1/08/2013

Application: Use this as the standard operating procedure (SOP) to obtain LFG migration monitoring readings from within the vadose zone in soil at established points. Monitoring points may also include structures in addition to permanent probes or bar hole probes at the perimeter of the facility (or other regulatory point).

General Description: Federal Regulations 40 CFR 258.23 and State regulations promulgated under Subtitle D require solid waste disposal facilities to control lateral migration of gas (methane). WM LFG migration monitoring is to be performed using this standard procedure unless otherwise stipulated by site specific permit conditions or other state/provincial regulations or requirements.

General Requirements:

40 CFR 258.23 includes several key requirements:

- Minimum frequency of monitoring shall be quarterly, unless site-specific permits specify otherwise. ***To prevent missed events, do not wait until the last month of the quarter to perform the monitoring.***
- Take immediate steps to protect human health in the event methane levels in structures exceed 25% of the LEL (1.25% methane by volume). Immediately evacuate personnel within the structure and notify the site manager and MAGOM and implement contingency plans. It is required that the agency be notified of such an occurrence, by the appropriate WM personnel, within the mandated timeline (*Check site permit for mandated reporting requirements to the regulator.*).
- The limit for methane detection at the property boundary is 100% of the LEL (5% methane by volume). Notify the appropriate site management, EP and MAGOM immediately when levels meet or exceed this value. It is a requirement that the agency be also be notified of such an occurrence, by the appropriate WM personnel, within the mandated timeline.
- WM approved LFG monitoring instruments are the CES-LANDTEC GEM-2000 and GEM-5000 or WM approved alternative. Alternative instruments must be approved in writing by the appropriate Corporate GOM.
- All migration monitoring data, regardless of purpose, shall be uploaded to LGMS in accordance with the Landfill Gas Management System (LGMS) and Data Collection Policy.

The following parameters shall be monitored and uploaded to LGMS whenever migration monitoring occurs:

- Identification of person taking the reading
- Identification of person uploading the readings to the LGMS

- Date and Time of Reading
- Barometric Pressure (1 Time/Reading Day)
- Ambient Temperature (1 Time/Reading Day)
- Precipitation (1 Time/Reading Day)
- Wind Direction (1 Time/Reading Day)
- Instrument Identification
- All other monitored parameters
- Appropriate Comments

Up to five questions can be pre-programmed into the GEM instrument to allow for monitoring for VOCs, H_2S, water levels, etc. as required by permit.

Appropriate comments shall be included with each reading. Typical comments include, but are not limited to, signs of vegetation damage or stress, ground cover and soil conditions (e.g. snow, frozen ground, saturated soil, etc.), audible or visual indications of gas venting (especially in standing water), and the presence of water and level within the probe where required.

As a means to prevent missed readings and to promote an efficient field event, it is important to properly sequence the monitoring order of points within LGMS (prior to the monitoring event).

Probe Monitoring:

Note: Each probe must have a proper sampling port installed to allow readings for methane without air intrusion (see Typical LFG Monitoring Probe Drawing No. P-9 of the GCCS Design & Installation Guidance Manual and associated detail included herewith). If it is required (by permit or regulation) to determine the pressure at the probe, the probe must have a petcock type ball valve or quick connect coupling be installed on the cap. Grainger Item No. 3CGK1 and 3CGP5 are recommended if clearance tolerances allow within the protective casing. The Landtec quick coupling-Female (Part No. 3-00000-1201) with vinyl cap (Part No. 3-00000-0215) is allowed if preferred. If the water level is required, it shall be measured after all other measurements are taken. Bubbler tubes such as those provided in the attached detail are the preferred system for measuring water levels due to ease and accuracy. The QED Digital Level Meter (cut sheet attached) is the preferred device for use with the bubbler tubing to depths of 80 feet. Refer to the attached table for state specific water level monitoring requirements.

1. All migration monitoring probes shall be designated as “Probes” within LGMS.
2. Upload relevant site probe IDs to the GEM in GA mode prior to departure to the field.
3. Calibrate the GEM (or other approved instrument) in accordance with manufacturer’s recommendations. For GEM devices, use 15% methane calibration gas as this provides increased low range accuracy. For other approved instruments, the calibration gas concentration shall be approximately 10 – 20% methane unless the manufacturer’s recommendations state otherwise.
4. After calibration is complete, document calibration zero and span accuracy by taking a reading using the calibration gas and fresh air and uploading these readings to LGMS. Configure specific “Sample Port” IDs in LGMS for this purpose. Suggested ID names are FRESHAIR for air and CAL15CH4 for 15% methane calibration gas.

5. Set the GEM to Gas Analyzer (GA mode) for all probe measurements. This mode measures and stores the relative pressure within the probe prior to starting the sampling so an accurate pressure measurement is obtained. Do not use the GEM mode when measuring probes. A water trap and new (each day) carbon filter are required to protect instrumentation from damage and to remove trace compounds such as ethane that can cause inaccurately high methane measurements.
6. Inspect the probe and area around the probe for hazards or issues such as broken or worn components, damage, safety hazards, or signs of subsurface LFG migration. Include any issues in the reading comments.

7. Connect the sample hose (with carbon filter and water trap) to the instrument. Purge the instrument and sample hose with fresh air and select the appropriate probe ID.

8. Connect the sample hose to the probe sample point and ensure the hose is securely attached to the fitting. **Do not connect the sample hose to the sampling point of the probe before connecting to the instrument as this could release pressure and LFG from the probe and prevent proper monitoring.**

9. Open the petcock valve on the sample point. As soon as the valve is opened, the relative/static pressure reading will be displayed on the instrument. Allow 5-10 seconds for the pressure to stabilize before starting the sample pump. The instrument (in GA mode) automatically stores the relative pressure before starting the sample pump. **The relative pressure reading will not change while the sample is taken.** When the pressure is stabilized, start the pump.
10. Observe the methane values visible on the GEM (if any) and allow readings to stabilize. It will usually take about 30 to 45 seconds for the sample to reach the instrument and for the instrument to respond. It is important to note the methane values initially measured by the GEM sensors will often spike before accurate and stable readings are displayed **A stable reading does not vary more than 0.5 percent by volume on the meter's scale.** A stable reading should occur within 90 seconds.

Note: The US EPA and many states stipulate that purging the probe is not necessary due to the small volume of the probe and, because methane is lighter than air, it collects in the head space of the probe. However, some states and other regulatory jurisdictions require purging. The standard WM procedure is not to purge the probe unless stipulated by regulation, permit, or other similar requirement because this simulates LFG buildup within a closed space and is therefore a more conservative approach. Refer to the attached table for state specific purging requirements.

11. If required, measure the water level within the probe and record the value using a pre-programmed question in the GEM. Use caution to prevent any cross-contamination between probes from contaminated water level detection devices. Bubbler tube use is recommended as noted above.
12. Some states require the instrument calibration to be verified at the end of the day to help ensure accurate readings. If required, document calibration zero and span accuracy at the end of the day by taking a reading using the calibration gas and fresh air and uploading these readings to LGMS. Use the same "Sample Port" IDs as for the original calibration documentation. Refer to the attached table for state specific

requirements regarding end of day calibration checks.

13. Review the data and upload it to LGMS at the end of the monitoring event or each day if multiple days are required. If methane concentrations of 5% by volume (100% of the LEL) or greater were measured, promptly notify site management, EP and the MAGOM.
14. DO NOT resume monitoring of LFG wells until another calibration of the device is performed using 50% methane.

Structure Monitoring:

BMP-LFG-104 clarifies when fixed Building Monitors should be incorporated within site structures. Sufficient building monitors may preclude the need for additional monitoring with the GEM (or other approved instrument). Building Monitor calibration checks are required per manufacturer's recommendations. Records documenting Building Monitor calibration and any detections of methane are to be maintained and uploaded to the "Documents" page within LGMS no less frequently than quarterly.

Where required (and when Building Monitors are not in place), methane gas accumulation shall be monitored within areas where LFG is likely to enter and collect within the structure such as confined areas, corners, crawl spaces, attics, underground utility runs, sumps, and underground utility penetrations.

1. LGMS IDs shall be established for each monitoring location within each structure to enable proper documentation within LGMS and to prevent missed readings.
2. All monitoring locations shall be designated as "Sample Ports" within LGMS.
3. Sequence the monitoring locations order within LGMS to aid in the field and as a means to prevent missed points.
4. Upload relevant site IDs to the GEM in GA mode prior to departure to the field.
5. When monitoring combustible gas in buildings or structures, use the rigid probe attachment to the GEM as appropriate to allow easy access to narrow spaces.
6. Calibrate the GEM (or other approved instrument) in accordance with manufacturer's recommendations. For GEM devices, use 15% methane calibration gas as this provides increased low range accuracy. For other approved instruments, the calibration gas concentration shall be approximately 10 – 20% methane unless the manufacturer's recommendations state otherwise.
7. After calibration is complete, document calibration zero and span accuracy by taking a reading using the calibration gas and fresh air and uploading these readings to LGMS. Configure specific "Sample Port" IDs in LGMS for this purpose. Suggested ID names are FRESHAIR for air and CAL15CH4 for 15% methane calibration gas.
8. Set the GEM instrument to GA mode. A water trap and new (each day) carbon filter are required to protect instrumentation from damage and to remove trace compounds such as ethane that can cause inaccurately high methane measurements.
9. Initiate monitoring and observe the methane values on the GEM (if any). Allow enough time for readings to stabilize at each monitoring point. It will usually take about 30 to 45 seconds for the sample to reach the instrument and for the instrument to respond. It is important to note that the methane values initially measured by the GEM sensors will often spike before accurate and stable readings are displayed. **A stable reading does not vary more than 0.5 percent by volume on the meter's scale.** When actually sampling a crack or joint in a structure or performing a "floor scan", stop and let the device process the sample prior to moving to the next sampling

location. A stable reading should occur within 90 seconds.

10. Take immediate steps to protect personnel if methane levels exceeding 25% of the LEL (1.25% methane by volume) are detected. Immediately evacuate all personnel from within the structure. Do not turn any lights or other electrical equipment on or off or use the telephone. After the building has been evacuated and you are outside, use your cell phone or a telephone within another structure to immediately notify the site manager, EP and MA GOM.
11. Review the data and upload it to LGMS at the end of the monitoring event or each day if multiple days are required. Provide any required notifications to site management, EP and the MAGOM.
12. DO NOT resume monitoring of wells until another calibration of the device is performed using 50% methane.

Bar Hole Monitoring:

Note: Bar hole probing is performed using a plunger bar to drive a small diameter hole to a depth of about 3 feet into the ground. **Use caution to ensure areas to be monitored have no underground utilities or other hazards prior to performing the work.** Bar hole punching requires soils conducive to this technique such as sands, sandy loams and some silty soils without high amounts of clay or rock. Bar hole probe readings are typically performed near structures or along the perimeter of a landfill to determine whether landfill gas is migrating off site. It may also be useful to confirm landfill gas migration in areas with stressed vegetation, as "burned out" areas may be indications of landfill gas migration near the surface.

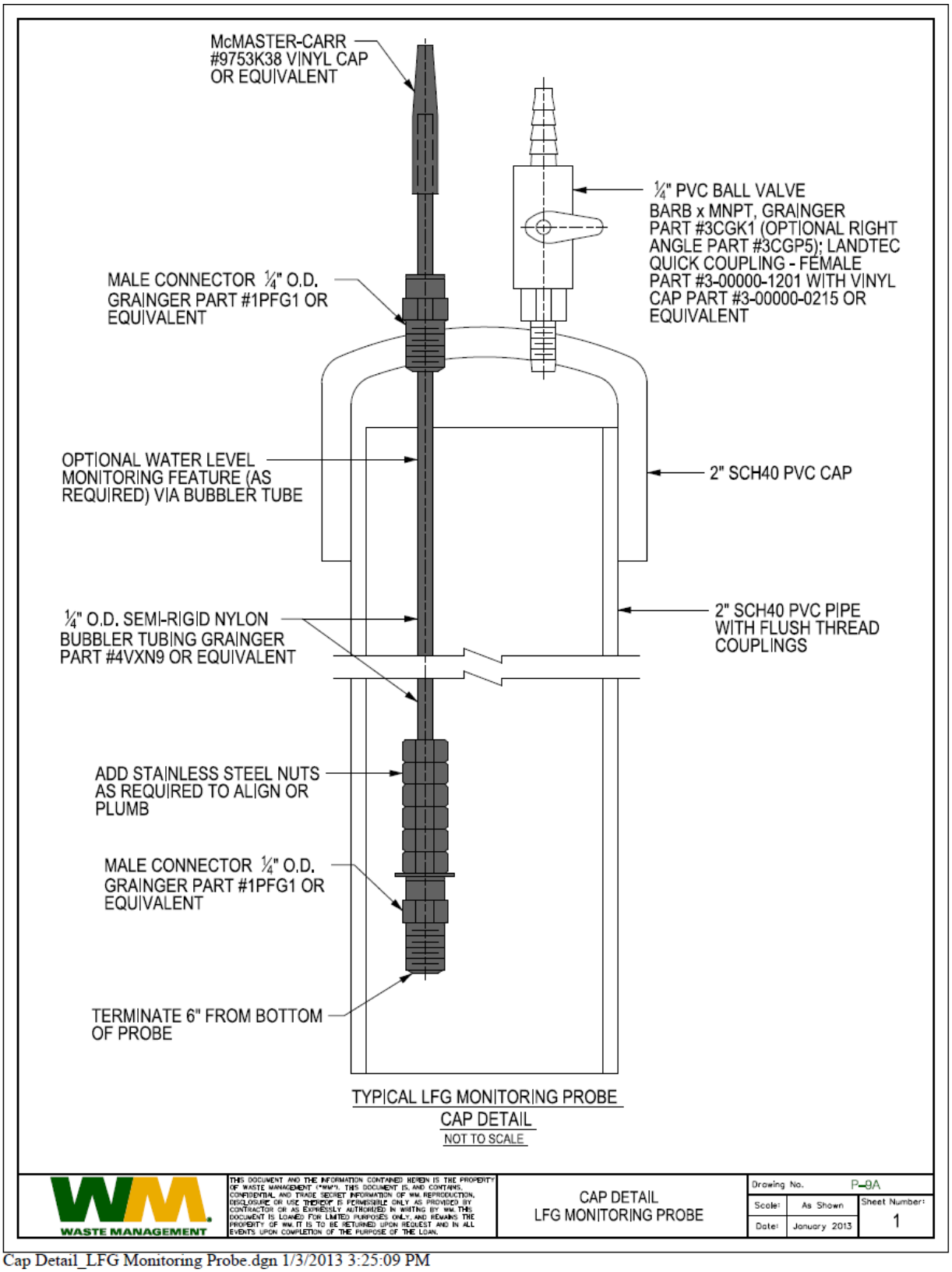
1. Create the bar hole at the desired location using a commercially available (from companies such as Forestry Suppliers, Inc.) "slide", "punch", "slam" or "drive" bar (such as the Geoprobe Manual Slide Hammer) or fence post driver (Grainger Part No. 4LVN8) with a ½ inch diameter rod or using the GASTEC Model No. 361 boring rod (33.5 inches long). If this location is to be monitored more than once, it may prove helpful to insert a nominal ½ inch diameter plastic PVC pipe (cut 12-18 inches in length) into the hole. The pipe will readily accept a compression type, expanding, rubber stopper to provide an air tight seal at the top.
2. Follow Probe Monitoring steps 1-8 listed above. However, to sample the hole for the presence of methane, remove the plunger bar and immediately insert the sample probe for the GEM (or other approved instrument). Seal the surface around the sample probe to minimize air infiltration into the bar hole using an appropriately sized rubber stopper with a sample probe inserted through the center of the rubber stopper. Once sealed, immediately start the sampling.
3. Start the instrument sample pump and observe the methane values visible on the GEM (if any) and allow readings to stabilize. **Note: Use caution with respect to liquids entering the tubing as the GEM will be seriously damaged if liquid enters the instrument.**
4. It will usually take about 30 to 45 seconds for the sample to reach the instrument and for the instrument to respond. It is important to note that the methane values initially measured by the GEM sensors will often spike before accurate and stable readings are displayed. **A stable reading does not vary more than 0.5 percent by volume on the meter's scale.** A stable reading should occur within 90 seconds. Some states require the instrument calibration to be verified at the end of the day to help ensure accurate readings. If required, document calibration zero and span accuracy

at the end of the day by taking a reading using the calibration gas and fresh air and uploading these readings to LGMS. Use the same "Sample Port" IDs as for the original calibration documentation. Refer to the attached table for state specific requirements regarding end of day calibration checks

5. Review the data and upload it to LGMS at the end of the monitoring event or each day if multiple days are required. If methane concentrations of 5% by volume (100% of the LEL) or greater were measured, promptly notify site management, EP and the MAGOM.
6. DO NOT resume monitoring of LFG wells until another calibration of the device is performed using 50% methane.

Reference/Links:

- **Landfill Gas Management System (LGMS) and Data Collection Policy**
- **BMP-LFG-104 Building Monitors**
- **Site Specific LFG Migration Monitoring Plans**



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EASY LEVEL

Liquid Level Measurement for Landfill Gas Wells with Digital Level Meter

Safe and easy measurement of liquid height in landfill gas wells, even under vacuum or pressure conditions.

The Digital Level Meter allows you to easily and accurately measure liquid levels in gas wells equipped with an Easy Level Indicator or a down-well bubbler tube. There is no need to open the well to take a reading, so gas collection is not stopped and workers are not exposed to gas or leachate.

The Digital Level Meter is capable of measuring liquid depths up to 100 ft. above the liquid level probe, and automatically compensates for pressure or vacuum conditions above the liquid. The light-weight hip pack also houses a small compressor powered by a rechargeable, removable battery. A spare battery and AC battery charger are provided. The entire unit weighs only 9lbs. and includes an adjustable shoulder strap.

To measure the liquid level, the Digital Level Meter's quick connect fittings are attached to the ports of an Easy Level Indicator or a dedicated bubbler tube, and the meter's air source is then activated. The level meter displays the liquid depth over the probe, without false readings in foaming wells.

Digital Level Meter Advantages:

- Compact and light-weight
- Rechargeable batteries
- No air enters the well
- Gas collection is not interrupted
- No false readings in foaming wells
- Easily transported from well to well
- Personnel are not exposed to landfill gases or leachate
- Accuracy is not affected by vacuum or pressure in the well

QED Environmental Systems

P.O. Box 3726 Ann Arbor, MI 48106-3726 USA • Phone (800) 624-2026 • Fax (734) 995-1170
info@qedenv.com • www.qedenv.com

Federal Regulations For Explosive Gas Monitoring

§ 258.23 Explosive gases control.

(a) Owners or operators of all MSWLF units must ensure that:
   1) The concentration of methane gas generated by the facility does not exceed 25 percent of the lower explosive limit for methane in facility structures (excluding gas control or recovery system components); and
   2) The concentration of methane gas does not exceed the lower explosive limit for methane at the facility property boundary.

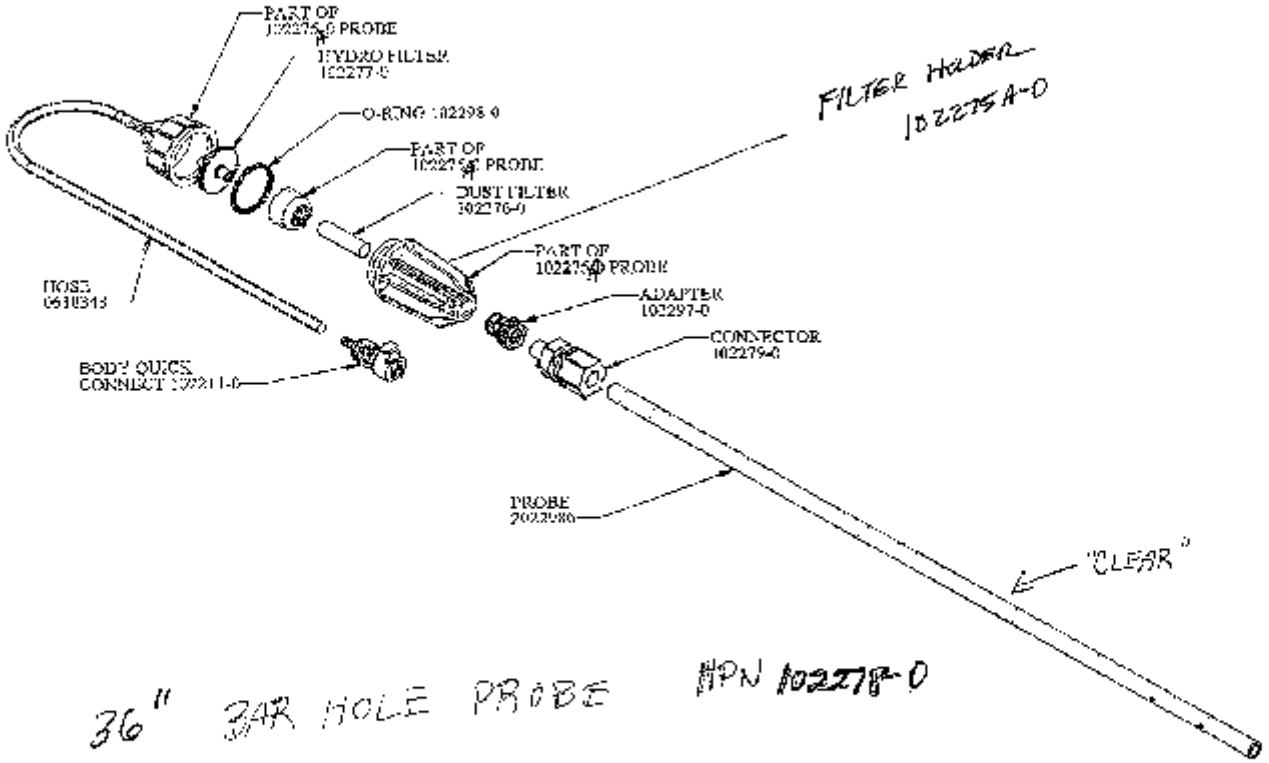
(b) Owners or operators of all MSWLF units must implement a routine methane monitoring program to ensure that the standards of paragraph (a) of this section are met.
   1) The type and frequency of monitoring must be determined based on the following factors:
      i. Soil conditions;
      ii. The hydrogeologic conditions surrounding the facility;
      iii. The hydraulic conditions surrounding the facility; and
      iv. The location of facility structures and property boundaries.
   2) The minimum frequency of monitoring shall be quarterly.

(c) If methane gas levels exceeding the limits specified in paragraph (a) of this section are detected, the owner or operator must:
   1) Immediately take all necessary steps to ensure protection of human health and notify the State Director;
   2) Within seven days of detection, place in the operating record the methane gas levels detected and a description of the steps taken to protect human health; and
   3) Within 60 days of detection, implement a remediation plan for the methane gas releases, place a copy of the plan in the operating record, and notify the State Director that the plan has been implemented. The plan shall describe the nature and extent of the problem and the proposed remedy.
   4) The Director of an approved State may establish alternative schedules for demonstrating compliance with paragraphs (c) (2) and (3) of this section.

(d) For purposes of this section, *lower explosive limit* means the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25° C and atmospheric pressure.

(e) The Director of an approved State may establish alternative frequencies for the monitoring requirement of paragraph (b)(2) of this section, after public review and comment, for any owners or operators of MSWLFs that dispose of 20 tons of municipal solid waste per day or less, based on an annual average. Any alternative monitoring frequencies established under this paragraph must:
   1) Consider the unique characteristics of small communities;
   2) Take into account climatic and hydrogeologic conditions; and
   3) Be protective of human health and the environment.

[56 FR 51016, Oct. 9, 1991, as amended at 62 FR 40713, July 29, 1997]



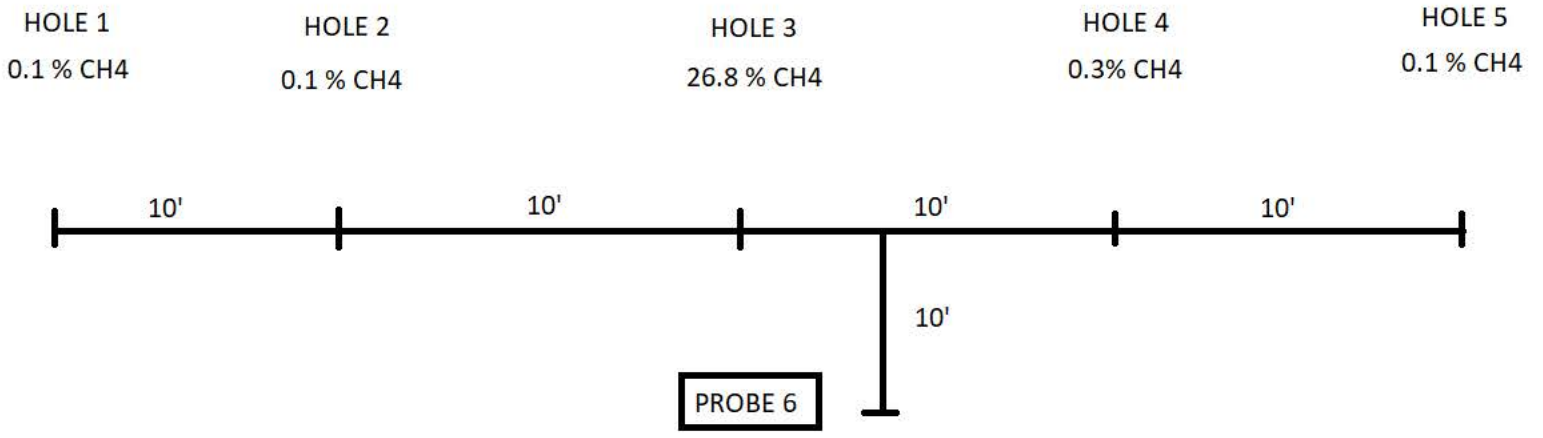
36" BAR HOLE PROBE MPN 102278-0

State or Province Specific LFG Migration Monitoring Requirements (current on 11/1/12)

State or Province	Regs?	Guidance	Purge	Water Levels?	End of Day Calibration Check?	Notes:
AL	YES	NO	NO	NO	NO	
AK	NO	NO	NO	NO	NO	
AZ	YES	NO	NO	NO	NO	
AR	YES	NO	NO	NO	NO	State regulation 22 Section 22.415
CA	YES	YES	YES	NO	NO	Consult site specific permits for purge and sampling details
CO	YES	NO	NO	YES	NO	
CT	YES	NO	NO	NO	NO	
DE	YES	NO	NO	NO	NO	Required quarterly by permit.
FL	YES	NO	NO	NO	NO	62-701.530 - Sampling shall be conducted in the headspace of the monitoring probe without purging the gas before collecting the sample.
GA	YES	YES	NO	NO	NO	Sampling must be conducted under normal /average conditions of temperature pressure and climate for the season. In addition all sampling must be performed after 12:00 pm and the readings submitted on the state form SWM-19. To sample the well, the cap is removed and the GEM 2000 hose is attached to the sample port and the percent methane and oxygen is recorded.
HI	Yes	NO	NO	NO	NO	
ID	X	X	X	X	X	**No landfills**
IL	NO *	NO	NO	NO	NO	* Only the monitoring frequency
IN	NO	YES	NO	YES	NO	Water level (if applicable).
IA	NO	NO	NO	NO	NO	
KS	NO	NO	NO	NO	NO	
KY	NO	YES	NO	NO	NO	The explosive meter should read "percent lower explosive limit" and should have a flexible probe capable of bing placed in subsurface holes made by the bar hole punch. For surface testing this method consists of placing the probe in areas in and around the landfill vicinity and simply drawing a sufficient amount of air to obtain a reading.
LA	YES	NO	NO	NO	NO	
ME	YES	NO	NO	NO	NO	Regulations: 06-096
MD	NO	NO	NO	NO	NO	
MA	NO	YES	YES	NO	NO	Sample prior to purging then after. Purge two well volumes. Provide houirly barometric pressure readings for the day of sampling 12-hours before and for the entire event.
MI	NO	NO	NO	NO	NO	
MN	NO	NO	NO	NO	NO	Elk River CUP/License agreement with City says we will take daily barometric pressure and temperature readings for 3 days prior to sampling and the day of sampling. Use site weather station data. Also want pressure reading if methane present in probe.
MS	YES	NO	NO	NO	NO	
MO	NO	YES	NO	NO	NO	Record stabilized reading. (One that does not vary over 0.5 percent.)
MT	X	X	X	X	X	**No landfills**

State or Province	Regs?	Guidance	Purge	Water Levels?	End of Day Recalibration?	Notes:
NE	NO	YES	NO	NO	YES	Record stabilized reading. (One that does not vary over 0.5 percent.)
NV	X	X	X	X	X	**No landfills**
NH	YES	NO	NO	NO	NO	Env-Sw 806.07
NJ	YES	NO	NO	NO	NO	Required quarterly by permit.
NM	YES	YES	YES	YES	NO	
NY	NO	NO	NO	NO	NO	
NC	NO	YES	YES	NO	NO	Stopcock valve required. Purge for at least one minute
ND	NO	NO	NO	NO	NO	
OH	YES	NO	YES	NO	NO	Ohio guidance is to follow the procedures outlined in each sites specific Landfill Gas Monitoring Plan.
OK	YES	NO	YES	YES	NO	
OR	YES	NO	NO	NO	NO	
PA	YES	NO	NO	NO	NO	Required quarterly by permit.
RI	X	X	X	X	X	**No landfills**
SC	YES	NO	NO	YES	NO	Record stabilized reading. (Not defined)
SD	X	X	X	X	X	**No landfills**
TN	YES	NO	NO	NO	NO	1200-01-07-.04(5)(a)5 Must be sampled quarterly and the following information recorded: (I) the date, exact place, and time of sampling or measurements; (II) The individual(s) who performed the sampling or measurements; (III) The date(s) analyses were performed; (IV) The individual(s) who performed the analyses; (V) The analytical techniques or methods used (including equipment used); and (VI) The results of such analyses. There are no regulations/guidance on how to properly sample the probes. All sampling for landfill gas requires insturment calibration with methane cal gas. You must record calibration activities (i.e. instrument, cal gas lot number, etc.)
TX	YES	YES	NO	YES	NO	30 TAC 330.731 for Regs. & TCEQ website for guidance
UT	YES	NO	NO	NO	NO	
VT	X	X	X	X	X	**No landfills**
VA	NO	NO	NO	NO	NO	
WA	YES	NO	NO	NO	NO	
WV	NO	NO	NO	NO	NO	
WI	YES	NO	NO	NO	NO	NR 507.22 - Initial and stabilized methane levels to be recorded unless the stabilized reading drops to zero.
WY	X	X	X	X	X	**No landfills**
Canada:						
Ontario	YES	NO	NO	NO	NO	Per Env. Monitoring Plan
Quebec	YES	NO	NO	NO	NO	
ALB	YES	NO	NO	NO	NO	Per Env. Monitoring Plan, lower explosive limits than US
BC						**No landfills**
MAN						**No landfills**
SAS						**No landfills**

Attachment B


HOLE 1
0.1 % CH4
HOLE 2
0.1 % CH4
HOLE 3
26.8 % CH4
HOLE 4
0.3% CH4
HOLE 5
0.1 % CH4
10'
10'
10'
10'
10'
PROBE 6