

BIGGERSTAFF LANDFILL
PERMIT NO. 36-02

LANDFILL GAS
MONITORING PLAN
UPDATE

NOVEMBER 2012

Prepared for:



Gaston County, North Carolina
P.O. Box 1578
Gastonia, NC 28053-1578

Prepared by:

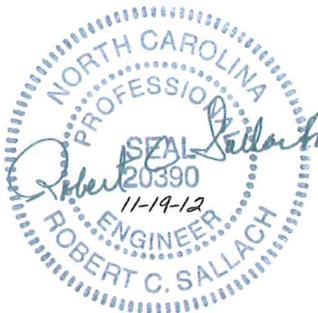


8720 Red Oak Boulevard, Suite 505
Charlotte, North Carolina 28217

N.C. License No. F-1165

Project Number 21420

APPROVED
DIVISION OF WASTE MANAGEMENT
SOLID WASTE SECTION
DATE 12/20/2012 BY Bruce Wooten
ID # 17957 Hydrogeologist



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1.0 INTRODUCTION

1.1 Purpose

This Landfill Gas Monitoring Plan (LFGMP) presents information and procedures associated with the landfill gas monitoring program for the closed Biggerstaff Landfill (Permit No. 36-02). The Biggerstaff Landfill is owned and maintained by the Gaston County Department of Public Works and is located at 555 Biggerstaff Landfill Road, Bessemer City, North Carolina 28016. A site location map of the Biggerstaff Landfill is included in Appendix A – Figure 1.

1.2 Regulatory Requirements

The Biggerstaff Landfill did not receive waste after October 9, 1991, and is subject to compliance with the closure requirements of 15A NCAC 13B.0510. The County has historically monitored the site for explosive gases and groundwater contamination.

The LFGMP, as described herein, is for monitoring of methane gas concentrations at the property boundary, and to document post-closure care actions and landfill gas (LFG) monitoring procedures already set in-place by the County.

In accordance with 15A NCAC 13B.0503, the following requirements must be met:

- The concentration of explosive gases generated by the site shall not exceed (i) 25 percent of the limit for the gases in site structures (excluding gas control or recovery system components); and (ii) the lower explosive limit for the gases at the property boundary.

2.0 SITE HISTORY

2.1 Background

The Biggerstaff Landfill is a pre-Subtitle D (unlined) landfill that operated from 1967 until it was closed in 1987. A chronology of key events is presented in the following table:

TABLE 1 Biggerstaff Landfill Key Events	
Activity	Date
First permitted	September 1967
Landfill stops receiving waste	1987
Certification of final cover depth by Law Engineering	September 1987
Division of Solid Waste Management issues Closure Letter	December 1991
County notification that facility will be maintained in accordance with the post closure conditions specified in SWS letter dated July 24, 1996. County requests effective closure date of November 28, 1995 to coincide with first groundwater monitoring event.	August 1996
SWS approves effective closure date of November 28, 1995.	August 1996

The landfill is currently well vegetated and the final layer of waste is covered by a minimum of 2 feet of soil cover in accordance with 15A NCAC 13B.0505.

This site is also home to the Lewis Brooks Airfield, which is used by the public for recreational radio-controlled airplane flying. Facilities include a 30-foot by 300-foot paved airstrip, open shelter, and stone access road and parking area. The Conditional Use Permit (CUP) for this activity was approved in 1994.

The County currently performs post-closure care activities that include site maintenance, storm-water management, erosion and sediment control, groundwater monitoring, and landfill gas monitoring.

2.2 Landfill Gas Monitoring

The County currently conducts annual LFG monitoring at five permanent wells located near the property boundary. Refer to Appendix B – Figure 3 for well locations. Based upon recent monitoring results (from year 2006 to 2012), the recorded concentration of explosive (methane) gas is not detected or is below the regulatory requirements noted in Section 1.2 at all monitoring locations. Per this monitoring plan revision, the County will continue to monitor wells MW-1, MW-2, MW-3, and MW-5. Two shallow probes (SP-1 and SP-5) will be installed at the proposed locations noted on Figure 3 in Appendix B. Figures 4 and 5 provide available information and details regarding the existing permanent well construction, shallow probe construction, and head space revision for gas monitoring. The areas to the south and southeast of the Biggerstaff landfill are bounded by the adjacent creeks, which should restrict the possible migration of LFG across the creek(s).

3.0 CONTINUED LONG-TERM MONITORING PLAN

3.1 Monitoring

As required by 15A NCAC 13B.503, the County is responsible for assessing and monitoring for LFG migration, specifically off-site migration beyond the property boundary, and for determining if methane is accumulating in any on-site structures.

There are no enclosed on-site structures located at the Biggerstaff Landfill, thus the Monitoring Plan for this site consists of continued monitoring of the wells noted in Section 2.2. As noted in Section 2.1, a radio-controlled model airplane airstrip has been constructed on the closed fill area. The County will also conduct ambient surface monitoring of specific locations on an as-needed basis if the presence of LFG is suspected.

3.2 Frequency

The County will continue to monitor the permanent compliance wells on a quarterly basis throughout the remainder of the post-closure care period. The shallow probes will be monitored quarterly for a period of one year. Based upon the monitoring results, the County will make a recommendation to SWS regarding continued monitoring of abandonment of the probes. The effective closure date of the

Biggerstaff facility was determined to be November 28, 1995 (see Table 1). If methane concentration levels that exceed the regulatory requirements are observed, the County will institute more frequent monitoring, following the implementation of corrective measures, until such time as it can be demonstrated that any migration issue is resolved to the satisfaction of the County and the Division of Waste Management.

3.3 Monitoring Protocols

Prior to initiating a LFG monitoring event, monitoring personnel (County or a third party) will record pertinent weather information. Via the use of a LFG analyzer, the following will typically be recorded at each monitoring well or on-site structure:

- Verification of sample tube purge;
- Time pumped in seconds;
- Barometric pressure;
- Methane concentrations (percent volume in air and lower explosive limit);
- Oxygen, carbon dioxide, and balance gas concentration; and
- Any field observations or comments.

Concentrations of gases, using a CES-Landtech, GEM 2000 analyzer (or equivalent type analyzer) at the monitoring wells, will be determined using the following sampling procedures:

- The instrument will be calibrated per the manufacturer's recommendations prior to use.
- The instrument will be turned on prior to sampling of the monitoring well.
- The instrument's sampling pump will be started and readings will be observed and recorded. Typically, two monitoring well volumes will be pumped and purged prior to recording measurements.
- Readings will be measured for a three-five minute time interval following the well purging.

The LFG Monitoring Report form is presented in Appendix D.

3.4 Detections and Exceedences

If methane concentrations are detected above 1.25 percent by volume in on-site structures or above 5.00 percent by volume at the property boundary, the County will:

- Notify the Division of Waste Management, Solid Waste Section (SWS);
- Perform a site investigation;
- Provide SWS monitoring data related to the exceedence; and
- Propose appropriate corrective actions.

3.5 Notification and Reporting

Landfill gas monitoring under this Plan will be scheduled quarterly.

The LFG Monitoring Report form is presented in Appendix C. LFG monitoring results will be submitted to SWS within 30 days following the completion of the monitoring event. However, if methane concentrations from any monitoring well exceed the prescribed regulatory requirements, the County will:

- Immediately take all necessary steps to ensure protection of human health and notify the Division of Waste Management, SWS;
- Within seven days of detection, place the monitoring results and a description of the steps taken to protect human health in the operating record; and
- Within 60 days of detection, implement a remediation plan and notify the SWS that the plan has been implemented.

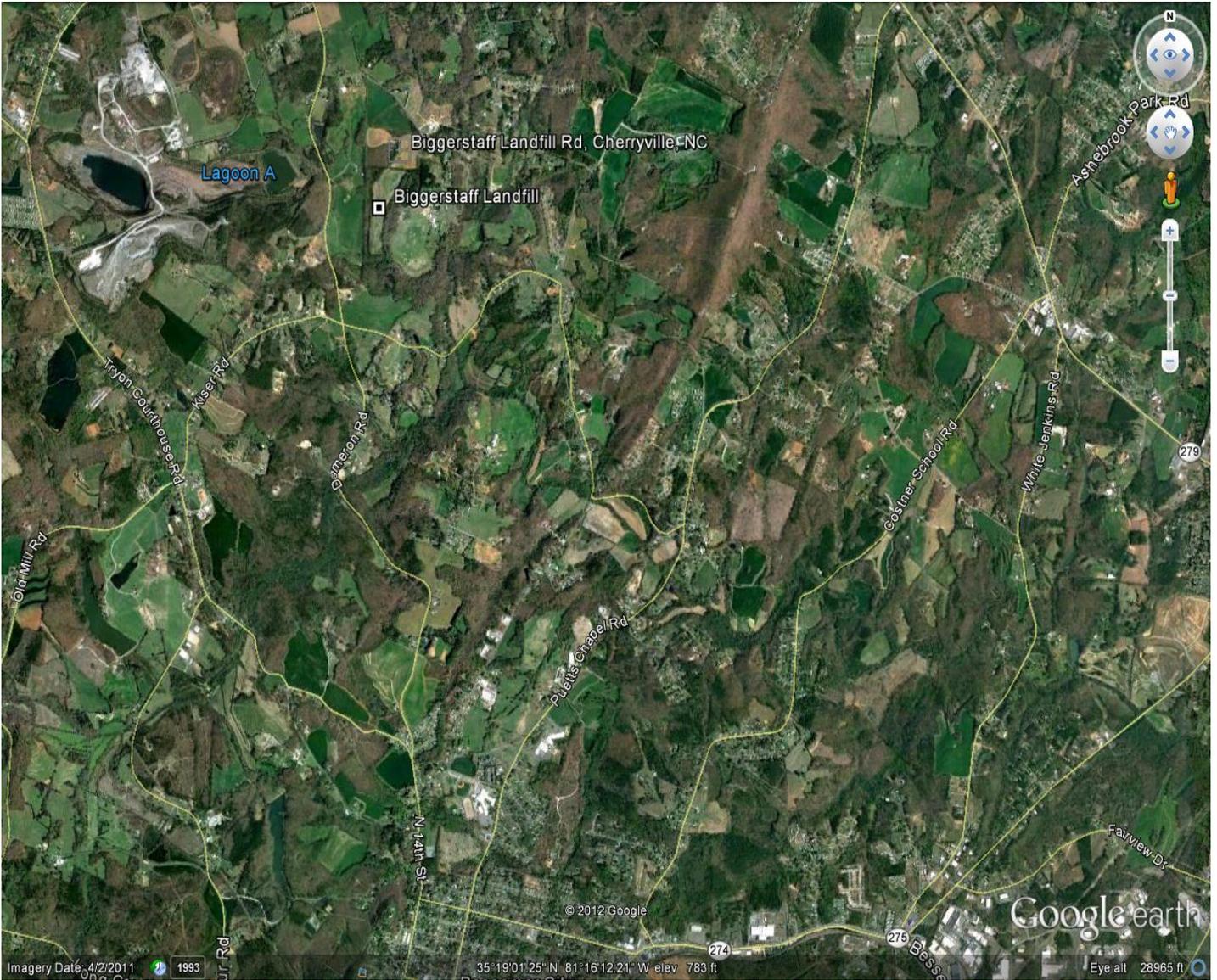
3.6 Revisions to the Plan

The County will implement the propose changes to the LFGMP in accordance with the following conditions:

- Within 90 days of approval of the LFGMP by the SWS, the new gas monitoring probes will be installed at the proposed locations as depicted on the site drawings.
- A Professional Engineer or a North Carolina Professional Geologist must certify/supervise the installation of all LFG monitoring probes.
- Within 30 days of completion of the LFG monitoring probes, a well construction record and/or boring log and a diagram for each probe, including but not limited to total depth, screened interval, and distance above seasonal high groundwater elevation, will be submitted to the SWS. The submittal will also include a scaled topographic map showing the surveyed location and identification of new, existing, and abandoned gas monitoring probes.

APPENDIX A

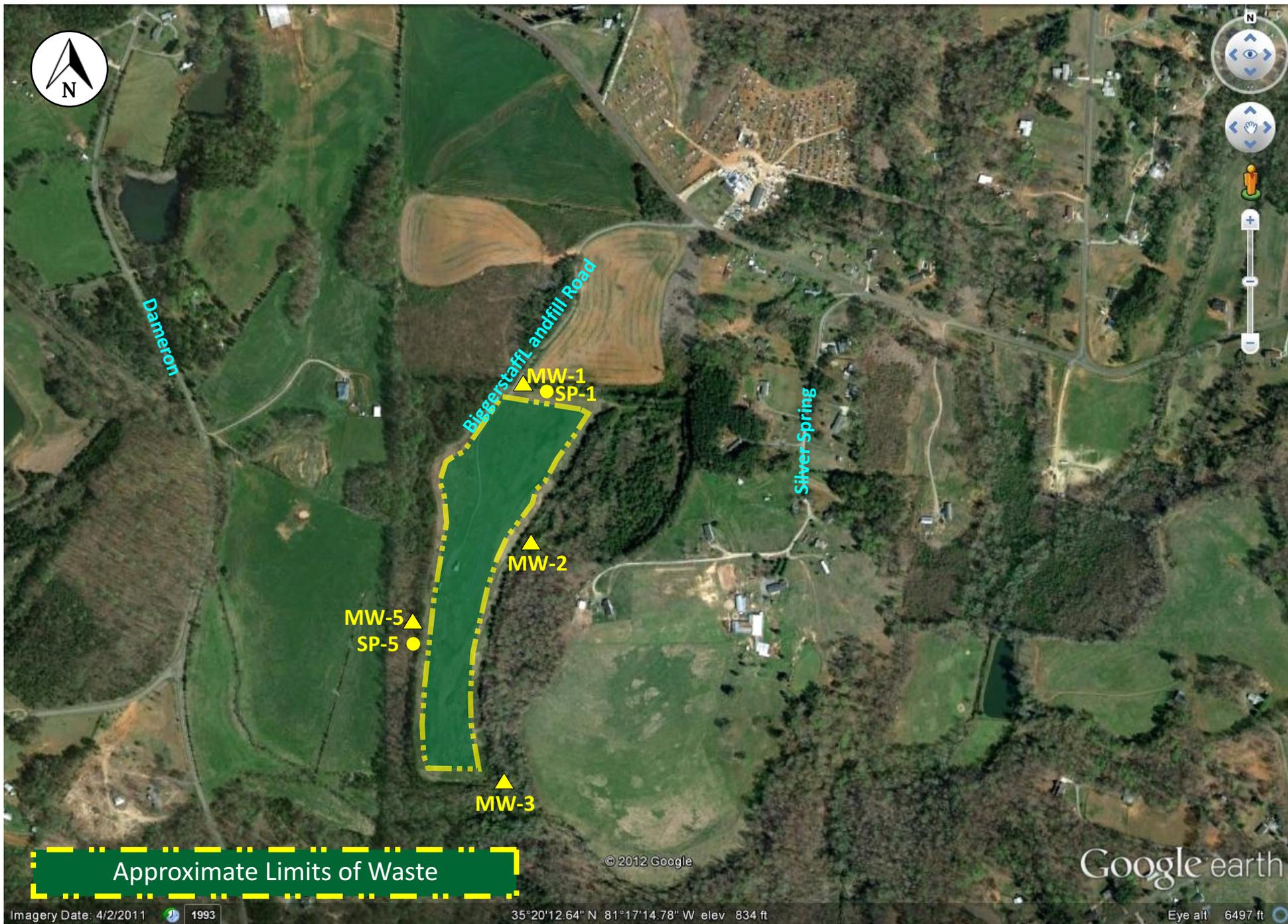
Site Location Map



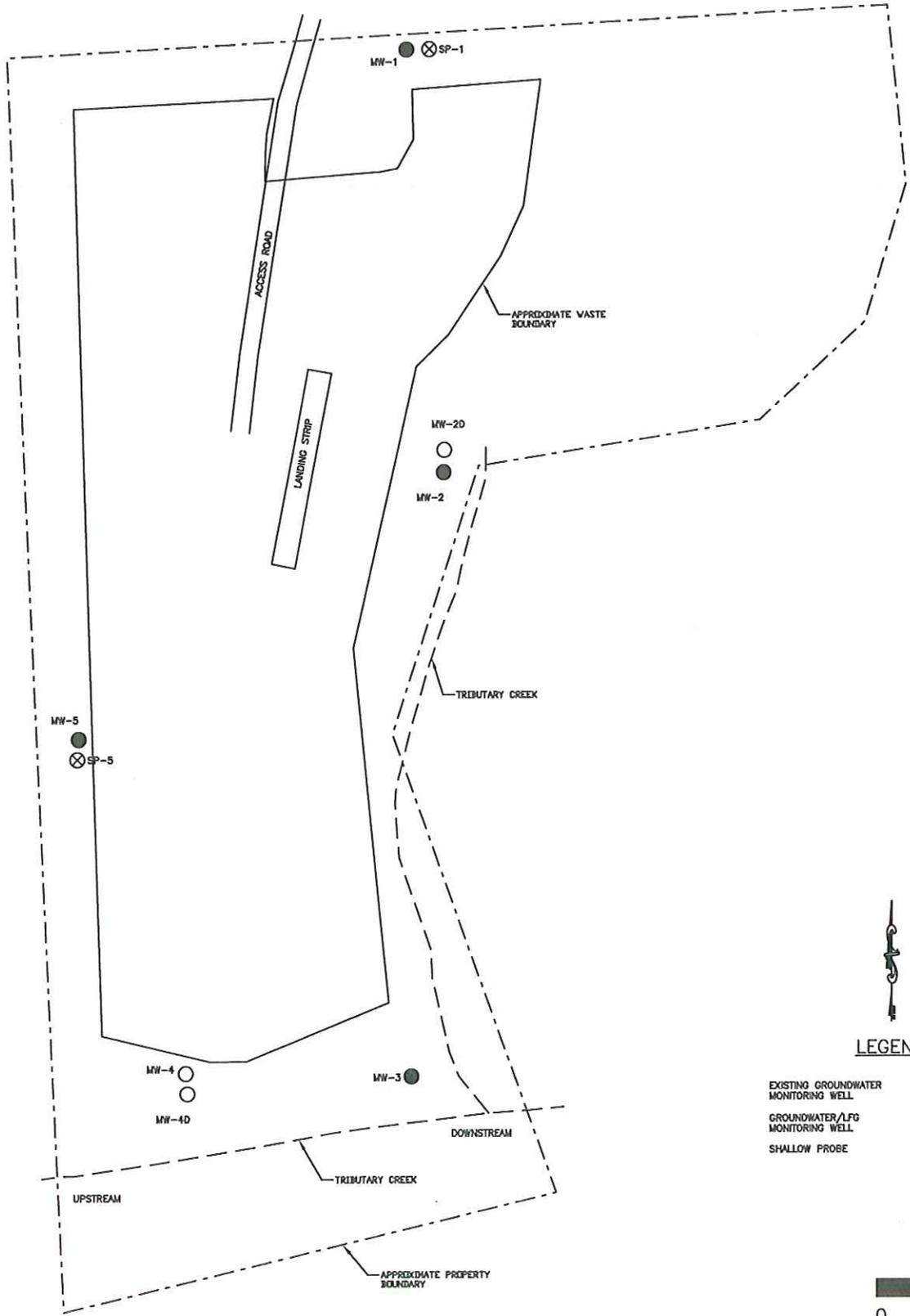
Biggerstaff Landfill - Site Location Map
Figure 1

APPENDIX B

Monitoring Well Location Plans

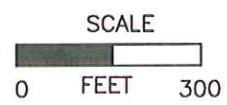


Biggerstaff Landfill – Monitoring Well Location Plan
Figure 2



LEGEND

- EXISTING GROUNDWATER MONITORING WELL ○ MW-4
- GROUNDWATER/LFG MONITORING WELL ● MW-4
- SHALLOW PROBE ⊗ SP-1



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**BIGGERSTAFF LANDFILL
GASTON COUNTY, NORTH CAROLINA**

LANDFILL GAS MONITORING PLAN UPDATE

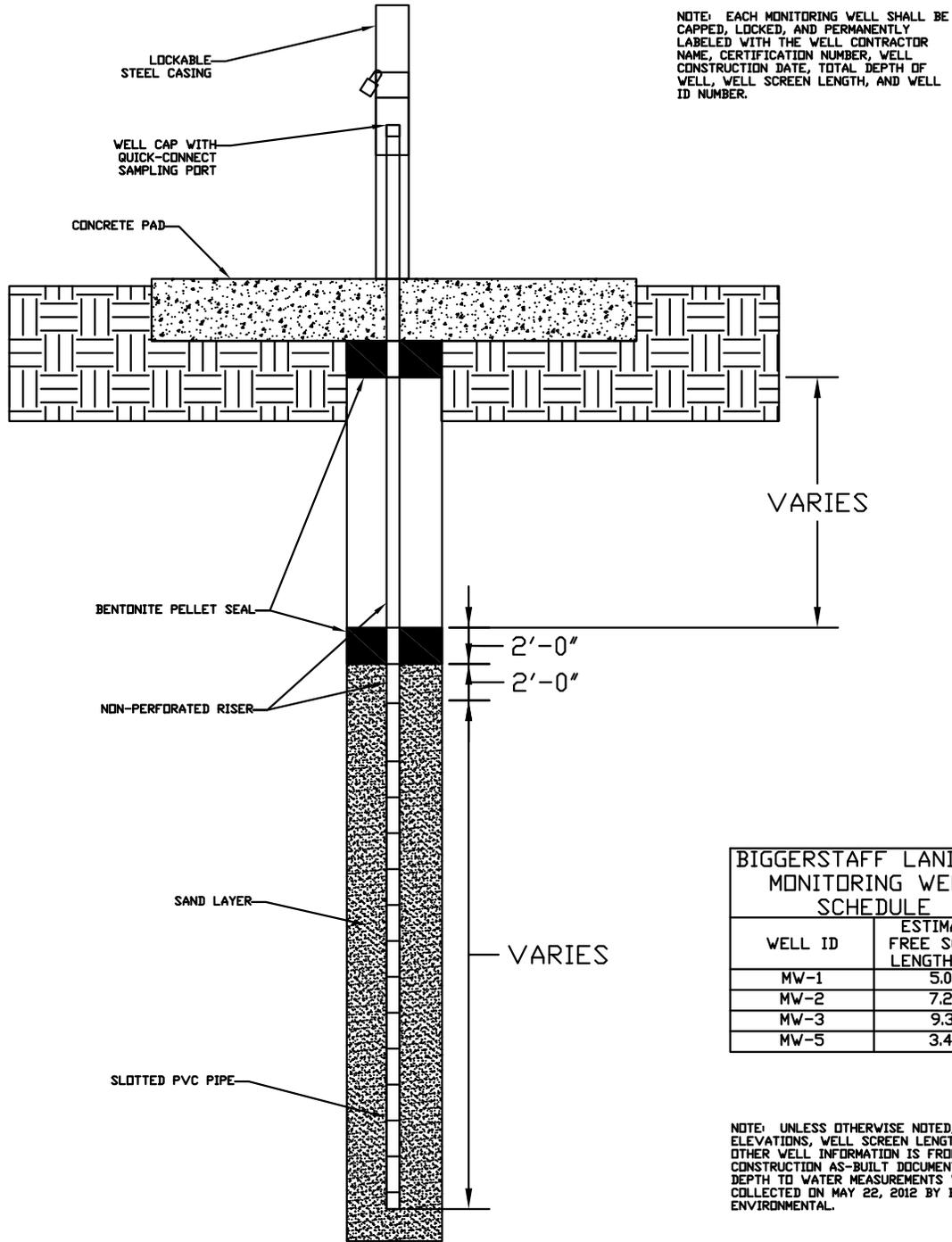
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21420**

DATE: AUGUST 2012

FIGURE 3

APPENDIX C

**Groundwater/LFG Monitoring
Well Typical Detail**



NOTE: EACH MONITORING WELL SHALL BE CAPPED, LOCKED, AND PERMANENTLY LABELED WITH THE WELL CONTRACTOR NAME, CERTIFICATION NUMBER, WELL CONSTRUCTION DATE, TOTAL DEPTH OF WELL, WELL SCREEN LENGTH, AND WELL ID NUMBER.

WELL ID	ESTIMATED FREE SCREEN LENGTH (FT.)
MW-1	5.05
MW-2	7.26
MW-3	9.31
MW-5	3.48

NOTE: UNLESS OTHERWISE NOTED, TDC ELEVATIONS, WELL SCREEN LENGTHS, AND OTHER WELL INFORMATION IS FROM CONSTRUCTION AS-BUILT DOCUMENTS. DEPTH TO WATER MEASUREMENTS WERE COLLECTED ON MAY 22, 2012 BY BUXTON ENVIRONMENTAL.

GW/LFG MONITORING WELL DETAIL
SCALE: N.T.S.

1

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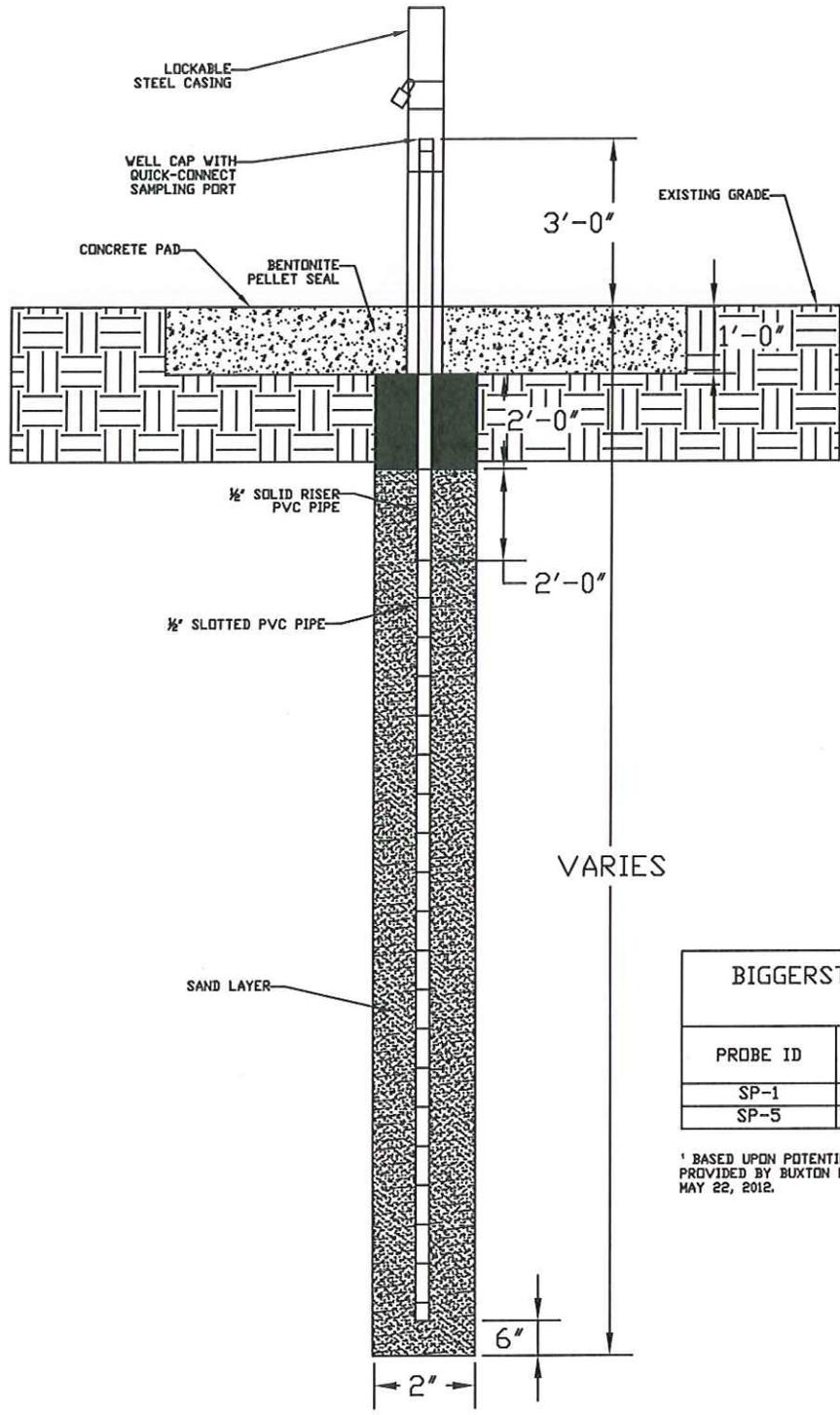
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BIGGERSTAFF LANDFILL
GROUNDWATER/LFG MONITORING WELL
REVISED TYPICAL DETAIL

PROJECT NO.
21420

DATE: AUGUST 2012

FIGURE 4



SHALLOW PROBE DETAIL
SCALE: N.T.S.

PROBE ID	PROBE DEPTH (FT.)	DEPTH TO GROUNDWATER (FT.) ¹	FREE SCREEN LENGTH (FT.)
SP-1	15	28	9.5
SP-5	15	29.5	9.5

¹ BASED UPON POTENTIOMETRIC CONTOUR MAPS PROVIDED BY BUXTON ENVIRONMENTAL DATED MAY 22, 2012.

APPENDIX D

LFG Monitoring Report Form



**BIGGERSTAFF
LANDFILL**

LANDFILL GAS MONITORING REPORT – CLOSED LANDFILL

Date: _____

Facility Name: **Biggerstaff Landfill**

Permit Number: **36-02**

Sampling Personnel: _____

Instrument Used: _____

Date Instrument Calibrated and Standard Used: _____

Weather Conditions: _____

Monitoring Well/Probe	% LEL	% CH ₄	% O ₂	% CO ₂	% Balance Gas	Comments
Facility Structures	% LEL	% CH ₄	% O ₂	% CO ₂	% Balance Gas	Comments

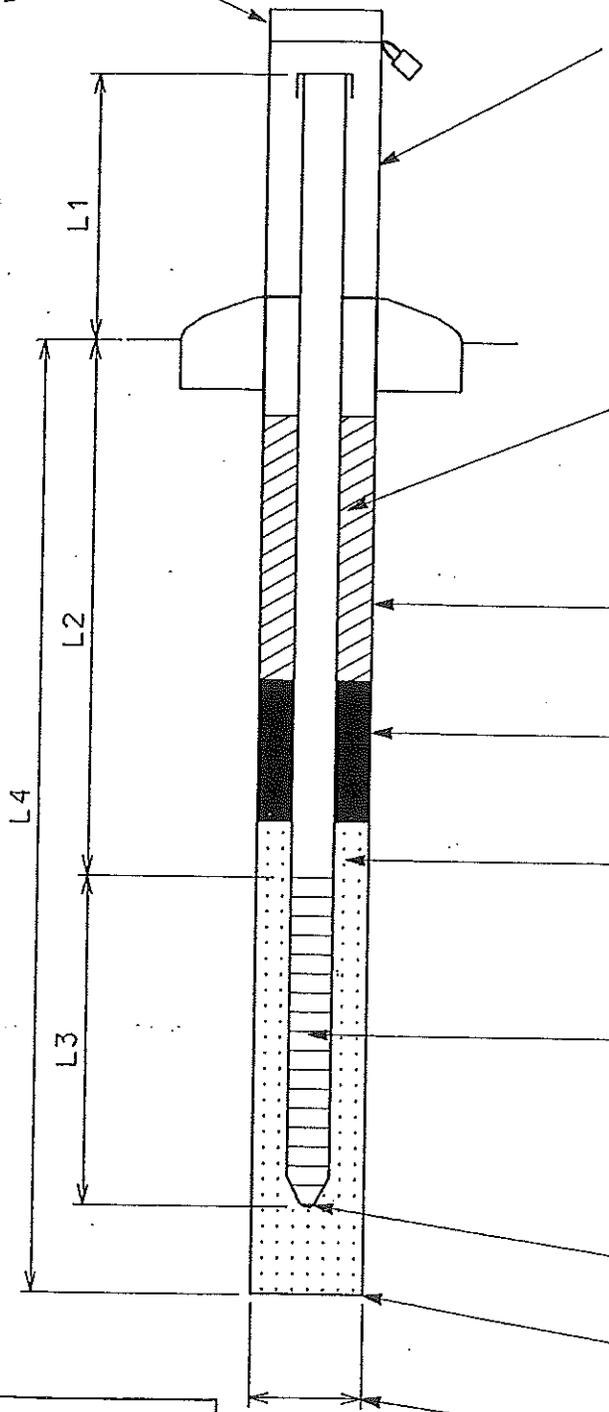
List wells/probes not sampled during this monitoring event: _____

APPENDIX E

Well Construction As-Builts

MONITORING WELL CONSTRUCTION DETAILS RAISED PROTECTIVE CASING

LOCKABLE CAP



PROTECTIVE CASING AND CONCRETE PAD	
P. CASING MATERIAL	Steel
P. CASING DIAMETER	4"
P. CASING LENGTH	
PAD DIMENSIONS	3' x 3'
HEIGHT ABOVE GROUND	3'
PAD ELEVATION	870.35
TOP OF CASING ELEVATION	872.88
WELL RISER CASING	
MATERIAL	Sch. 40 PVC
DIAMETER	2"
JOINT TYPE	Flush Thread
LENGTH	10'
BACKFILL AROUND RISER	
MATERIAL	Grout
THICKNESS	6.0'
ANNULAR SEAL	
TYPE OF SEAL	Bentonite
THICKNESS	2.5
FILTER PACK	
TYPE OF FILTER	Sand
DISTANCE ABOVE SCREEN	1.5
LENGTH	22.5
WELL SCREEN	
SCREEN MATERIAL	Sch 40 PVC
DIAMETER	2"
LENGTH	20
SLOT SIZE	10
DEPTH TO BOTTOM OF MONITORING WELL	
	30
DEPTH TO BOTTOM OF FILTER SAND	
	31
DIAMETER OF BOREHOLE	
	8"

L1 = 3 FT.
L2 = 10 FT.
L3 = 20 FT.
L4 = 31 FT.

**CROSS-SECTIONAL
VIEW**

TITLE
Monitoring Well MW-1
Biggerstaff Landfill
Gaston County, North Carolina
July 8, 1993



CAD FILE

PREP. BY

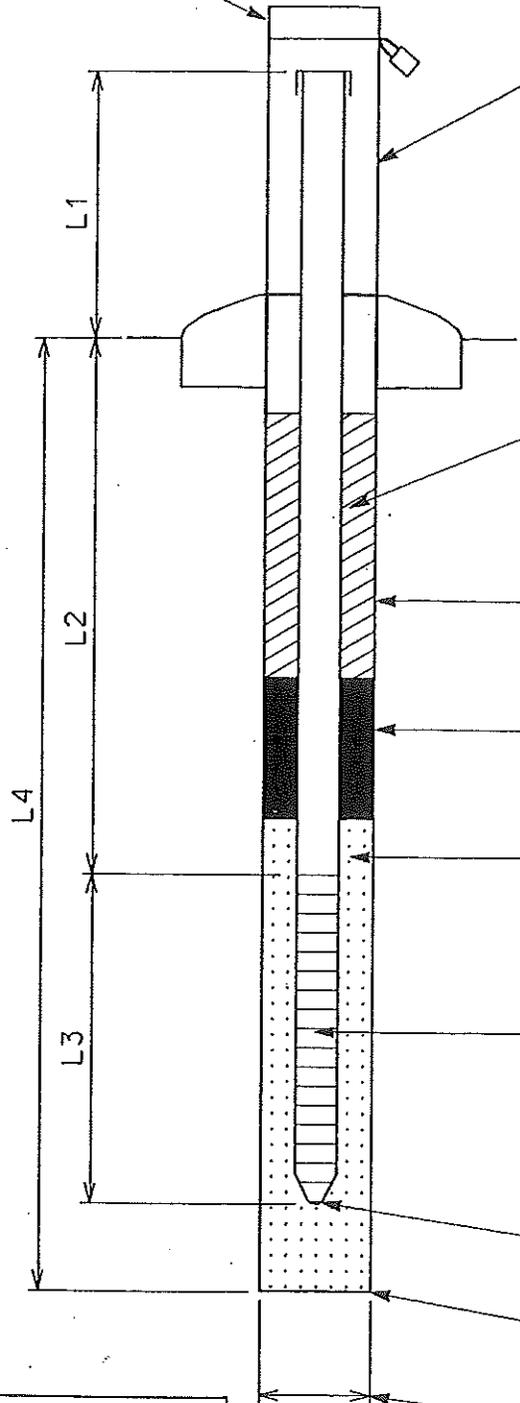
REV. BY

DATE

PROJECT NO.
35-07-93-00092

MONITORING WELL CONSTRUCTION DETAILS RAISED PROTECTIVE CASING

LOCKABLE CAP



PROTECTIVE CASING AND CONCRETE PAD

P. CASING MATERIAL	Steel
P. CASING DIAMETER	4"
P. CASING LENGTH	
PAD DIMENSIONS	3' x 3'
HEIGHT ABOVE GROUND	3'
PAD ELEVATION	808.24
TOP OF CASING ELEVATION	811.01

WELL RISER CASING

MATERIAL	Sch. 40 PVC
DIAMETER	2"
JOINT TYPE	Flush Thread
LENGTH	5

BACKFILL AROUND RISER

MATERIAL	Grout
THICKNESS	2'

ANNULAR SEAL

TYPE OF SEAL	Bentonite
THICKNESS	2'

FILTER PACK

TYPE OF FILTER	Sand
DISTANCE ABOVE SCREEN	1
LENGTH	13

WELL SCREEN

SCREEN MATERIAL	Sch. 40 PVC
DIAMETER	2"
LENGTH	10'
SLOT SIZE	10

DEPTH TO BOTTOM OF MONITORING WELL

15'

DEPTH TO BOTTOM OF FILTER SAND

17'

DIAMETER OF BOREHOLE

8"

L1 = 3 FT.
L2 = 5 FT.
L3 = 10 FT.
L4 = 17 FT.

CROSS-SECTIONAL
VIEW

TITLE

Monitoring Well MW-2
Biggerstaff Landfill
Gaston County, North Carolina
July 7, 1993



ATEC
Environmental
Consultants

CAD FILE

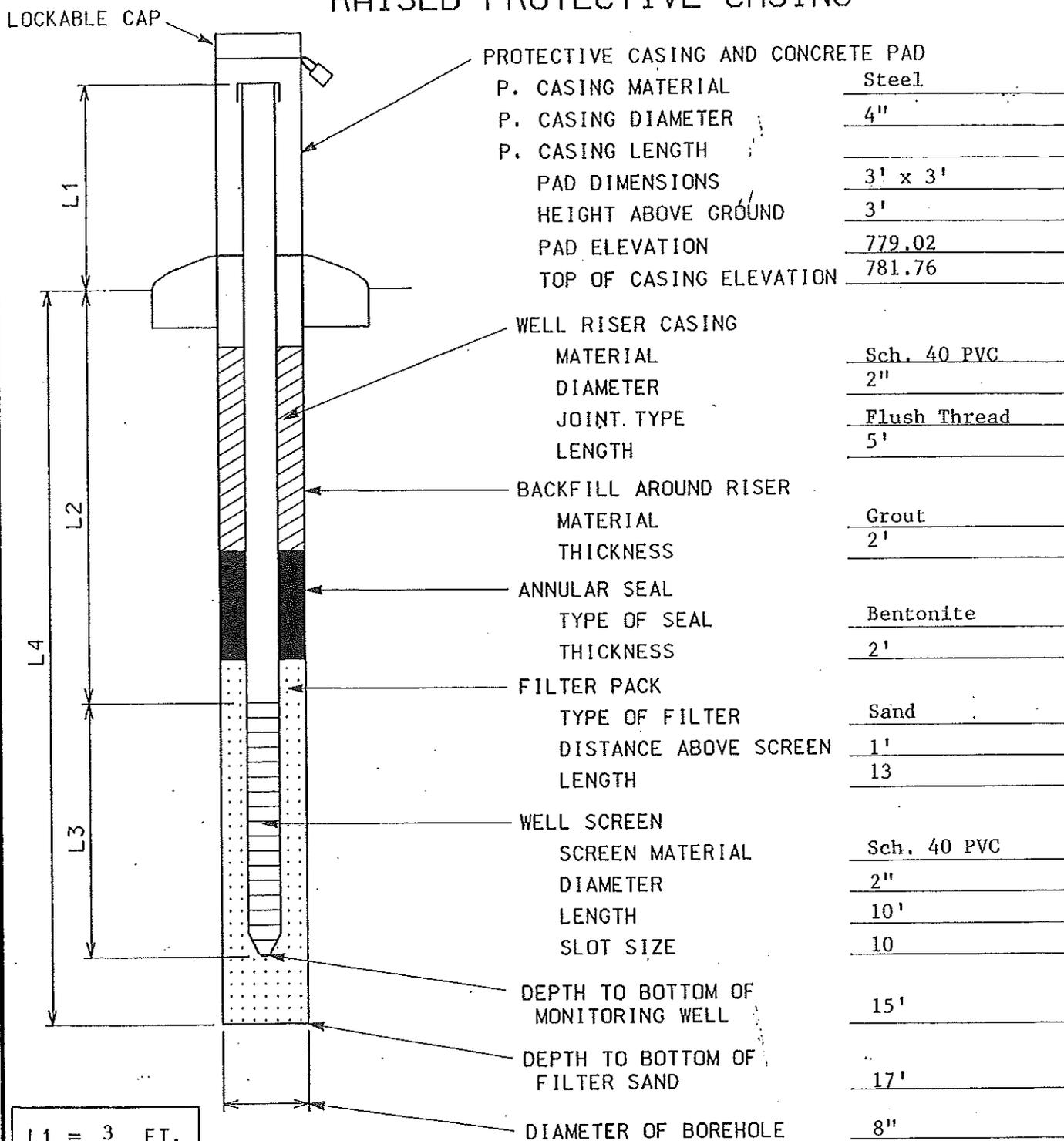
PREP. BY

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DATE

PROJECT NO.
35-07-93-00092

MONITORING WELL CONSTRUCTION DETAILS RAISED PROTECTIVE CASING



L1 = 3 FT.
 L2 = 5 FT.
 L3 = 10 FT.
 L4 = 17 FT.

**CROSS-SECTIONAL
VIEW**

TITLE

Monitoring Well MW-3
 Biggerstaff Landfill
 Gaston County, North Carolina
 July 8, 1993



**Environmental
Consultants**

CAD FILE

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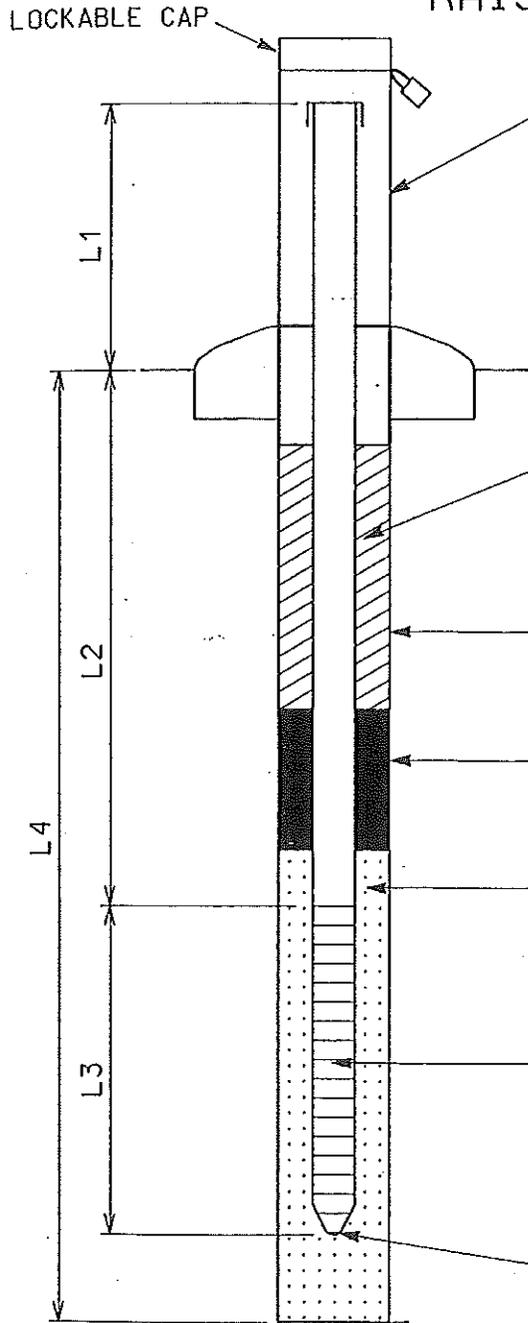
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DATE

PROJECT NO.

35-07-93-00092

MONITORING WELL CONSTRUCTION DETAILS RAISED PROTECTIVE CASING



PROTECTIVE CASING AND CONCRETE PAD	
P. CASING MATERIAL	Steel
P. CASING DIAMETER	4"
P. CASING LENGTH	
PAD DIMENSIONS	3' x 3'
HEIGHT ABOVE GROUND	3'
PAD ELEVATION	783.53
TOP OF CASING ELEVATION	786.22

WELL RISER CASING	
MATERIAL	Sch. 40 PVC
DIAMETER	2"
JOINT TYPE	Flush Thread
LENGTH	10'

BACKFILL AROUND RISER	
MATERIAL	Grout
THICKNESS	6'

ANNULAR SEAL	
TYPE OF SEAL	Bentonite
THICKNESS	2'

FILTER PACK	
TYPE OF FILTER	Sand
DISTANCE ABOVE SCREEN	2'
LENGTH	9'

WELL SCREEN	
SCREEN MATERIAL	Sch. 40 PVC
DIAMETER	2"
LENGTH	5'
SLOT SIZE	10'

DEPTH TO BOTTOM OF MONITORING WELL	15'
------------------------------------	-----

DEPTH TO BOTTOM OF FILTER SAND	17'
--------------------------------	-----

DIAMETER OF BOREHOLE	8"
----------------------	----

L1 = 3 FT.
 L2 = 10 FT.
 L3 = 5 FT.
 L4 = 17 FT.

**CROSS-SECTIONAL
VIEW**

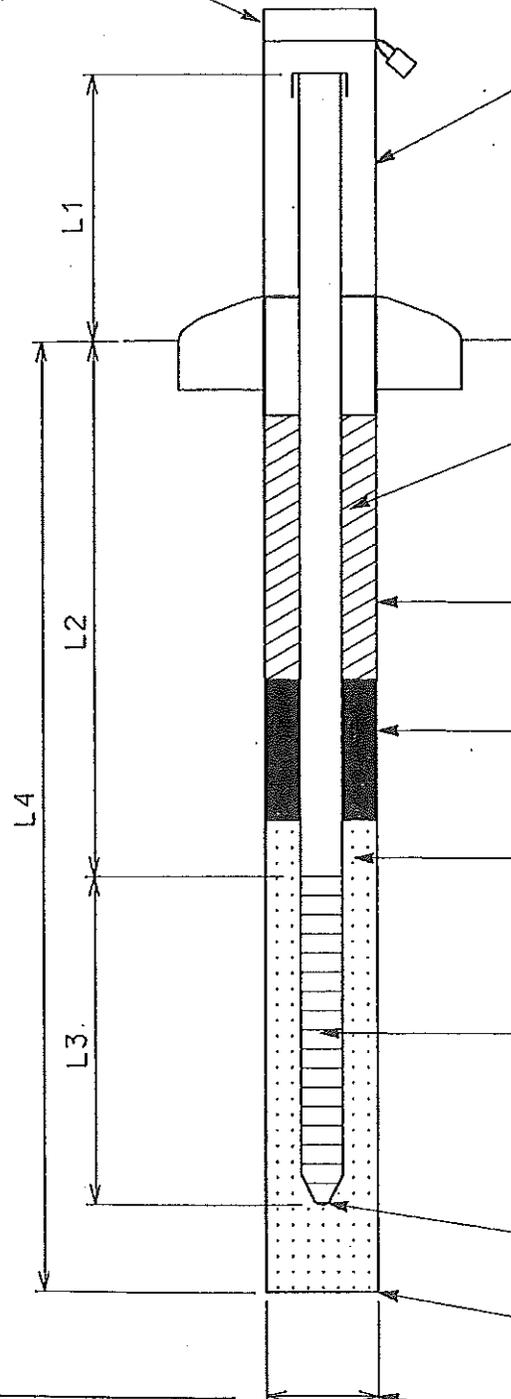
TITLE
 Monitoring Well MW-4
 Biggerstaff Landfill
 Gaston County, North Carolina
 July 8, 1993



CAD FILE	PREP. BY	REV. BY	DATE
			PROJECT NO. 35-07-93-00092

MONITORING WELL CONSTRUCTION DETAILS RAISED PROTECTIVE CASING

LOCKABLE CAP



PROTECTIVE CASING AND CONCRETE PAD	
P. CASING MATERIAL	Steel
P. CASING DIAMETER	4"
P. CASING LENGTH	
PAD DIMENSIONS	3' x 3'
HEIGHT ABOVE GROUND	3'
PAD ELEVATION	822.67
TOP OF CASING ELEVATION	825.72
WELL RISER CASING	
MATERIAL	Sch. 40 PVC
DIAMETER	2"
JOINT TYPE	Flush Thread
LENGTH	15'
BACKFILL AROUND RISER	
MATERIAL	Grout
THICKNESS	6.5
ANNULAR SEAL	
TYPE OF SEAL	Bentonite
THICKNESS	1.5
FILTER PACK	
TYPE OF FILTER	Sand
DISTANCE ABOVE SCREEN	7'
LENGTH	23'
WELL SCREEN	
SCREEN MATERIAL	Sch. 40 PVC
DIAMETER	2"
LENGTH	15'
SLOT SIZE	10'
DEPTH TO BOTTOM OF MONITORING WELL	30'
DEPTH TO BOTTOM OF FILTER SAND	31'
DIAMETER OF BOREHOLE	8"

L1 = 3 FT.
L2 = 15 FT.
L3 = 15 FT.
L4 = 31 FT.

**CROSS-SECTIONAL
VIEW**

TITLE

Monitoring Well MW-5
Biggerstaff Landfill
Gaston County, North Carolina
July 7, 1993



CAD FILE

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DATE

PROJECT NO.

35-07-93-00092