

Permit No.	Scan Date	DIN
5504	March 15, 2011	13295

55-04



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 N.C. Dept. of EHNR
 JUN 14 1999
 Winston-Salem
 Regional Office

Permit/Doc ID #	Date	Doc ID#
hu	06/11/99	DIN

June 11, 1999

NCDENR
 Division of Solid Waste
 55 Waughtown Road
 Winston-Salem, North Carolina 27107-2241

LAKE NORMAN
 C&D Landfill
 # 55-04
 CENTRAL FILES

Attn: Mr. Tim Jewett
 Western Area Engineer

Ref: Methane Migration Monitoring – Permit # 55-04

Dear Mr. Jewett,

Please find enclosed a methane monitoring well installation report.

Our plan is to check these monitoring points semi-annually with a MSA 62S gasscope. The on site buildings are monitored continuously with Macurco, Inc. GD-21 combustible gas monitors.

If you have any questions or comments, I can be reached at 704-822-3033.

Sincerely,

BFI/Lake Norman Landfill

David Craddock
 Facility Manager



ESP ASSOCIATES, P.A.
engineering • surveying • planning

May 11, 1999

Lake Norman C&D Landfill
 7099 Quarry Lane
 Stanley, North Carolina 28164

Attention: Mr. David Craddock

Reference: **METHANE MONITORING WELLS MMW-1, 2, 3, 4, 5 & 6**
LAKE NORMAN C&D LANDFILL
 ESP JOB NO. ND35

Dear Mr. Craddock:

Methane monitoring wells MMW- 1, 2, 3, 4, 5 & 6 were installed on May 6, 1999 by Geologic Exploration, Inc. at the Lake Norman C&D Landfill at the request of Mr. David Craddock with BFI. ESP Associates, P.A. personnel observed the installation of each well. Monitoring wells MMW-1 through MMW-5 were installed to 10 feet below ground surface and MMW-6 to 15 feet below ground surface. Attached with this letter are completed well construction records and typical as-built drawing for the methane monitoring wells. Also attached with this letter is a "Methane Monitoring Well Locations" plan based on approximate field locations and site plan provided by others. This plan was developed by modifying the "Water Quality Monitoring Plan" (S&ME Inc. 2/98) made available to us by BFI.

Corporate Office

10915 Southern Loop Boulevard, Pineville, NC 28134
 (704) 583-4949 Fax (704) 583-4950

Raleigh Office

1150 S. E. Maynard Rd., Ste. 240, Cary, NC 27511
 (919) 467-9613 Fax (919) 467-9614

Geotechnical Engineering Office

372 Crompton Street, Charlotte, NC 28241
 (704) 504-1015 Fax (704) 504-0917

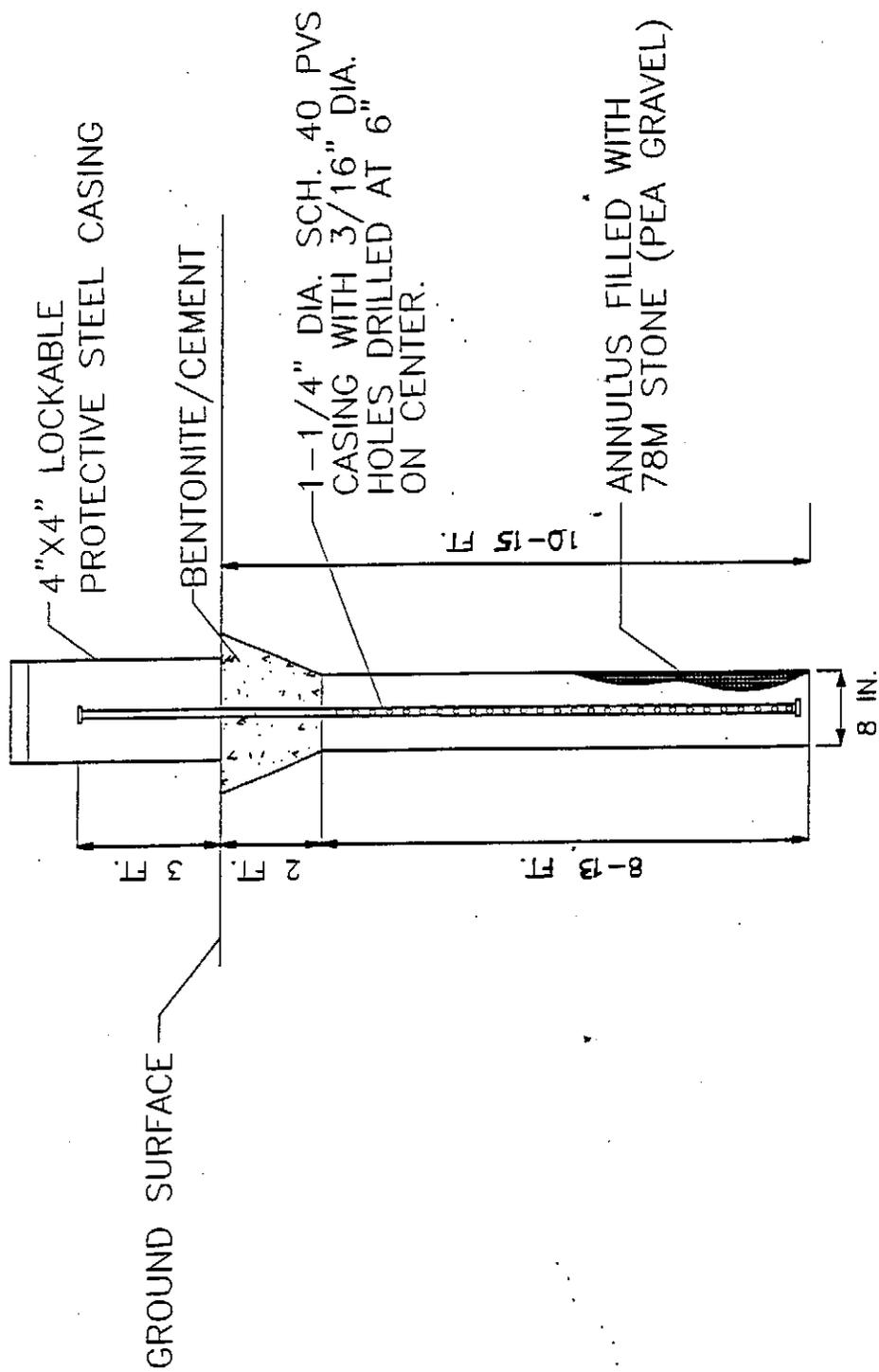
If you should have any questions or require additional information concerning this letter or attachments, please contact me.

Sincerely,

ESP Associates, P.A.

A handwritten signature in black ink, appearing to read "David W. Wasiela". The signature is fluid and cursive, with the first name "David" and last name "Wasiela" clearly distinguishable.

David W. Wasiela, P.E.
Project Engineer



LAKE NORMAN METHANE MONITORING WELLS

N.T.S.

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR Geologic Exploration, Inc.
 DRILLER REGISTRATION NUMBER 1175

STATE WELL CONSTRUCTION
 PERMIT NUMBER N/A

1. WELL LOCATION: (Show sketch of the location below)
 Nearest Town: Lowesville
Highway 16
 (Road, Community, or Subdivision and Lot No.)
2. OWNER Lake Norman Landfill, Inc.
 ADDRESS 7099 Quarry Lane
 (Street or Route No.)
Stanley, NC 28164
 City or Town State Zip Code
3. DATE DRILLED 5/6/99 USE OF WELL Methane Monitoring
4. TOTAL DEPTH 10 CUTTINGS COLLECTED YES NO
5. DOES WELL REPLACE EXISTING WELL? YES NO
6. STATIC WATER LEVEL: N/A FT. ABOVE TOP OF CASING
 BELOW
 TOP OF CASING IS 3 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST N/A
8. WATER ZONES (depth) N/A
9. CHLORINATION: Type N/A Amount N/A

County: Lincoln

Depth		DRILLING LOG
From	To	Formation Description
<u>0</u>	<u>6</u>	<u>Red Brown slightly sandy clayey SILT</u>
<u>6</u>	<u>10</u>	<u>Red Brown fine sandy SILT</u>

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

10. CASING:
- | From | Depth | To | Diameter | Wall Thickness or Weight/Ft. | Material |
|------|----------|----------|--------------|------------------------------|------------|
| | <u>0</u> | <u>2</u> | <u>1 1/4</u> | <u>SCH 40</u> | <u>PVC</u> |
| | | | | | |
| | | | | | |
11. GROUT:
- | From | Depth | To | Material | Method |
|------|----------|----------|-----------------|---------------|
| | <u>0</u> | <u>2</u> | <u>Portland</u> | <u>cement</u> |
| | | | | |
12. SCREEN:
- | From | Depth | To | Diameter | Slot Size | Material |
|------|----------|-----------|------------------|-----------------|------------|
| | <u>2</u> | <u>10</u> | <u>1 1/4 in.</u> | <u>3/16 in.</u> | <u>PVC</u> |
| | | | | | |
| | | | | | |
13. GRAVEL PACK:
- | From | Depth | To | Size | Material |
|------|----------|-----------|------------|--------------|
| | <u>2</u> | <u>10</u> | <u>78M</u> | <u>Stone</u> |
| | | | | |

14. REMARKS:

Well No. MMW - 1
 I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C.
 WELL CONSTRUCTION STANDARDS AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO
 THE WELL OWNER

[Signature] 5/11/99
 SIGNATURE OF CONTACTOR OR AGENT DATE

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR Geologic Exploration, Inc.
 DRILLER REGISTRATION NUMBER 1175

STATE WELL CONSTRUCTION
 PERMIT NUMBER N/A

1. WELL LOCATION: (Show sketch of the location below)
 Nearest Town: Lowesville
Highway 16
 (Road, Community, or Subdivision and Lot No.)

County: Lincoln

2. OWNER Lake Norman Landfill, Inc.
 ADDRESS 7099 Quarry Lane

Depth		DRILLING LOG
From	To	Formation Description
<u>0</u>	<u>5</u>	<u>Red Brown slightly sandy clayey SILT</u>
<u>5</u>	<u>10</u>	<u>Red Brown to Brown slightly clayey SILT w/ some Mica</u>

(Street or Route No.)
Stanley, NC 28164
 City or Town State Zip Code

3. DATE DRILLED 5/6/99 USE OF WELL Methane Monitoring

4. TOTAL DEPTH 10 CUTTINGS COLLECTED YES NO
 5. DOES WELL REPLACE EXISTING WELL? YES NO
 6. STATIC WATER LEVEL: N/A FT. ABOVE TOP OF CASING
 BELOW
 TOP OF CASING IS 3 FT. ABOVE LAND SURFACE.

7. YIELD (gpm): N/A METHOD OF TEST N/A
 8. WATER ZONES (depth) N/A

If additional space is needed use back of form

9. CHLORINATION: Type N/A Amount N/A

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

10. CASING:

Depth	Diameter	Wall Thickness or Weight/Ft.	Material
From <u>0</u> To <u>2</u> Ft.	<u>1 1/4</u> Ft.	<u>SCH 40</u>	<u>PVC</u>
From _____ To _____ Ft.	_____ Ft.	_____	_____
From _____ To _____ Ft.	_____ Ft.	_____	_____

11. GROUT:

Depth	Material	Method
From <u>0</u> To <u>2</u> Ft.	<u>Portland</u>	<u>cement</u>
From _____ To _____ Ft.	_____	_____

12. SCREEN:

Depth	Diameter	Slot Size	Material
From <u>2</u> To <u>10</u> Ft.	<u>1 1/4 in.</u>	<u>3/16 in.</u>	<u>PVC</u>
From _____ To _____ Ft.	_____ in.	_____ in.	_____
From _____ To _____ Ft.	_____ in.	_____ in.	_____

13. GRAVEL PACK:

Depth	Size	Material
From <u>2</u> To <u>10</u> Ft.	<u>78M</u>	<u>Stone</u>
From _____ To _____ Ft.	_____	_____

14. REMARKS:

Well No. MMW - 2
 I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C.
 WELL CONSTRUCTION STANDARDS AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO
 THE WELL OWNER

[Signature] 5/11/99
 SIGNATURE OF CONTACTOR OR AGENT DATE

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR Geologic Exploration, Inc.
 DRILLER REGISTRATION NUMBER 1175

STATE WELL CONSTRUCTION
 PERMIT NUMBER N/A

1. WELL LOCATION: (Show sketch of the location below)
 Nearest Town: Lowesville
Highway 16
 (Road, Community, or Subdivision and Lot No.)

County: Lincoln

2. OWNER Lake Norman Landfill, Inc.

ADDRESS 7099 Quarry Lane
 (Street or Route No.)
Stanley, NC 28164
 City or Town State Zip Code

Depth		DRILLING LOG
From	To	Formation Description
<u>0</u>	<u>6.5</u>	<u>Red Brown slightly sandy clayey SILT</u>
<u>6.5</u>	<u>10</u>	<u>Light Gray slightly sandy clayey SILT</u>
_____	_____	_____
_____	_____	_____

3. DATE DRILLED 5/6/99 USE OF WELL Methane Monitoring

4. TOTAL DEPTH 10 CUTTINGS COLLECTED YES NO

5. DOES WELL REPLACE EXISTING WELL? YES NO

6. STATIC WATER LEVEL: N/A FT. ABOVE TOP OF CASING
BELOW
 TOP OF CASING IS 3 FT. ABOVE LAND SURFACE.

7. YIELD (gpm): N/A METHOD OF TEST N/A

8. WATER ZONES (depth) N/A

If additional space is needed use back of form

9. CHLORINATION: Type N/A Amount N/A

LOCATION SKETCH

(Show direction and distance from at least two State Roads,
 or other map reference points)

10. CASING:

From	Depth	To	Diameter	Wall Thickness	Material
			Ft.	or Weight/Ft.	
	<u>0</u>	<u>2</u>	<u>1 1/4</u>	<u>SCH 40</u>	<u>PVC</u>
From	To	Ft.			
From	To	Ft.			

11. GROUT:

From	Depth	To	Material	Method
	<u>0</u>	<u>2</u>	<u>Portland</u>	<u>cement</u>
From	To	Ft.		
From	To	Ft.		

12. SCREEN:

From	Depth	To	Diameter	Slot Size	Material
			Ft.	in.	
	<u>2</u>	<u>10</u>	<u>1 1/4</u>	<u>3/16</u>	<u>PVC</u>
From	To	Ft.	in.	in.	
From	To	Ft.	in.	in.	

13. GRAVEL PACK:

From	Depth	To	Size	Material
			Ft.	
	<u>2</u>	<u>10</u>	<u>78M</u>	<u>Stone</u>
From	To	Ft.		
From	To	Ft.		

14. REMARKS:

Well No. MMW-3

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C.
 WELL CONSTRUCTION STANDARDS AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO
 THE WELL OWNER

[Signature] 5/11/99
 SIGNATURE OF CONTACTOR OR AGENT DATE

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR Geologic Exploration, Inc.
 DRILLER REGISTRATION NUMBER 1175

STATE WELL CONSTRUCTION
 PERMIT NUMBER N/A

1. WELL LOCATION: (Show sketch of the location below)
 Nearest Town: Lowsville
Highway 16
 (Road, Community, or Subdivision and Lot No.)
2. OWNER Lake Norman Landfill, Inc.
 ADDRESS 7099 Quarry Lane
 (Street or Route No.)
Stanley, NC 28164
 City or Town State Zip Code
3. DATE DRILLED 5/6/99 USE OF WELL Methane Monitoring
4. TOTAL DEPTH 10 CUTTINGS COLLECTED YES NO
5. DOES WELL REPLACE EXISTING WELL? YES NO
6. STATIC WATER LEVEL: N/A FT. ABOVE TOP OF CASING
 BELOW
 TOP OF CASING IS 3 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): N/A METHOD OF TEST N/A
8. WATER ZONES (depth) N/A
9. CHLORINATION: Type N/A Amount N/A

County: Lincoln

Depth From To	DRILLING LOG Formation Description
<u>0 - 3</u>	<u>Brown sandy SILT w/ rock fragments</u>
<u>3 - 5</u>	<u>Brown slightly clayey sandy SILT w/ Mica</u>
<u>5 - 10</u>	<u>Red Brown and Brown slightly sandy clayey SILT w/ Mica</u>

If additional space is needed use back of form

LOCATION SKETCH

(Show direction and distance from at least two State Roads, or other map reference points)

10. CASING:

Depth	Diameter	Wall Thickness or Weight/Ft.	Material
From <u>0</u> To <u>2</u> Ft.	<u>1 1/4</u>	<u>SCH 40</u>	<u>PVC</u>
From _____ To _____ Ft.	_____	_____	_____
From _____ To _____ Ft.	_____	_____	_____

11. GROUT:

Depth	Material	Method
From <u>0</u> To <u>2</u> Ft.	<u>Portland</u>	<u>cement</u>
From _____ To _____ Ft.	_____	_____

12. SCREEN:

Depth	Diameter	Slot Size	Material
From <u>2</u> To <u>10</u> Ft.	<u>1 1/4 in.</u>	<u>3/16 in.</u>	<u>PVC</u>
From _____ To _____ Ft.	_____ in.	_____ in.	_____
From _____ To _____ Ft.	_____ in.	_____ in.	_____

13. GRAVEL PACK:

Depth	Size	Material
From <u>2</u> To <u>10</u> Ft.	<u>78M</u>	<u>Stone</u>
From _____ To _____ Ft.	_____	_____

14. REMARKS:

Well No. MMW - 4
 I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C.
 WELL CONSTRUCTION STANDARDS AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO
 THE WELL OWNER

[Signature] 5/11/99
 SIGNATURE OF CONTACTOR OR AGENT DATE

FOR OFFICE USE ONLY

Quad No. _____ Serial No. _____
 Lat. _____ Lon. _____ Pc. _____
 Minor Basin _____
 Basin Code _____
 Header Ent. _____ GW-1 Ent. _____

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR Geologic Exploration, Inc.

STATE WELL CONSTRUCTION PERMIT NUMBER N/A

DRILLER REGISTRATION NUMBER 1175

1. WELL LOCATION: (Show sketch of the location below)
 Nearest Town: Lowesville
Highway 16
 (Road, Community, or Subdivision and Lot No.)

County: Lincoln

2. OWNER Lake Norman Landfill, Inc.

Depth From To	DRILLING LOG Formation Description
<u>0 - 2</u>	<u>Red Brown slightly clayey sandy SILT w/ Mica</u>
<u>2 - 10</u>	<u>Red Brown sandy clayey SILT w/some Mica</u>

ADDRESS 7099 Quarry Lane
 (Street or Route No.)
Stanley, NC 28164

City or Town State Zip Code

3. DATE DRILLED 5/6/99 USE OF WELL Methane Monitoring

4. TOTAL DEPTH 10 CUTTINGS COLLECTED ___ YES ___ X ___ NO

5. DOES WELL REPLACE EXISTING WELL? ___ YES ___ X ___ NO

6. STATIC WATER LEVEL: N/A FT. ABOVE TOP OF CASING
 BELOW
 TOP OF CASING IS 3 FT. ABOVE LAND SURFACE.

7. YIELD (gpm): N/A METHOD OF TEST N/A

If additional space is needed use back of form

8. WATER ZONES (depth) N/A

LOCATION SKETCH

9. CHLORINATION: Type N/A Amount N/A

(Show direction and distance from at least two State Roads, or other map reference points)

10. CASING:

From	Depth To	Diameter	Wall Thickness or Weight/Ft.	Material
From <u>0</u>	To <u>2</u>	Ft. <u>1 1/4</u>	<u>SCH 40</u>	<u>PVC</u>
From _____	To _____	Ft. _____	_____	_____
From _____	To _____	Ft. _____	_____	_____

11. GROUT:

From	Depth To	Diameter	Material	Method
From <u>0</u>	To <u>2</u>	Ft. <u>Portland</u>	<u>cement</u>	_____
From _____	To _____	Ft. _____	_____	_____

12. SCREEN:

From	Depth To	Diameter	Slot Size	Material
From <u>2</u>	To <u>10</u>	Ft. <u>1 1/4 in.</u>	<u>3/16 in.</u>	<u>PVC</u>
From _____	To _____	Ft. _____	in. _____	in. _____
From _____	To _____	Ft. _____	in. _____	in. _____

13. GRAVEL PACK:

From	Depth To	Size	Material
From <u>2</u>	To <u>10</u>	Ft. <u>78M</u>	<u>Stone</u>
From _____	To _____	Ft. _____	_____

14. REMARKS:

Well No. MMW-5

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C. WELL CONSTRUCTION STANDARDS AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER

[Signature] 5/11/99
 SIGNATURE OF CONTACTOR OR AGENT DATE

WELL CONSTRUCTION RECORD

DRILLING CONTRACTOR Geologic Exploration, Inc.
 DRILLER REGISTRATION NUMBER 1175

STATE WELL CONSTRUCTION
 PERMIT NUMBER N/A

1. WELL LOCATION: (Show sketch of the location below)
 Nearest Town: Lowesville
Highway 16
 (Road, Community, or Subdivision and Lot No.)

County: Lincoln

2. OWNER Lake Norman Landfill, Inc.

Depth From	To	DRILLING LOG Formation Description
<u>0</u>	<u>2</u>	<u>Red Brown slightly sandy clayey SILT w/ Topsoil</u>
<u>2</u>	<u>11</u>	<u>Reddish brown to Brown slightly sandy to Sandy silty CLAY</u>
<u>11</u>	<u>15</u>	<u>Grayish Brown sandy SILT</u>

ADDRESS 7099 Quarry Lane

(Street or Route No.)

Stanley, NC 28164

City or Town State Zip Code

3. DATE DRILLED 5/6/99 USE OF WELL Methane Monitoring

4. TOTAL DEPTH 15 CUTTINGS COLLECTED YES NO

5. DOES WELL REPLACE EXISTING WELL? YES NO

6. STATIC WATER LEVEL: N/A FT. ABOVE TOP OF CASING
 BELOW
 TOP OF CASING IS 3 FT. ABOVE LAND SURFACE.

7. YIELD (gpm): N/A METHOD OF TEST N/A

If additional space is needed use back of form

8. WATER ZONES (depth) N/A

LOCATION SKETCH

9. CHLORINATION: Type N/A Amount N/A

(Show direction and distance from at least two State Roads, or other map reference points)

10. CASING:

Depth From	To	Diameter	Wall Thickness or Weight/Ft.	Material
<u>0</u>	<u>2</u>	<u>1 1/4</u>	<u>SCH 40</u>	<u>PVC</u>

11. GROUT:

Depth From	To	Material	Method
<u>0</u>	<u>2</u>	<u>Portland</u>	<u>cement</u>

12. SCREEN:

Depth From	To	Diameter	Slot Size	Material
<u>2</u>	<u>10</u>	<u>1 1/4 in.</u>	<u>3/16 in.</u>	<u>PVC</u>

13. GRAVEL PACK:

Depth From	To	Size	Material
<u>2</u>	<u>10</u>	<u>78M</u>	<u>Stone</u>

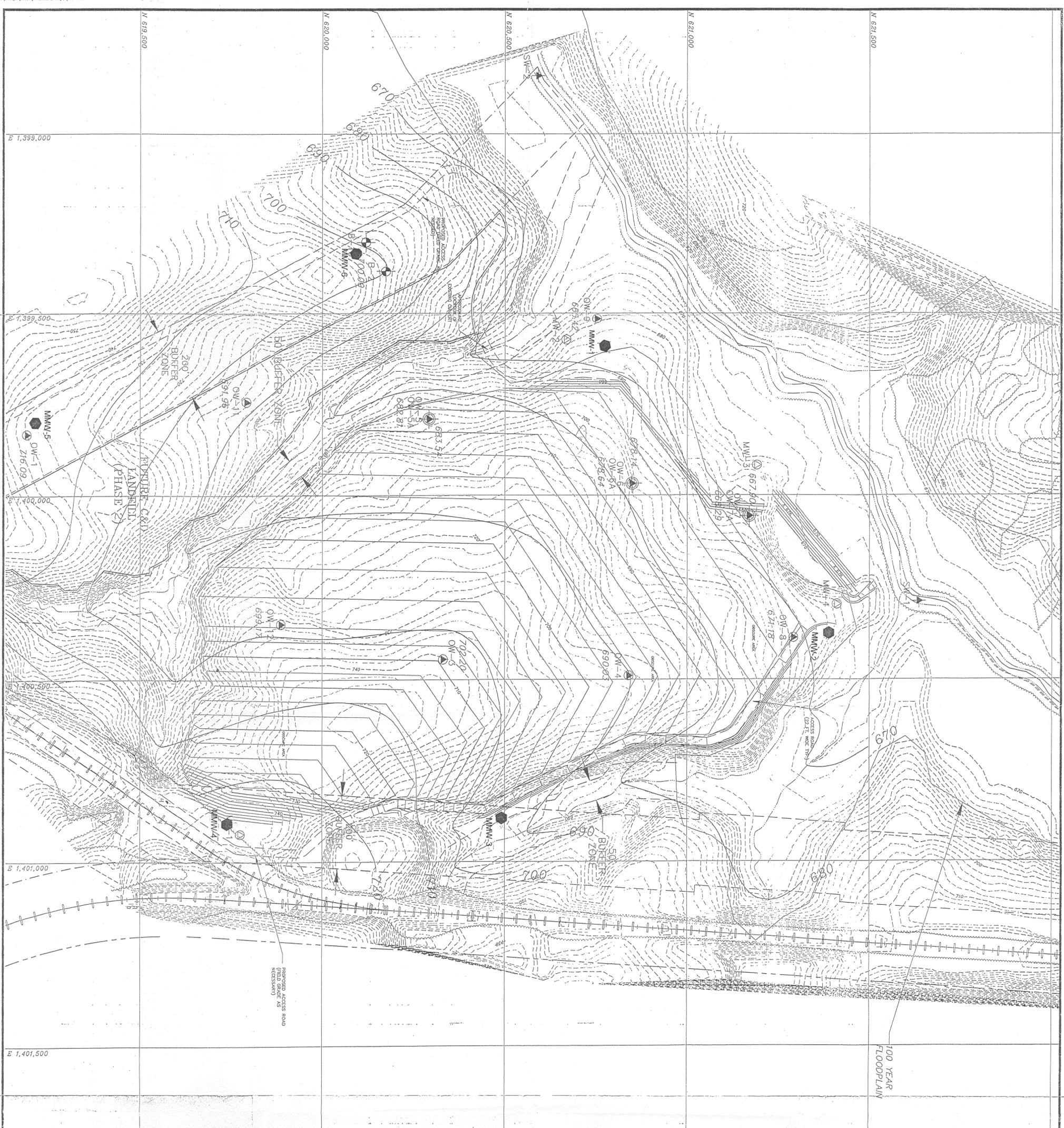
14. REMARKS:

Well No. MMW-6

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C. WELL CONSTRUCTION STANDARDS AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER

SIGNATURE OF CONTACTOR OR AGENT DATE

[Handwritten Signature] 5/11/99



COORDINATES FOR OBSERVATION WELLS AND BORINGS

Boring	Netting	Existing	Ground Elevation (MSL)	Top of Casing Elevation (MSL)
OW-1	619,150.21	1,399,631.34	725.91	726.49
B-2	620,174.88	1,399,380.05	723.18	N/A
OW-3	620,330.01	1,400,447.95	729.84	742.89
OW-4	620,848.97	1,400,489.71	729.44	722.89
OW-5	620,288.25	1,399,977.48	685.04	686.13
OW-5A	620,295.35	1,399,979.93	685.25	687.42
OW-6	620,944.01	1,399,972.14	697.01	700.34
OW-6A	620,954.97	1,399,982.16	697.97	698.76
OW-7	621,175.91	1,400,951.07	684.37	687.45
OW-7A	621,181.98	1,400,951.91	683.22	685.72
OW-8	621,281.08	1,400,597.44	693.18	693.18
OW-9	621,753.40	1,399,516.19	677.24	680.59
B-10	620,190.00	1,399,585.00	723.00	N/A
OW-11	619,790.45	1,399,743.79	702.49	706.19
OW-12	618,887.08	1,400,350.87	723.11	721.48

NO.	DATE	DESCRIPTION	BY

GRAPHIC SCALE
 1 inch = 100 ft.

LEGEND

- POTIOMETRIC SURFACE
- EXISTING GRADE CONTOUR
- PROPOSED CONSTRUCTION CONTOUR
- PROPERTY LINE
- 100 YEAR FLOODPLAIN
- PROPOSED MONITORING WELL LOCATION
- LOCATED SURFACE WATER SAMPLING
- EXISTING OBSERVATION WELL
- EXISTING BORING LOCATION
- MMW-1 METHANE MONITORING WELL LOCATION**

REFERENCES:

- TOPOGRAPHIC SURVEY FOR LAKE NORMAN LANDFILL, INC. BY SUTLIS
- TOPOGRAPHIC SURVEY BASED ON BORINGS AT ELEVATION 784.94
- 610,000.43 EXISTING 1,400,164.49 COORDINATES AT ELEVATION 784.94
- MSL PROVIDED BY SUTLIS SURVEYING, P.A.

SAVE
 ENGINEERING & SURVEYING

WATER QUALITY MONITORING PLAN
 LAKE NORMAN LANDFILL, INC.
 LINCOLN COUNTY, NORTH CAROLINA

SCALE: AS SHOWN
 DRAWN BY: CLD
 CHECKED BY: JMB
 DATE: 2-18-98
 SHEET 9 OF 12

