



Construction Documentation Report

Landfill Gas Collection and Control System Expansion 2011

Johnston County Landfill (Permit# 51-03)

Presented to:

Johnston County Public Utilities Department

Johnston County Landfill
680 County Home Road
Smithfield, North Carolina 27577

Prepared by:

C2I Methane Partners
93 St. Marks Place, Suite 2
New York, NY 10009
(212) 804-6279

SCS ENGINEERS, PC
2520 Whitehall Drive, Suite 450
Charlotte, NC 28273
(704) 504-3107

Permit No.	Date	Document ID No.
51-03	February 09, 2012	16068

December 6, 2011
File No. 02210301.00

APPROVED DOCUMENT
Division of Waste Management
Solid Waste Section

Received Dated: **November 2011 and revised through December 2011**
Date: **February 09, 2012** By: **Ming-Tai Chao**

Offices Nationwide
www.scsengineers.com

Construction Documentation Report
**Landfill Gas Collection and Control
System Expansion 2011**
Johnston County Landfill

Presented To:

Johnston County Landfill
680 County Home Road
Smithfield, North Carolina 27577

Prepared By:

C2I Methane Partners
93 St. Marks Place, Suite 2
New York, NY 10009
(212) 804-6279

SCS ENGINEERS, PC
2520 Whitehall Drive, Suite 450
Charlotte, NC 28273
(704) 504-3107

December 6, 2011
File No. 02210301.00

Johnston County As-built Well Schedule
29-Nov-11

WELL ID	NORTHING	EASTING	FINAL GROUND SURFACE ELEVATION	BASELINER ELEVATION	LANDFILL DEPTH	WELL DEPTH	LENGTH OF 6" SOLID PIPE BELOW GRADE	LENGTH OF 6" SOLID PIPE ABOVE GRADE	LENGTH OF 6" PERFORATED PIPE LENGTH
EW-405	643,655	2,170,934	264			42	17	4	25
EW-406	643,760	2,170,953	266			42	17	4	25
EW-407	643,873	2,170,980	253			42	17	4	25
EW-408	644,076	2,170,998	246			42	17	4	25
EW-409	644,424	2,170,959	231			42	17	4	25
EW-410	644,587	2,170,930	232			42	17	4	25
EW-411	644,725	2,170,961	226			42	17	4	25
EW-412	644,792	2,170,819	219			42	17	4	25
EW-413	644,654	2,170,576	218	164	54	39	12	4	26
EW-414	644,426	2,170,659	269	175	94	74	24	4	49
EW-415	644,135	2,170,686	276	182	94	74	23	4	49
EW-416	643,838	2,170,642	276	188	88	67	21	4	45
EW-417	REMOVED FROM WELL SCHEDULE (4/22/11)								
EW-501	642,389	2,169,340	273	230	42	27	11	4	15
EW-502	642,509	2,169,372	271	228	42	27	11	4	15
EW-503	642,486	2,169,186	288	225	63	40	14	4	25
EW-504	642,639	2,169,216	283	227	57	42	13	4	28
EW-505	642,632	2,169,096	283	223	60	38	12	4	25
EW-506	642,792	2,169,005	274	224	50	30	14	4	15
EW-507	642,938	2,168,923	269	214	56	41	20	4	20
EW-508	643,068	2,168,841	261	212	50	35	22	4	12
EW-509	643,319	2,168,739	250	206	44	28	15	4	12
EW-510	643,443	2,168,716	246	202	44	28	15	4	12
EW-511	643,598	2,168,680	242	198	44	26	13	4	12
TOTAL						952	376	92	561

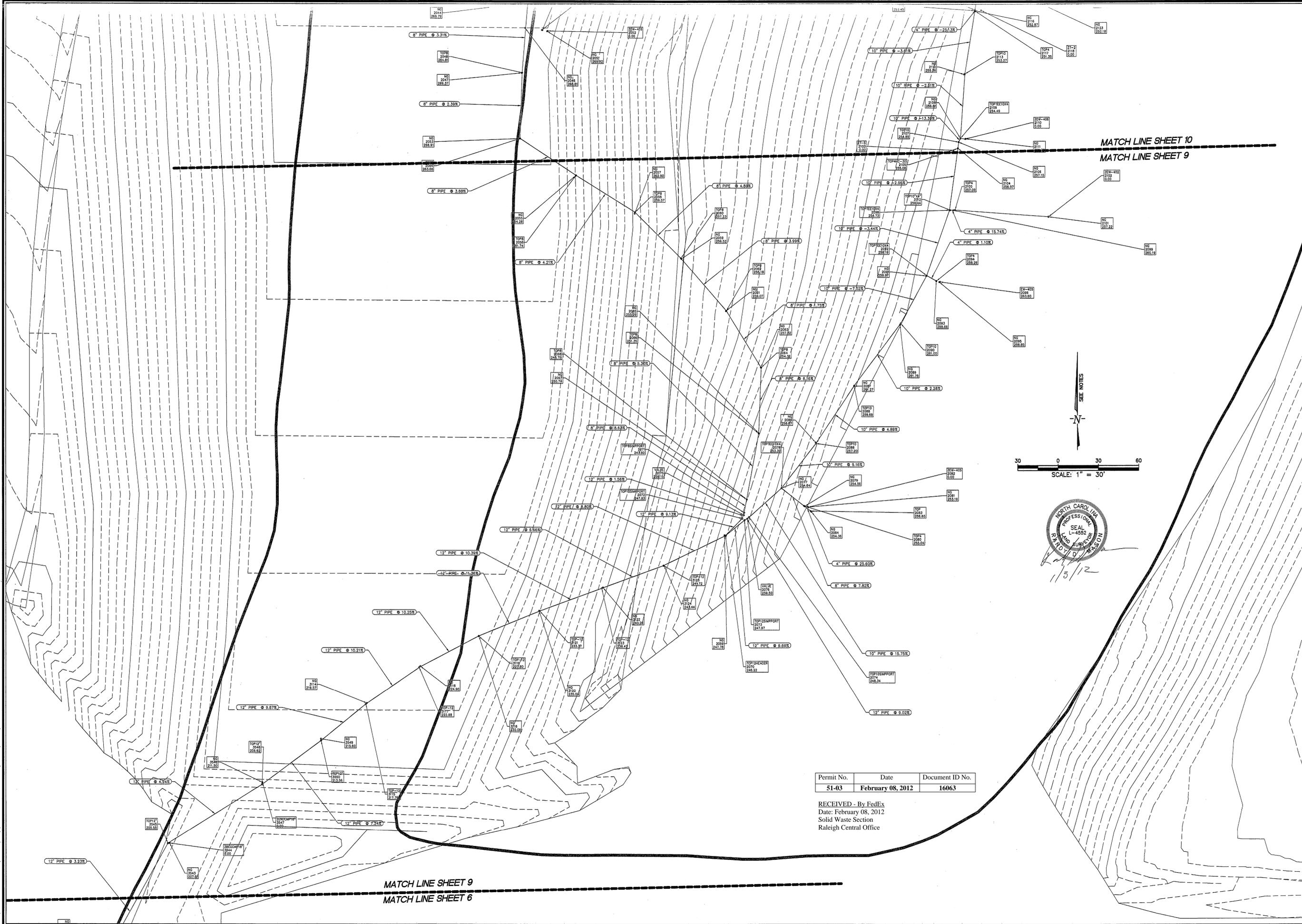
NOTES:

1. BASE GRADE DATA FOR PHASE 4A WAS TAKEN FROM RSG.
2. BASE GRADE DATA FOR PHASE 5 WAS TAKEN FROM FDL & ASSOC. "TOP OF CLAY & TOP OF OPERATIONAL COVER" DATED 11/7/96, REV. 2/21/97.
3. FINAL LANDFILL SURFACE TOPOGRAPHY FROM SURVEYS ON 4/14/11, 4/15/11, 5/3/11, 5/24/11, 6/27/11, 6/28/11, 6/28/11, AND 7/8/11,
4. CONFIRMED BASE GRADES FOR WELLS EW-509, EW-510, AND EW-511 ON 4/26/11.

Permit No.	Date	Document ID No.
51-03	February 08, 2012	16063

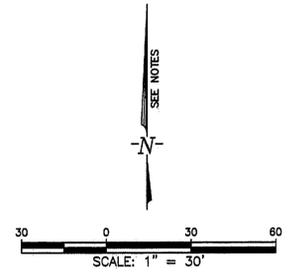
RECEIVED - By FedEx
Date: February 08, 2012
Solid Waste Section
Raleigh Central Office

PA\10065 - Johnston County Landfill Survey\AC02012 - as-built-revised.dwg Tuesday, January 03, 2012 12:40:38 PM - M-III ENGINEERING



MATCH LINE SHEET 10
MATCH LINE SHEET 9

MATCH LINE SHEET 9
MATCH LINE SHEET 6



Permit No.	Date	Document ID No.
51-03	February 08, 2012	16063

RECEIVED - By FedEx
Date: February 08, 2012
Solid Waste Section
Raleigh Central Office

970 TRINITY ROAD
RALEIGH, NC 27607
TEL: 919-822-2222
WWW.M-III.COM
LICENSE #: P-0661



**JOHNSTON COUNTY
LANDFILL GAS PROJECT**

JOHNSTON COUNTY
NORTH CAROLINA

AS-BUILTS MAP

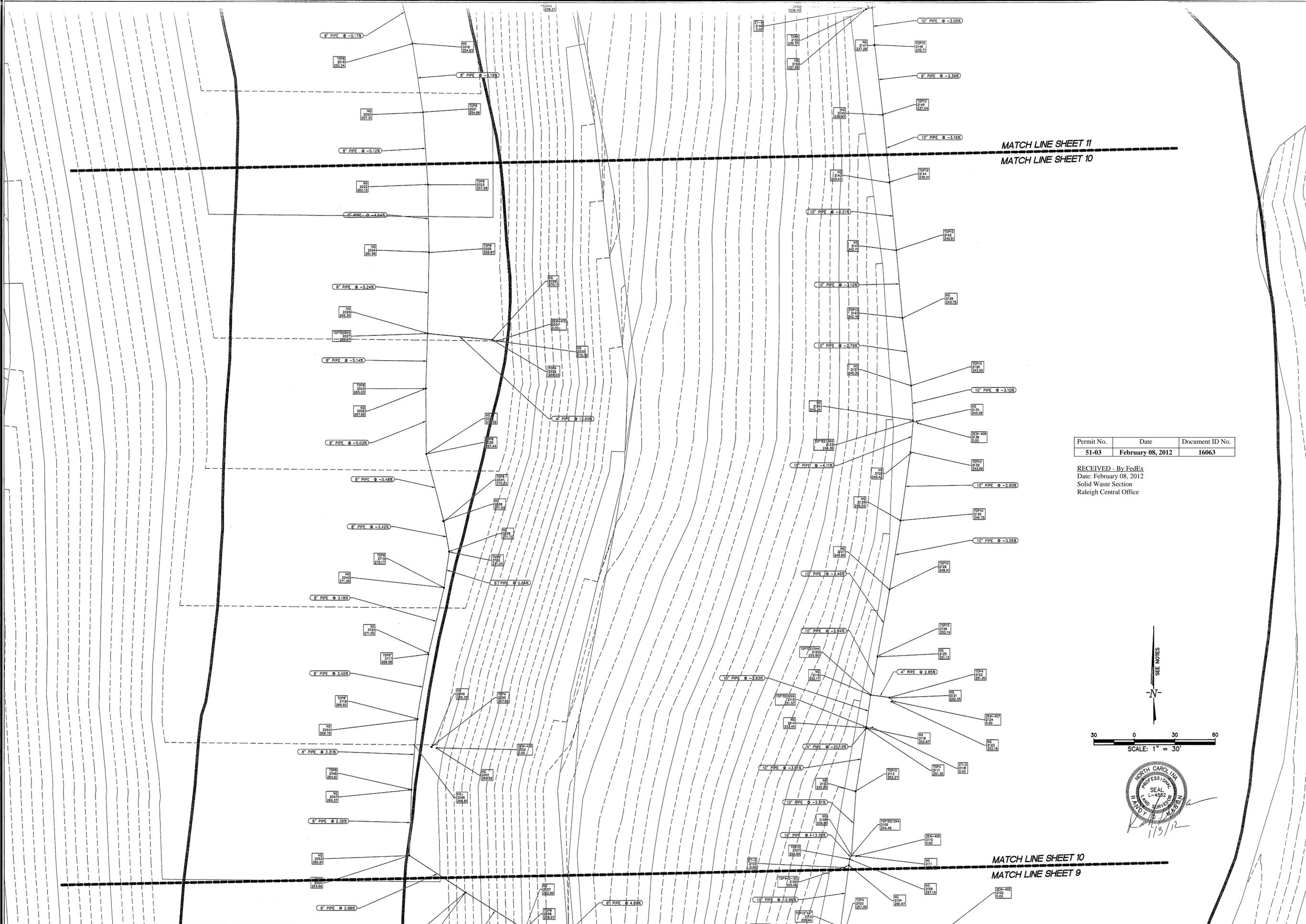
JOHNSTON COUNTY
NORTH CAROLINA

NO.	DATE	DESCRIPTION	BY
1	12/29/11	Revised to contract and labels.	RDM

DATE: 12-2-11
DRAWN: RDM
CHECKED: MWY
SCALE: 1" = 30'

SHEET: 9 OF 12
CAD FILE: ASBUILTS.DWG
PROJECT NO: 110065

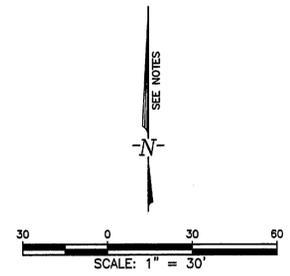
PA\110065 - Johnston County Landfill\GIS\mxd\2012-01-12\12-21-11-07 PM - M-IE ENGINEERING



MATCH LINE SHEET 11
MATCH LINE SHEET 10

Permit No.	Date	Document ID No.
51-03	February 08, 2012	16063

RECEIVED - By FedEx
Date: February 08, 2012
Solid Waste Section
Raleigh Central Office



MATCH LINE SHEET 10
MATCH LINE SHEET 9

970 TRINITY ROAD
RALEIGH, NC 27607
TEL: 919-822-2222
WWW.M-III.COM
LICENSE #: P-0661



JOHNSTON COUNTY
NORTH CAROLINA

JOHNSTON COUNTY LANDFILL GAS PROJECT

JOHNSTON COUNTY

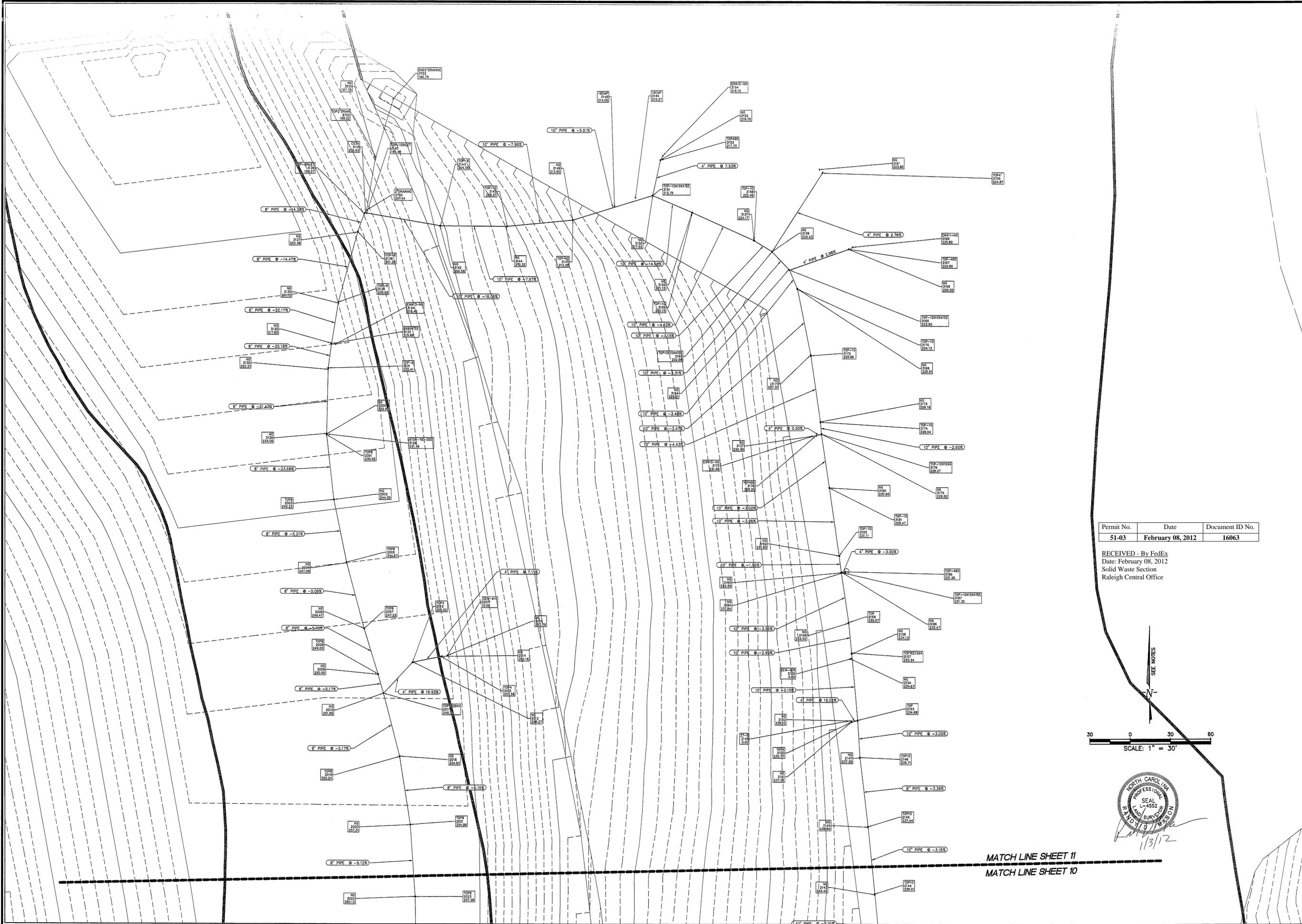
AS-BUILTS MAP

JOHNSTON COUNTY

DATE	DESCRIPTION	BY	SCALE
12-2-11	Revised to correct well labels.	RDM	1" = 30'
12/29/11		MWY	

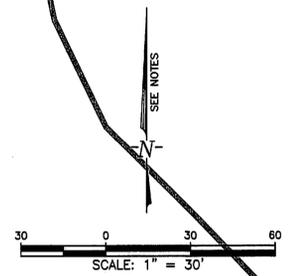
CAD FILE: ASBUILTS.DWG
PROJECT NO: 110065

PA\10065 - Johnston County Landfill Survey\10065.dwg - Tuesday, January 03, 2012 12:52:17 PM - M-III ENGINEERING



Permit No.	Date	Document ID No.
51-03	February 08, 2012	16063

RECEIVED - By FedEx
 Date: February 08, 2012
 Solid Waste Section
 Raleigh Central Office



MATCH LINE SHEET 11
 MATCH LINE SHEET 10

970 TRINITY ROAD
 RALEIGH, NC 27607
 TEL: 919-822-2222
 WWW.M-III.COM
 LICENSE #: P-0661



**JOHNSTON COUNTY
 LANDFILL GAS PROJECT**

JOHNSTON COUNTY
 AS-BUILTS MAP

JOHNSTON COUNTY
 NORTH CAROLINA

NO.	DATE	DESCRIPTION	BY
1	12/29/11	Revised to correct well labels.	ROM

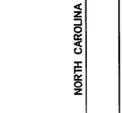
DATE:	SCALE:
12-2-11	1" = 30'

DRAWN:	CHECKED:
RCM	MWY

SHEET: **11** OF **12**

CAD FILE: **ABBLTSDWG**

PROJECT NO: **110065**



NORTH CAROLINA
JOHNSTON COUNTY

JOHNSTON COUNTY LANDFILL GAS PROJECT AS-BUILTS MAP

DATE: 12-2-11
SCALE: N.T.S.
DRAWN: RDM
CHECKED: MWY
SHEET: 12 of 12
CAD FILE: ASBUILTS.DWG
PROJECT NO: 110065



Point #	Northing	Easting	Elevation	Description
3016	64305.07	217001.91	246.77	TOP-490
3028	64295.52	217001.19	227.13	NG
3021	64487.57	217056.02	230.92	TOP8
3025	64329.39	216995.07	261.34	TOP-10
3037	64311.93	217029.57	208.25	NG
3002	643001.17	217024.80	232.27	TOP-12/DOPE
3014	64281.99	217001.85	214.86	NG
3436	64223.18	216935.55	242.03	TOP2
3445	64227.30	216945.36	237.41	TOP8"X10"REDUCER
3422	64248.76	216923.26	280.35	NG
3367	64245.01	216920.60	284.27	TOP8
3376	64261.01	216937.19	288.28	TOP4"TEE
3353	64250.44	216884.79	226.08	TOP4"TEE
3278	64289.07	216846.20	289.50	NG
3404	64208.01	216884.42	280.75	EW508
3284	64296.69	216885.03	282.52	TOP8
3261	643073.66	216880.21	256.46	NG
3208	643593.32	216876.34	239.19	TOP4"
3718	643599.62	217027.45	266.92	TOP8"
2189	64440.58	217095.83	232.67	TOP
3153	644498.18	217095.02	231.11	TOP-10
2113	643807.28	217092.25	283.27	TOP10
3137	644736.09	217092.10	203.38	NG
2080	643824.82	217090.51	281.00	TOP10
3114	643346.51	217090.07	219.57	NG
3029	643707.50	217094.86	260.19	NG
3123	643430.70	217086.97	236.47	TOP-12
2076	643461.66	217090.27	265.50	VALVE
3100	643430.32	216997.67	235.32	TOP-4TEE(HC46)
2021	643402.14	217083.37	254.86	TOP8
3045	643817.19	216993.78	276.53	NG
3022	643240.96	216982.34	258.28	NG
2007	644445.67	217092.86	247.23	NG
3031	643341.17	216994.28	265.99	NG
3543	643243.82	217036.07	207.81	NG
3421	642159.59	216980.00	227.01	TOP10"
3396	642391.94	216934.64	272.96	NG
3373	642581.51	216924.63	278.77	NG
3362	642314.27	216943.02	251.66	TOP8"X4"
3359	642509.18	216913.60	286.33	TOP8"
3304	642794.93	216906.13	274.39	NG
3313	642764.28	216903.81	275.85	NG
3290	642845.68	216920.09	267.78	TOP4"90
3235	643403.71	216987.71	237.16	TOP8"
3212	643584.23	216881.70	228.37	NG
3724	642058.99	216950.72	226.56	CONC1
3221	643581.65	216950.32	208.03	NG
3733	642051.91	216990.91	226.16	CONC3
3119	643377.27	217062.93	252.17	NG
3143	643740.71	217063.82	204.56	TOP-8
3128	643254.34	217077.31	248.41	TOP10
3152	642788.05	217081.35	216.76	NG
3164	642080.28	216995.53	222.89	TOP2"FLAREDRAN
3054	643752.76	217094.05	205.08	TOP4HC-30
3129	643588.00	217068.16	231.48	BTOP-TEE-2001
3020	643583.16	217057.47	267.60	NG
3074	643872.15	216973.62	272.20	TOP-4
3027	644140.70	217034.81	252.97	TOP8EX4
3091	643605.81	216997.33	280.35	HC40
2036	644004.07	217068.23	271.62	NG
3080	643728.05	216994.97	280.27	TOP-HC45
2013	644421.05	217032.94	256.02	TOP4
3037	643487.22	216993.36	271.83	NG
3549	643320.37	217074.80	215.60	NG
3494	642389.25	2170129.02	213.09	CH2NG
3425	642451.09	216920.58	284.36	TOP8"
3402	642304.18	216931.99	254.92	NG
3411	642279.19	216921.97	261.12	TOP(2)"4"
3388	642391.91	216934.66	270.62	TOP8"X4"TEE/VERT
3393	643417.58	216895.91	233.98	NG
3310	642792.36	216902.63	274.81	NG
3319	642845.22	216908.43	267.56	NG
3264	643062.24	216874.49	245.16	NG
3241	643325.14	216873.13	248.80	NG
3250	643216.48	216874.33	249.64	NG
3227	643439.00	216897.63	234.50	TOP8"
3739	642056.94	216992.95	228.02	SHED1
2148	644351.45	217086.30	235.71	TOP10
3172	644645.81	217092.61	225.86	TOP-10
3684	643235.03	217003.76	211.75	NG
2126	643905.16	217068.28	251.12	NG
3149	644761.68	217078.92	215.27	BCMP
2134	644077.60	217099.43	245.34	NG
3158	644730.14	217088.31	222.49	TOP-10
3670	642093.20	216978.62	217.58	NG
2111	643759.76	217092.85	255.77	NG
3135	644883.94	217077.73	211.15	NG
2056	643732.97	217062.80	261.74	TOP8
3080	644019.97	216992.04	263.81	TOP-4
2085	643544.26	217078.71	255.29	NG
3089	644170.25	216978.27	256.66	NG
3086	643773.01	216976.00	278.13	TOP-4
3011	643063.63	216982.41	244.08	TOP-10KATEE
3323	642875.28	217022.47	216.21	TOP12"
3500	642928.07	217097.65	208.81	TOP12"
3027	642777.33	217022.43	215.91	NG
3451	642304.59	216944.16	260.26	NG
3440	642286.41	216947.87	236.13	TOP8"
3417	642415.46	216932.40	278.27	NG
3392	642466.46	216917.13	288.01	NG
3348	642611.72	216935.01	287.91	NG
3325	643254.13	216920.44	253.22	NG
3270	643070.13	216836.37	259.52	NG
3247	643167.13	216873.76	247.32	TOP4"90
3201	643258.67	216896.69	241.33	NG
2154	644423.76	217029.36	234.67	NG
3178	644587.27	217033.53	228.29	TOP490
3090	644283.10	217011.30	208.06	TOP12"
3187	644487.08	217029.31	231.35	TOP-10KATEE
2140	644152.46	217096.86	242.16	TOP10

Point #	Northing	Easting	Elevation	Description
3164	644708.88	217091.33	225.21	NG
3678	642196.76	216890.82	213.51	NG
3021	64357.37	217084.15	258.87	TOP4"
3271	643070.28	216836.13	257.93	TOP4"90
3280	643068.78	216830.99	256.99	TOP8"X4"
3287	643088.21	216832.86	256.82	NG
3202	643633.81	217074.07	212.22	TOP-12
3088	644160.78	216997.20	256.12	TOP-4BEND
2071	643486.10	217078.62	247.90	TOP8BSP/PORT
3095	643814.74	216973.57	246.31	NG
3161	644586.74	217030.44	231.96	EW10-NG
3081	642361.73	217013.18	207.70	TOP12"90
3040	644752.14	217058.06	201.44	2"DRANNG
2140	64305.69	217021.29	247.30	EW40-NG
3529	642963.63	217024.30	225.03	TOP12"
2002	644540.12	217054.37	244.00	NG
3028	643319.73	216953.24	264.89	NG
3538	643112.00	217027.58	204.29	TOP12" OUT
3003	643001.64	217024.78	234.10	NG
3515	64287.60	217012.45	217.05	NG
3437	642783.23	216925.04	240.12	NG
3448	642227.07	216920.94	237.44	NG
3423	642458.68	216923.64	274.56	TOP8"
3377	642507.58	216932.44	270.71	NG
3354	642594.76	216924.11	285.04	NG
3299	642826.71	216845.63	267.51	TOP8"
3276	643068.14	216843.11	260.59	NG
3285	642936.32	216898.66	266.05	NG
3282	643074.97	216892.04	256.49	LCR1
3207	643592.80	216899.82	242.82	NG
3719	643985.29	217084.10	270.17	TOP8
3216	643581.04	216892.56	228.27	NG
3728	642907.73	216897.95	256.58	CONC2
3705	644779.52	217093.04	224.87	TOP4"
2114	643953.35	217099.56	253.45	NG
3138	644736.48	217092.11	201.28	TOP-8
2091	643659.40	217092.46	259.97	NG
3115	643345.82	217058.23	217.78	TOP-12
2100	643707.73	217044.84	257.09	TOP4
3124	643447.11	217072.25	243.44	NG
2077	643503.64	217081.73	254.64	NG
2022	642449.34	217063.20	260.13	NG
3046	643817.86	216936.20	275.26	TOP-10KATEE
3023	643241.08	216991.59	256.54	TOP-10
3034	643098.47	217024.74	211.61	NG
2008	644412.18	217080.37	250.95	NG
3030	643440.49	216949.08	264.76	TOP-10
3444	643403.71	2170380.24	0.00	ZBEGCOMP18"
3452	643128.40	216820.80	227.04	NG
3397	643289.84	216834.40	271.19	TOP8"X4"TEE/VERT
3374	64281.42	216925.79	277.59	TOP4"
3383	642334.65	216949.33	259.04	NG
3328	643144.27	216952.68	242.66	TOP4"
3305	642793.12	216905.59	273.16	TOP8"X4"
3314	642744.45	216902.74	274.37	TOP8"
3291	642945.25	216920.47	268.32	HC56
3278	643683.71	216916.37	226.54	TOP8"X4"
3725	642058.89	216854.65	226.57	CONC1
3023	643541.84	216984.09	231.10	NG
3734	642057.42	216868.75	226.19	CONC3
2120	643877.26	217093.81	250.80	TOP12EX4
3144	644740.01	217072.66	210.32	NG
2129	644004.70	217085.15	248.04	NG
3153	644788.96	217081.39	217.75	TOP490
3655	642067.94	216874.98	221.11	NG
2108	643757.37	217047.62	257.15	NG
3130	644635.50	2170570.01	222.21	NG
2051	643838.25	217064.37	269.92	NG
3075	643822.26	216973.18	271.06	NG
2028	644136.32	217062.85	270.11	HC4-NG
3052	643611.78	216997.69	280.33	TOP8
3061	643003.65	217064.91	270.22	TOP8
3063	643726.20	216993.72	260.32	TOP-HC44
3044	64424.26	217055.01	261.16	NG
3038	643496.16	216920.48	270.85	TOP-10
3550	643619.05	217047.91	213.59	TOP12"
3680	642274.40	216950.47	212.97	NG
2121	643874.08	2170120.85	207.22	TOP12"
3504	642627.47	217001.45	210.51	TOP12"
3403	643003.16	216937.15	292.71	TOP4"X10"TEE/VERT
3412	642333.51	216922.50	269.55	NG
3389	642988.02	216934.46	271.82	NG
3334	643417.62	216897.85	224.53	TOP4"X10"TEE/VERT
3311	642791.94	216901.62	274.84	HC54
3320	642848.96	216908.52	266.17	TOP4"
3265	643082.21	216874.87	241.73	TOP4"
3242	643325.17	216873.48	248.15	TOP4"90
3251	643216.39	216874.33	248.13	TOP8"X8"
3228	643432.35	216875.13	237.76	NG
3740				

Permit No.	Date	Document ID No.
51-03	December 22, 2011	16062

DELIVERED - By E-Mail
Date: December 22, 2011
Solid Waste Section
Raleigh Central Office

Chao, Ming-tai

From: Chao, Ming-tai
Sent: Thursday, December 22, 2011 8:50 AM
To: 'Lamb, Steve'
Cc: Mussler, Ed
Subject: RE: Construction Record Report for LFGCCS, Johnston County MSWLF, 51-03

Hey Steve:

I have completed a review of the revised Construction Document Report (Report). There are several “typos” or data missing in the As-built drawings which are described below:

1. (Sheet 9 of 12) There are two locations have the same identification number-ZEW-405. To avoid confusion please change the one with other identification number and keep the ZEW-405 for the well EW-405 or make a “field note” in the drawing to eliminate any potential confusion in the future.
2. (Sheet 10 of 12) The well EW-417 was removed from the project scope according to the Report but showed on the drawing. Is it a typographic error? Or will this be the well EW-416 which is missing from the drawing? Please clarify.
3. (Sheet 11 of 12) The well EW-409 and EW-414 are missing from the drawing. There is “ZEW-413 (Point #2017) located in the proximity of EW-414; is this well EW-414? Please clarify.
4. (Sheet 12 of 12) Please incorporate the responses to the comments No. 1 through 3 to the data sheet on the drawing.
5. Appendix D – As-built Well Schedule Table
 - i. Please double check the landfill depths at wells EW-503 and EW-505; there are apparently have some calculation errors.
 - ii. The baseliner elevation at the well EW-506 is approximately 224 above mean sea level according to the Drawing No. 2 of 2. The baseliner elevation data presented in the Table of Appendix D is incorrect. Please make necessary correction.

Please submit only the portions of the documents which are subjected to revise [one hard copy and one electronic copy (in pdf format)]. The Solid Waste Section appreciates your corporations on this matter. Should you have any questions, please contact me at 919-707-8251. Wishing you and your family have a Merry Christmas and Happy New Year.

Ming-Tai Chao, P.E.
Environmental Engineer II
Permitting Branch, Solid Waste Section
Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646 (Mailing Address)

**Green Square, 217 West Jones Street
Raleigh, NC 27603**

Tel. 919-707-8251

ming.chao@ncdenr.gov

<http://portal.ncdenr.org/web/wm/sw>

E-mail correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Lamb, Steve [<mailto:SLamb@scsengineers.com>]
Sent: Tuesday, November 29, 2011 1:21 PM
To: Chao, Ming-tai
Cc: Mussler, Ed; Wilson, Donna
Subject: RE: Construction Record Report for LFGCCS, Johnston County MSWLF, 51-03

Ming:

Thanks for the draft comments letter. We will review this week and revise report accordingly. In regards to EW509, EW510, and EW511, we did not drill through the liner. After we submitted the permit drawings to you we obtained better as-built data of the liner grades in Phase 5, revised the drawing/well schedule and adjusted the drilling depths to maximize LFG extraction. Sorry for the confusion on this one, we should have documented that better in the report.

Steve

From: Chao, Ming-tai [<mailto:ming.chao@ncdenr.gov>]
Sent: Tuesday, November 29, 2011 9:31 AM
To: Lamb, Steve
Cc: Mussler, Ed; Wilson, Donna
Subject: Construction Record Report for LFGCCS, Johnston County MSWLF, 51-03

Dear Mr. Lamb:

After completing a review of the "Construction Documentation Report (Report) – Landfill Gas Collection and Control System Expansion 2011" dated November 17, 2011, I made comments on the Report to request for more information and clarification on several issues associated with the project. The attached is the "draft" comment letter for you to review so that certain comments such as the request for supplemental data and the correction of typos can be removed from the final official comment letter if you agree to provide a revised copy of the report including an electronic copy in a CD (pdf format).

Please pay special attention to the Comment No. 5 iii. Based on the data in the report, the landfill baseliner is likely damaged by advancing soil borings – EW509, EW-510, & EW-511. However, I don't want to make the final conclusion on this matter without discussing with you and your associates in charge of the construction activities. Please feel free to contact me if you have any questions on the draft comment letter.

Best regards,

Ming-Tai Chao, P.E.
Environmental Engineer II
Permitting Branch, Solid Waste Section
Division of Waste Management

1646 Mail Service Center
Raleigh, NC 27699-1646 (Mailing Address)

Green Square, 217 West Jones Street
Raleigh, NC 27603
Tel. 919-707-8251
ming.chao@ncdenr.gov
<http://portal.ncdenr.org/web/wm/sw>

E-mail correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties.

Permit No.	Date	Document ID No.
51-03	December 22, 2011	16062

DELIVERED - By E-Mail
Date: December 22, 2011
Solid Waste Section
Raleigh Central Office

Chao, Ming-tai

From: Chao, Ming-tai
Sent: Thursday, December 22, 2011 8:50 AM
To: 'Lamb, Steve'
Cc: Mussler, Ed
Subject: RE: Construction Record Report for LFGCCS, Johnston County MSWLF, 51-03

Hey Steve:

I have completed a review of the revised Construction Document Report (Report). There are several “typos” or data missing in the As-built drawings which are described below:

1. (Sheet 9 of 12) There are two locations have the same identification number-ZEW-405. To avoid confusion please change the one with other identification number and keep the ZEW-405 for the well EW-405 or make a “field note” in the drawing to eliminate any potential confusion in the future.
2. (Sheet 10 of 12) The well EW-417 was removed from the project scope according to the Report but showed on the drawing. Is it a typographic error? Or will this be the well EW-416 which is missing from the drawing? Please clarify.
3. (Sheet 11 of 12) The well EW-409 and EW-414 are missing from the drawing. There is “ZEW-413 (Point #2017) located in the proximity of EW-414; is this well EW-414? Please clarify.
4. (Sheet 12 of 12) Please incorporate the responses to the comments No. 1 through 3 to the data sheet on the drawing.
5. Appendix D – As-built Well Schedule Table
 - i. Please double check the landfill depths at wells EW-503 and EW-505; there are apparently have some calculation errors.
 - ii. The baseliner elevation at the well EW-506 is approximately 224 above mean sea level according to the Drawing No. 2 of 2. The baseliner elevation data presented in the Table of Appendix D is incorrect. Please make necessary correction.

Please submit only the portions of the documents which are subjected to revise [one hard copy and one electronic copy (in pdf format)]. The Solid Waste Section appreciates your corporations on this matter. Should you have any questions, please contact me at 919-707-8251. Wishing you and your family have a Merry Christmas and Happy New Year.

Ming-Tai Chao, P.E.
Environmental Engineer II
Permitting Branch, Solid Waste Section
Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646 (Mailing Address)

**Green Square, 217 West Jones Street
Raleigh, NC 27603**

Tel. 919-707-8251

ming.chao@ncdenr.gov

<http://portal.ncdenr.org/web/wm/sw>

E-mail correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Lamb, Steve [<mailto:SLamb@scsengineers.com>]
Sent: Tuesday, November 29, 2011 1:21 PM
To: Chao, Ming-tai
Cc: Mussler, Ed; Wilson, Donna
Subject: RE: Construction Record Report for LFGCCS, Johnston County MSWLF, 51-03

Ming:

Thanks for the draft comments letter. We will review this week and revise report accordingly. In regards to EW509, EW510, and EW511, we did not drill through the liner. After we submitted the permit drawings to you we obtained better as-built data of the liner grades in Phase 5, revised the drawing/well schedule and adjusted the drilling depths to maximize LFG extraction. Sorry for the confusion on this one, we should have documented that better in the report.

Steve

From: Chao, Ming-tai [<mailto:ming.chao@ncdenr.gov>]
Sent: Tuesday, November 29, 2011 9:31 AM
To: Lamb, Steve
Cc: Mussler, Ed; Wilson, Donna
Subject: Construction Record Report for LFGCCS, Johnston County MSWLF, 51-03

Dear Mr. Lamb:

After completing a review of the "Construction Documentation Report (Report) – Landfill Gas Collection and Control System Expansion 2011" dated November 17, 2011, I made comments on the Report to request for more information and clarification on several issues associated with the project. The attached is the "draft" comment letter for you to review so that certain comments such as the request for supplemental data and the correction of typos can be removed from the final official comment letter if you agree to provide a revised copy of the report including an electronic copy in a CD (pdf format).

Please pay special attention to the Comment No. 5 iii. Based on the data in the report, the landfill baseliner is likely damaged by advancing soil borings – EW509, EW-510, & EW-511. However, I don't want to make the final conclusion on this matter without discussing with you and your associates in charge of the construction activities. Please feel free to contact me if you have any questions on the draft comment letter.

Best regards,

Ming-Tai Chao, P.E.
Environmental Engineer II
Permitting Branch, Solid Waste Section
Division of Waste Management

1646 Mail Service Center
Raleigh, NC 27699-1646 (Mailing Address)

Green Square, 217 West Jones Street

Raleigh, NC 27603

Tel. 919-707-8251

ming.chao@ncdenr.gov

<http://portal.ncdenr.org/web/wm/sw>

E-mail correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties.

SCS ENGINEERS, PC

December 15, 2011
File No. 02210301.00

Mr. Ming Chao
North Carolina Department of Environment and Natural Resources
Division of Solid Waste
410 Oberlin Rd
Raleigh, North Carolina 27605



Subject: Transmittal Letter for Construction Documentation Report Revision
Landfill Gas Collection and Control System Expansion 2011
Johnston County MSW and C&D Landfill Facility
SW Permit #51-03
Smithfield, North Carolina

Dear Mr. Chao:

On behalf of Johnston County MSW and C&D Landfill Facility (Landfill), SCS Engineers, PC (SCS) is re-submitting the Construction Documentation Report (CDR) for the landfill gas collection and control system expansion in 2011. Based on your draft comments in a letter dated November 29, 2011 the appropriate changes were made to the report. Below is a list of your comments and where in the report our responses are provided.

ADDRESSED COMMENTS

- Comment 1 was addressed by revising Section 2.2 of the report.
- Comment 2.i. was addressed by revising the well logs.
- Comment 2.ii. was addressed by revising Section 2.2 and Appendix E.
- Comment 3 was addressed by adding certification page ii to the report.
- Comment 4 was addressed by removing comments from the well completion logs.
- Comment 5.i. was addressed by revising the well logs.
- Comment 5.ii. was addressed by updating the well logs.
- Comment 5.iii was addressed by adding Appendix D to the report and updating Appendix F with Drawing 2.2.

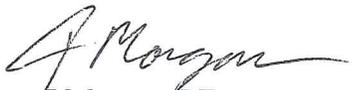
Mr. Ming-tai Chao
December 15, 2011

- Comment 6.i. was addressed by including the licensed surveyor's signed and sealed drawings as part of Appendix F.
- Comment 6.ii. was addressed by adding an as-built well schedule (tabulated format) in Appendix D and revising Appendix C.
- Comment 7 was addressed by revising Section 2.1 of the report.
- Comment 8 was addressed by adding Appendix J to the report.
- Comment 9 was addressed in a phone call between Steve Lamb of SCS and Mr. Chao where Mr. Chao was informed that Johnston County retained another consultant, RSG and Associates, to revise the Operations Plan and Closure and Post-Closure Plan for the site.

CLOSING

The GCCS installation continues to successfully facilitate the collection of LFG. Please do not hesitate to contact either of the undersigned if you have any questions or comments at (704) 504-3107.

Sincerely,



J Morgan, PE
Senior Project Professional
SCS ENGINEERS, PC



Steven C. Lamb, PE
Vice President
SCS ENGINEERS, PC

jm/scl

cc: Rick Proctor, Johnston County Solid Waste Manager
Annika Colston, Blue Source
Matt Wells, Blue Source
Guy Lewis, SCS Field Services



December 15, 2011

Mr. Ming-Tai Chao, P.E.
 Environmental Engineer II
 NC DENR - Division of Waste Management
 217 West Jones Street
 Raleigh, NC 27603

Permit No.	Date	Document ID No.
51-03	December 16, 2011	15771

RECEIVED
December 15, 2011 via an e-mail
 Solid Waste Section
 Raleigh Central Office

**Re: Johnston County Landfill (Permit No. 51-03)
 LFG Collection & Control System Expansion 2011
 Comments on Construction Documentation Report
 Response to Comment No. 9**

Dear Mr. Chao:

On behalf of Johnston County, Richardson Smith Gardner & Associates, Inc. (RSG) would like to respond to Comment No. 9 in your letter dated November 29, 2011 (see **attached**), as follows. The comment stated in your letter is repeated below in *italics* and our response follows in **bold**.

9. *In the February 18, 2011 letter (DOC ID 12976), the SWS has requested the County to submit the revised document including the modification of Operation Plan and Closure and Post-Closure Plan to the existing Permit Amendment Application, Johnston County MSW Landfill, Phase 4A, Cell 3, which was approved by the SWS in 2009. Via the February 28, 2011 e-mail message, the SWS has further agreed the County's consultant request that the above-mentioned document would be submitted to SWS within four (4) weeks after the LFGCCS starts. Since the Report and the report cover letter do not mention the schedule of submittal of the aforementioned document, please provide the firm submittal date.*

Please find attached a revised Operations Manual and Closure and Post-Closure Plan for the landfill. Note that the following modifications have been made in these documents:

<u>Document</u>	<u>Section/Table</u>	<u>Modification</u>
Operations Manual	Section 1.2	Updated contact information.
	Section 3.5	Replaced prior text; now references SWANA LFG O&M Manual of Practice.
	Section 3.6	Replaced prior text; now addresses LFG monitoring plan.
Closure and Post-Closure Plan	Section 2.4.7	Added description related to decommissioning activities.
	Table 2.1	General updates made.
	Section 3.4	Added description related to assessment and corrective action costs.
	Section 3 Tables	Updated/revised cost information as necessary (including LFG system related costs); Added Table 3.3.

Mr. Ming-Tai Chao, P.E.
December 15, 2011
Page 2

Please contact me at your earliest convenience with any questions or comments which you may have on this submittal.

Sincerely,
Richardson Smith Gardner & Associates, Inc.



Pieter K. Scheer, P.E.
Principal, Project Manager
pieter@rsgengineers.com



December 15, 2011

Attachments: NC DWM Letter - November 29, 2011
Revised Operations Manual
Revised Closure and Post-Closure Plan

cc: Rick Proctor, Johnston County



North Carolina Department of Environment and Natural Resources
Division of Waste Management

Beverly Eaves Perdue
Governor

Dexter R. Matthews
Director

Dee Freeman
Secretary

Solid Waste Section

November 29, 2011

Mr. Tim Broome, Director
Johnston County Public Utilities Department
Post Office Box 2263
Smithfield, NC 27577-2633

Re: Comments on Construction Documentation Report
Landfill Gas Collection and Control System Expansion 2011
Johnston County Landfill Facility, Johnston County, North Carolina
Permit No. 51-03, Document ID No. (Doc ID) 15642

Dear Mr. Broome:

On November 17, 2011, the Division of Waste Management (DWM), Solid Waste Section (SWS) received the following document:

- *Construction Documentation Report – Landfill Gas Collection and Control System Expansion 2011*, Johnston County Landfill (Permit # 51-03). Dated November 17, 2011. Prepared by C21 Methane Partners in New York, New York and SCS Engineers, PC (SCS) in Charlotte, North Carolina (Doc ID 15611).

After conducting a review, the SWS has comments on the Construction Documentation Report (Report) for the constructed landfill gas collection and control system (LFGCCS). Your responses to the following comments will expedite the review of the report:

1. The gas well EW-417 is likely removed from the proposed LFGCCS because no information of this well is provided in the Report. If this is correct, please add status of well EW-417 to the Report.
2. (Section 2.2 – Landfill Gas Extraction Wells)
 - i. As described in this sub-section the well borings were backfilled by a NC DOT No. 57 stone, bentonite seals, and soil which is consistent with the approved work plan (Doc ID 12972). However, the well logs in Appendix C described that # 4 washed aggregates were used as backfill around well screens/slots. Please clarify the discrepancy.
 - ii. The approved specification for a gas well (see Note 10 on the Drawing No. 4 of 6 of the approved work plan) requires the stone gradation in the ranges from ½ -inches to 1and1/2 – inches determined by ASTM Method D 421 at the testing frequency of one test per 250

cubic yards. Please provide the type and quantity of the stone used for this project and stone gradation testing results.

3. (Section 4 - Summary and Conclusion) The submitted final Report must be signed, sealed, and certified by a professional engineer registered in the State of North Carolina.
4. (Appendix B - SCS Daily Field Reports) The descriptions of well relocation in the field (EW-406, EW-408, EW-410, EW-411, EW-414, and EW-505) in the Daily Field Report are inconsistent with remarks made to the well logs in Appendix C. Please clarify.
5. (Appendix C – Landfill Gas Extraction Well Logs)
 - i. Please double check the consistency of the present data against the sketch of boring log. For example, the well log for EW-503, the total depth is noted 40 feet, but the boring log shown 41 feet.
 - ii. Well logs of EW-510 & EW-511 are incomplete. There is no “description” of excavated material / waste in the log.
 - iii. According to the data shown on the well logs for EW-509, EW-510, & EW-511 and the baseliner elevations at these two locations shown on the Drawing No. 4 of 6 in the approved work plan, **the wells have likely penetrated the landfill baseliner system.** The well logs indicated each “well was constructed at surveyed location and terminated at the specific depth.” However, the well depths do not terminate at the proposed depth or adjust according to the ground surface elevation provided by a surveyor. The County must provide the SWS solid information to demonstrate the landfill baseliner system is intact and not damaged by the well installation. Should the baseliner system have been damaged due to well installation, within 15 calendar days after receiving this comment letter, the County must submit a work plan to assess and restore the damaged landfill liner system in the areas surround the wells. The SWS will review the submitted plan, and the County shall not conduct any baseliner restoration activities prior to the SWS approval.
6. (Appendix D – Record Drawing No. 1 of 1)
 - i. The as-built drawing must be signed and sealed by a professional engineer or licensed surveyor registered in the State of North Carolina.
 - ii. Please provide the final well schedule (tabulated format) in consistent with the well logs on the as-built drawing. For example final data of the ground elevation, well depth, etc is based on survey results. Well EW-417 is removed from the project scope. Since many wells are relocated in the field, so the final northing & easting coordinates of these well must be provided in the record report.
7. (Appendix F – Leak Test Results) Air testing that was conducted at 14:00 p.m., June 25, 2011 through 07:00 a.m., June 26, 2011 on the 2-inch forcemain and 2 X 4 DC shown the pressure drop/ air loss ”1 lb.” Please explain why the test result is acceptable.
8. (Appendix G – Correspondence) The NCDHHS letter dated December 6, 2010 is a review/comment correspondence to inquire clarification and more information and not an

approval document. Please provide the documentation issued by NCDHHS that approved the asbestos-containing material/waste plan associated with the construction of LFGCCS.

9. In the February 18, 2011 letter (Doc ID 12976), the SWS has requested the County to submit the revised document including the modification of Operation Plan and Closure and Post-Closure Plan to the existing *Permit Amendment Application, Johnston County MSW Landfill, Phase 4A, Cell 3*, which was approved by the SWS in 2009. Via the February 28 2011 e-mail message, the SWS has further agreed the County's consultant request that the above-mentioned document would be submitted to SWS within four (4) weeks after the LFGCCS starts. Since the Report and the report cover letter do not mention the schedule of submittal of the aforementioned document, please provide the firm submittal date.

Please respond the above-mentioned comments and provide the SWS one hard copy and an electronic copy (in the pdf format) of the revised Report. The Solid Waste Section appreciates your efforts and cooperation in this matter. If you have any questions or would like to schedule a meeting to discuss this matter further, please contact me at (919) 707-8251.

Sincerely,

Ming-Tai Chao, P.E.
Environmental Engineer II
Permitting Branch, Solid Waste Section

cc:

Steven C. Lamb, P.E., SCS
Donna Wilson, DWM
Mary Whaley, DWM

Ed Mussler, Permitting Branch Supervisor
Dennis Shackelford, DWM
Central Files

THIS PAGE INTENTIONALLY LEFT BLANK

Operations Manual

Johnston County Landfill Facility Smithfield, North Carolina

Prepared for:

**Johnston County Department of Public Utilities
Smithfield, North Carolina**

December 2011



14 N. BOYLAN AVENUE
RALEIGH, NORTH CAROLINA 27603
NC LIC. NO. C-0828 (ENGINEERING)

THIS PAGE INTENTIONALLY LEFT BLANK

**JOHNSTON COUNTY
JOHNSTON COUNTY LANDFILL FACILITY**

OPERATIONS MANUAL

TABLE OF CONTENTS

	<u>Page</u>
1.0 GENERAL FACILITY OPERATIONS	
1.1 Overview	1.0-1
1.2 Contact Information	1.0-1
1.2.1 Johnston County	1.0-1
1.2.2 North Carolina Department of Environment and Natural Resources	1.0-2
1.3 Access Control	1.0-2
1.3.1 Physical Restraints	1.0-3
1.3.2 Security	1.0-3
1.4 Signage	1.0-3
1.5 Communications	1.0-3
1.6 Fire and Safety	1.0-3
1.6.1 Fire Control	1.0-3
1.6.2 Safety	1.0-4
1.7 Severe Weather Conditions	1.0-5
1.7.1 Ice Storms	1.0-5
1.7.2 Heavy Rains	1.0-5
1.7.3 Electrical Storms	1.0-5
1.7.4 Windy Conditions	1.0-5
1.7.5 Violent Storms	1.0-5
1.8 Equipment Requirements	1.0-6
1.9 Personnel Requirements	1.0-6
1.10 Utilities	1.0-6
1.11 Record Keeping Program	1.0-6
2.0 WASTE HANDLING OPERATIONS	
2.1 Overview	2.0-1
2.2 Acceptable Wastes	2.0-1
2.2.1 MSW Landfill Units	2.0-1
2.2.2 C&D Landfill Units	2.0-1
2.3 Prohibited Wastes	2.0-2
2.3.1 MSW Landfill Units	2.0-2
2.3.2 C&D Landfill Units	2.0-2
2.4 Waste Screening Programs	2.0-2
2.4.1 Waste Receiving and Inspection	2.0-3
2.4.2 Hazardous Waste Contingency Plan	2.0-3

Table of Contents (Continued)

	<u>Page</u>
2.5 Waste Disposal	2.0-4
2.5.1 Access	2.0-4
2.5.2 General Procedures	2.0-4
2.5.3 Waste Disposal - Lined (MSW or C&D) Landfill Units	2.0-5
2.5.3.1 Cell Operations and Phasing	2.0-5
2.5.3.2 Cell Activation	2.0-6
2.5.3.3 Placement of Initial Lift	2.0-6
2.5.3.4 Equipment Operations Within the Landfill	2.0-6
2.5.4 Special Waste Management	2.0-7
2.5.4.1 Asbestos Management (MSW or C&D Landfill Units)	2.0-7
2.5.4.2 Sewage Sludge Management (MSW Landfill Units)	2.0-8
2.5.4.3 Spoiled Food and Animal Waste (MSW Landfill Units)	2.0-8
2.5.5 Daily or Periodic Cover	2.0-8
2.5.5.1 MSW Landfill Units	2.0-8
2.5.5.2 C&D Landfill Units	2.0-8
2.5.5.3 Tarpomatic Alternative Daily Cover	2.0-8
2.5.6 Intermediate Cover	2.0-9
2.5.7 Height Monitoring	2.0-9
2.6 Yard Waste Processing Area Operations	2.0-10
2.7 Convenience Center Operations	2.0-10

3.0 ENVIRONMENTAL MANAGEMENT

3.1 Overview	3.0-1
3.2 Surface Water Control	3.0-1
3.2.1 Surface Water Run-On Control	3.0-1
3.2.2 Active Face Run-Off Control - MSW Landfill Units	3.0-1
3.2.3 Erosion Control	3.0-2
3.2.4 Sedimentation Control	3.0-2
3.2.5 Separation of Stormwater/Leachate - Lined (MSW or C&D) Landfill Units	3.0-2
3.3 Leachate Management - Lined (MSW or C&D) Landfill Units	3.0-3
3.3.1 Leachate Collection System (LCS)	3.0-3
3.3.1.1 Gravel Column Maintenance	3.0-3
3.3.1.2 Collection Pipe Cleanout	3.0-4
3.3.1.3 Leachate Removal	3.0-4
3.3.1.4 Operation & Maintenance of Leachate Pumps & Storage Lagoon	3.0-4
3.3.2 Leak Detection System - Phase 4A MSW Landfill Unit	3.0-4
3.3.3 Leachate Quality Sampling	3.0-5
3.3.4 Record Keeping	3.0-5
3.3.5 Leachate Contingency Plan	3.0-6
3.4 Water Quality Monitoring	3.0-6

Table of Contents (Continued)

	<u>Page</u>
3.5	Landfill Gas (LFG) Management 3.0-7
3.5.1	MSW Landfill Units 3.0-7
3.5.2	C&D Landfill Units 3.0-7
3.6	Landfill Gas (LFG) Monitoring Plan 3.0-7
3.6.1	Record Keeping 3.0-7
3.7	Vector Control 3.0-8
3.7.1	MSW Landfill Units 3.0-8
3.7.2	C&D Landfill Units 3.0-8
3.8	Odor Control 3.0-8
3.8.1	MSW Landfill Units 3.0-8
3.8.2	C&D Landfill Units 3.0-8
3.9	Dust Control 3.0-8
3.10	Irrigation of Reclaimed Wastewater 3.0-8

FIGURES

Figure 1	Existing and Proposed Landfill Units and Solid Waste Management Activities
----------	--

APPENDICES

Appendix A	EPA Method 9095 - Paint Filter Liquids Test
Appendix B	Waste Screening Form
Appendix C	Cell Activation Forms
Appendix D	Leachate Recirculation Plan
Appendix E	Irrigation of Reclaimed Wastewater

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 1.0 GENERAL FACILITY OPERATIONS

1.1 OVERVIEW

This Operations Manual was prepared for operations of the Johnston County Landfill facility (Permit No. 51-03) located off of Highway 210 on County Home Road near Smithfield. This document discusses the operation of the following landfill units and other solid waste management activities:

- Phase 4A Lined Subtitle D MSW Landfill Unit (Cell 3 - Proposed);
- Area 1 C&D Vertical Expansion;
- Area 2 Lined C&D Landfill Unit;
- Yard Waste Processing Area; and
- Convenience Center.

Refer to **Figure 1** for the location of existing and proposed landfill units and other solid waste management activities.

The information contained herein was prepared to provide landfill personnel with a clear understanding of how the Design Engineer assumed that the completed facility would be operated. While deviations from the operations outlined here may be acceptable, they should be reviewed and approved by the Design Engineer. Please refer to the appropriate permit application for a detailed discussion and calculations for the individual components of each landfill unit, including phasing plans.

1.2 CONTACT INFORMATION

All correspondence and questions concerning the operation of the Johnston County Landfill should be directed to the appropriate County and State personnel listed below. For fire or police emergencies dial 911.

1.2.1 Johnston County

Johnston County Department of Public Utilities
309 E. Market Street
P.O. Box 2263
Smithfield, NC 27577
Phone: (919) 209-8333
Fax: (919) 934-7174

Contacts: Tim Broome, P.E., Director

Johnston County Solid Waste Management Department
680 County Home Road
P.O. Box 2263
Smithfield, NC 27577
Phone: (919) 938-4750
Fax: (919) 989-7152

Contact: Rick Proctor, Solid Waste Manager

1.2.2 North Carolina Department of Environment and Natural Resources

North Carolina DENR - Raleigh Central Office (RCO)
217 West Jones Street
Raleigh, NC 27603
Phone: (919) 707-8200
Fax: (919) 707-8200

North Carolina DENR - Raleigh Regional Office (RRO)
3800 Barrett Drive
Raleigh, NC 27609
Phone: (919) 571-4700
Fax: (919) 571-4718

North Carolina DENR - Fayetteville Regional Office (FRO)
225 Green Street, Suite 714
Fayetteville, NC 28301
Phone: (910) 486-1541
Fax: (910) 486-0707

Division of Waste Management (DWM) - Solid Waste Section:

Field Operations Branch Head:	Mark Poindexter (RCO)
Eastern District Supervisor:	Dennis Shackelford (FRO)
Waste Management Specialist:	Mary Whaley ((919) 693-5023)

Division of Land Resources - Land Quality Section:

Regional Engineer:	John Holley, P.E. (RRO)
--------------------	-------------------------

1.3 ACCESS CONTROL

Limiting access to the landfill facility is important for the following reasons:

- Unauthorized and illegal dumping of waste materials is prevented.
- Trespassing, and injury resulting therefrom, is discouraged.
- The risk of vandalism is greatly reduced.

Access to active areas of the landfill will be controlled by a combination of fences and natural barriers, and strictly enforced operating hours. A landfill attendant will be on duty at all times when the facility is open for public use to enforce access restrictions.

1.3.1 Physical Restraints

The site will be accessed by the existing entrance on County Home Road. Scales and a scale house and office are provided at the entrance. All waste will have been weighed prior to being placed in the landfill. The entrances have gates which will be securely locked during non-operating hours.

1.3.2 Security

Frequent inspections of gates and fences will be performed by landfill personnel. The County will arrange for a random security patrol of the main gate to further discourage trespassing. Evidence of trespassing, vandalism, or illegal operation will be reported to the County Solid Waste Manager.

1.4 SIGNAGE

A prominent sign(s) containing the information required by the DWM will be placed at the landfill entrance. This sign(s) will provide information on operating hours, operating procedures, and acceptable wastes. Additional signage will be provided within the landfill complex to distinctly distinguish the roadway to the active landfill unit(s). Service and maintenance roads for use by operations personnel will be clearly marked and barriers (e.g., traffic cones, barrels, etc.) will be provided as required.

1.5 COMMUNICATIONS

Two way radio communication will be maintained between the active landfill unit(s) and the landfill scale house and office. The scale house and office have telephones in case of emergency and for the conduct of day-to-day business. Emergency telephone numbers are displayed in the scale house and office.

1.6 FIRE AND SAFETY

1.6.1 Fire Control

The possibility of fire within the landfill or a piece of equipment must be anticipated in the daily operation of the landfill. A combination of factory installed fire suppression systems and/or portable fire extinguishers will be operational on all heavy pieces of equipment at all times. For larger or more serious outbreaks, the local fire department will respond.

Fires within the landfill will be limited by the use of daily and intermediate cover as a

fire break and control of "hot" loads entering the landfill. Landfill personnel at the scale house will turn away all trucks containing waste that is suspected to be hot. If a hot load is placed on the working face, then the load will be spread as thin as possible and daily cover soil will be immediately placed on the waste to extinguish the fire.

In general, fires that break out close to the surface of the disposal area should be excavated and smothered with cover material. Deep fires should be smothered out by placing moist soil on the surface and by constructing soil barriers around the fire. Where the smothering technique fails, the burning material must be excavated and smothered or quenched with water once the burning material is brought to the surface. Water is usually not effective unless it can be directly applied to the burning material.

For the lined landfill unit(s), in the event a fire occurs in the first lift of waste immediately above the protective cover layer, the possibility of damage to geosynthetics and collection piping exists. Once the fire is extinguished, the residue must be removed to allow limited inspection of the geosynthetics and piping. Damaged sections of geosynthetics, piping, etc. must be removed and replaced with new items of the same or equal material. The new materials must be placed in accordance with the technical specifications and construction quality assurance (CQA) documents prepared for this facility.

The County will verbally notify the DWM (see **Section 1.2.2**) within 24 hours of discovery of a fire within any landfill disposal area. In addition, written documentation describing the fire, the actions carried out to extinguish the fire, and a strategy for preventing future occurrences will be provided to the DWM within 15 days following any such occurrence.

1.6.2 Safety

All aspects of the operation of the landfill facility were developed with the health and safety of the landfill's operating staff, customers, and neighbors in mind. Prior to commencement of operations in the new landfill phase/area, a member of the landfill operating staff will be designated site safety officer. This individual, together with the facility's management will modify the site safety and emergency response program to remain consistent with National Solid Waste Management Association and Occupational Safety and Health Administration (OSHA) guidance.

Safety equipment provided includes equipment rollover protective cabs, seat belts, audible reverse warning devices, hard hats, safety shoes, and first aid kits. Landfill personnel will be encouraged to complete the American Red Cross Basic First Aid Course. Other safety requirements as designated by the County will also be implemented.

1.7 SEVERE WEATHER CONDITIONS

Unusual weather conditions can directly affect the operation of the landfill facility. Some of these weather conditions and recommended operational responses are as follows.

1.7.1 Ice Storms

An ice storm can make access to the landfill dangerous, prevent movement or placement of daily cover, and, thus, may require closure of the landfill until the ice is removed or has melted.

1.7.2 Heavy Rains

Exposed soil surfaces can create a muddy situation in some portions of the landfill during rainy periods. The control of drainage and use of crushed stone on unpaved roads should provide all-weather access for the site and promote drainage away from critical areas. In areas where the aggregate surface is washed away or otherwise damaged, new aggregate should be used for repair.

Intense rains can affect newly constructed drainage structures such as swales, diversions, cover soils, and vegetation. After such a rain event, inspection by landfill personnel will be initiated and corrective measures taken to repair any damage found before the next rainfall.

1.7.3 Electrical Storms

The open area of a landfill is susceptible to the hazards of an electrical storm. If necessary, landfilling activities will be temporarily suspended during such an event. To guarantee the safety of all field personnel, refuge will be taken in the on-site buildings or in rubber-tired vehicles.

1.7.4 Windy Conditions

Landfill operations during a particularly windy period may require that the working face be temporarily shifted to a more sheltered area. When this is done, the previously exposed face will be immediately covered with daily cover.

1.7.5 Violent Storms

In the event of hurricane, tornado, or severe winter storm warning issued by the National Weather Service, landfill operations may be temporarily suspended until the warning is lifted. Daily cover will be placed on exposed waste and buildings and equipment will be properly secured.

1.8 EQUIPMENT REQUIREMENTS

The County will maintain on-site equipment required to perform the necessary landfill activities. Periodic maintenance of all landfilling equipment, and minor and major repair work will be performed at designated maintenance zones outside of the landfill.

1.9 PERSONNEL REQUIREMENTS

At least one member of the landfill supervisory staff will be certified as a Manager of Landfill Operations (MOLO) by the Solid Waste Association of North America (SWANA). Each landfill employee will go through an annual training course (led by supervisory staff) and is certified by SWANA as Landfill Operations personnel. As part of this training, personnel learn to recognize loads which may contain prohibited wastes.

1.10 UTILITIES

Electrical power, water, telephone, and restrooms are provided at the landfill scale house and/or office.

1.11 RECORD KEEPING PROGRAM

The County will maintain the following records in an operating record at the landfill:

- A. Waste inspection records (see **Section 2.4**);
- B. Daily tonnage records - including source of generation;
- C. Waste determination records;
- D. Quantity, location of disposal, generator, and special handling procedures for all special wastes disposed of at the site;
- E. List of generators and haulers that have attempted to dispose of restricted wastes;
- F. Employee training procedures and records of training completed;
- G. Documentation of cell activation (see **Section 2.5.2.2**)
- H. Leachate records (see **Section 3.3.3**);
- I. Gas monitoring results and remediation measures as required (see **Section 3.4.2**);
- J. All ground water monitoring and surface water quality information (See the current **Water Quality Monitoring Plan**) including:
 - 1. Monitoring well construction records;
 - 2. Sampling dates and results;
 - 3. Statistical analyses; and
 - 4. Results of inspections, repairs, etc.
- K. Annual landfill reports;
- L. All closure and post-closure information, where applicable, including:
 - 1. Testing;
 - 2. Certification; and
 - 3. Recording.
- M. Cost estimates or financial assurance documentation.

The operating record will be kept up to date by the Solid Waste Manager or his designee. It will be presented upon request to the DWM for inspection. A copy of this Operations Manual will be kept at the landfill and will be available for use at all times.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 2.0 WASTE HANDLING OPERATIONS

2.1 OVERVIEW

This section describes the required waste handling operations for the Johnston County Landfill facility. In addition to the MSW and C&D waste disposed of at this facility, the County also processes recyclables, scrap tires, and white goods. These materials are stored at the landfill facility until there are sufficient quantities for pick up by various recycling contractors.

2.2 ACCEPTABLE WASTES

2.2.1 MSW Landfill Units

Only the waste as defined by NCGS 130A-290(a)(18a) generated within the approved service area may be disposed of in the MSW landfill units. In addition, the special wastes described in **Section 2.5.4** may also be disposed of in the MSW landfill units.

2.2.2 C&D Landfill Units

Only the following wastes generated within the approved service area may be disposed of in the C&D landfill unit:

- Construction and Demolition Debris: as defined in 15A NCAC 13B.0532(8) means solid waste resulting solely from construction, remodeling, repair, or demolition operations on pavement, buildings, or other structures. C&D waste does not include municipal and industrial waste that may be generated by on-going operations at buildings or structures.
- Land Clearing and Inert Debris Landfill: as defined in 15A NCAC 13B.0101(54) means a facility for the disposal of land-clearing waste, concrete, brick, concrete block, uncontaminated soil, gravel and rock, untreated and unpainted wood, and yard trash.
- Land Clearing Waste: as defined in 15A NCAC 13B.0101(53) means solid waste which is generated solely from land-clearing activities, limited to stumps, trees, limbs, brush, grass, and other naturally occurring vegetative material.
- Asphalt: in accordance with NCGS 130A-294(m).
- Other Wastes as Approved by the Solid Waste Section of the Division of Waste Management.

In addition, the special wastes (asbestos only) described in **Section 2.5.4** may also be disposed of in the C&D landfill units.

2.3 PROHIBITED WASTES

2.3.1 MSW Landfill Units

The following wastes are prohibited from disposal within the MSW landfill units:

- Whole Scrap Tires
- Used Oil
- White Goods
- Lead Acid Batteries
- Yard Waste
- Construction and Demolition Debris (C&D) (Except when allowed by the County)
- Aluminum Cans

In addition, operating criteria prohibit other materials from disposal within the MSW landfill units. These materials include:

- Hazardous waste as defined by NCGS 130A-290(a)(8), including hazardous waste from conditionally exempt small quantity generators.
- Polychlorinated biphenyls (PCB) wastes as defined in 40 CFR 761 with the exception of trace amounts found in materials such as consumer electronics.
- Bulk or non-containerized liquid wastes unless the waste is household waste other than septic waste and waste oil; or the waste is leachate or gas condensate derived from the MSW landfill unit. A liquid determination will be performed by the paint filter test (see **Appendix A** for apparatus and procedure).
- Containers holding liquid wastes unless the waste is household waste.

2.3.2 C&D Landfill Units

Only wastes, as defined in **Section 2.2.2** above may be accepted for disposal in the C&D landfill units. No other wastes may be accepted.

2.4 WASTE SCREENING PROGRAMS

In order to assure that prohibited wastes are not entering the landfill facility, screening programs have been implemented at the landfill. Waste received at both the scale house entrance and waste taken to the working face is inspected by trained personnel. These individuals have been trained to spot indications of suspicious wastes, including: hazardous placarding or markings, liquids, powders or dusts, sludges, bright or unusual colors, drums or commercial size containers, and "chemical" odors. Screening programs for visual and olfactory characteristics of prohibited wastes are an ongoing part of the landfill operation.

2.4.1 Waste Receiving and Inspection

All vehicles must stop at the scale house located at the entrance of the facility and visitors are required to sign-in. All waste transportation vehicles are weighed and the content of the load assessed. The scale attendant(s) requests from the driver of the vehicle a description of the waste it is carrying to ensure that unacceptable waste is not allowed into the landfill. The attendant(s) then visually checks the vehicle as it crosses the scale. Signs informing users of the acceptable and unacceptable types of waste are posted at the scale house. Once passing the scales, the vehicles are routed to the appropriate landfill unit or other area (convenience center, etc.) as appropriate.

Vehicles are randomly selected for screening at a rate of approximately 1% of industrial, commercial, and institutional vehicles entering the landfill. However, if something suspicious is spotted in any waste load, that load is inspected further. The number of loads inspected is determined by the total vehicle count as per scales tickets. Each calendar year the number is recalculated (For example, for 2001, 1% was equal to 252 vehicles; 264 vehicles were actually inspected).

Vehicles selected for inspection are directed to an area of intermediate cover adjacent to the working face where the vehicle will be unloaded. Waste is carefully spread using suitable equipment. An attendant trained to identify wastes that are unacceptable at the landfill inspects the waste discharged at the screening site. If unacceptable waste is found, including wastes generated from outside of the service area, the load will be isolated and secured by berming off the area. For unacceptable wastes that are non-hazardous, the Solid Waste Manager will then notify officials of the DWM (see **Section 1.2.2**) within 24 hours of attempted disposal of any waste the landfill is not permitted to receive in order to determine the proper course of action. For unacceptable wastes that are hazardous, the Hazardous Waste Contingency Plan outlined in **Section 2.4.2** will be followed. The hauler is responsible for removing unacceptable waste from the landfill property.

If no unacceptable waste is found, the load will be pushed to the working face and incorporated into the daily waste cell. All random waste inspections will be documented by landfill staff using the waste screening form provided in **Appendix B**.

In addition to random waste screening described above, waste unloaded on the active face will be inspected by the equipment operators, trained to spot unacceptable wastes, before and during spreading and compaction. Any suspicious looking waste is reported immediately to the designated primary inspector for further evaluation.

2.4.2 Hazardous Waste Contingency Plan

In the event that identifiable hazardous waste or waste of questionable character is detected at the landfill, appropriate equipment, protective gear, personnel, and materials as necessary will be employed to isolate the wastes. The DWM will be notified immediately (see **Section 1.2.2**) that an attempt was made to dispose of hazardous waste

at the landfill. If the vehicle attempting disposal of such waste is known, all attempts will be made to prevent that vehicle from leaving the site or, if the vehicle has left the site, immediate notice will be served on the owner of the vehicle that hazardous waste, for which they have responsibility, has been disposed of at the landfill.

The County will assist the DWM as necessary and appropriate in the removal and disposition of the hazardous waste and in the prosecution of responsible parties. If needed, the hazardous waste will be covered with either on-site soils or other tarping material until such time when an appropriate method can be implemented to properly handle the waste. The cost of the removal and disposing of the hazardous waste will be charged to the owner of the vehicle involved. Any vehicle owner or operator who knowingly dumps hazardous waste in the landfill may be barred from using the landfill.

Should an incident where hazardous waste is found at the landfill occur, the event will be documented by landfill staff using the waste screening form provided in **Appendix B**.

Records of information gathered as part of the waste screening programs will be maintained at the landfill site during its active life and as long as required by the County and the DWM.

2.5 WASTE DISPOSAL

2.5.1 Access

Traffic will be clearly directed to the appropriate active access road. For the active lined landfill unit(s), all vehicles entering the unit will use the active ramp to avoid damaging the liner system. Traffic speed on the ramp should be less than 10 MPH. Rutting of gravel roadway surfaces must be repaired by placement of additional gravel on the roadway and not solely by grading the rut. This will maintain the separator geotextile placed below most gravel roadway surfaces.

The location of access roads during waste placement will be determined by operations personnel in order to reflect waste placement strategy.

2.5.2 General Procedures

For each active landfill unit, waste transportation vehicles will arrive at the working face at random intervals. There may be a number of vehicles unloading waste at the same time, while other vehicles are waiting. In order to maintain control over the unloading of waste, a certain number of vehicles will be allowed on the working face at a time. The actual number will be determined by the truck spotter. This procedure will be used in order to minimize the potential of unloading unacceptable waste and to control disposal activity. Operations at the working face will be conducted in a manner which will encourage the efficient movement of transportation vehicles to and from the working face, and to expedite the unloading of waste.

The approach to the working face will be maintained such that two or more vehicles may safely unload side by side. A vehicle turn-around area large enough to enable vehicles to arrive and turn around safely with reasonable speed will be provided adjacent to the unloading area. The vehicles will back to a vacant area near the working face to unload. Upon completion of the unloading operation, the transportation vehicles will immediately leave the working face area. Personnel will direct traffic necessary to expedite safe movement of vehicles.

Waste unloading at the landfill will be controlled to prevent disposal in locations other than those specified by site management. Such control will also be used to confine the working face to a minimum width, yet allow safe and efficient operations. The width and length of the working face will be maintained as small as practical in order to maintain the appearance of the site, control windblown waste, and minimize the amount of cover required each day. Normally, only one working face will be active on any given day, with all deposited waste in other areas covered by either daily/periodic, intermediate, or final cover, as appropriate.

The procedures for placement and compaction of solid waste include: unloading of vehicles, spreading of waste into 2 foot lifts, and compaction on relatively flat slopes (i.e. 5H:1V max.) using a landfill compactor and a minimum number of three full passes.

Wind screens adjacent to the working face may be used as required to control windblown waste.

The use of portable signs with directional arrows and portable traffic barricades will facilitate the unloading of wastes to the designated disposal locations. These signs and barricades will be placed along the access route to the working face of the landfill or other designated areas which may be established.

2.5.3 Waste Disposal - Lined (MSW or C&D) Landfill Units

2.5.3.1 Cell Operations and Phasing

Each lined landfill unit is divided into cells. Each cell will be filled in sequence until the entire footprint is covered with waste. Phasing drawings are presented in the appropriate permit application for each landfill unit.

It is advantageous to begin to establish final cover grades along the perimeter berms as soon as is possible. This will allow earlier construction of intermediate or final cover to promote "clean" runoff and to spread out final cover construction costs.

2.5.3.2 Cell Activation

Before placing waste in a particular area of any cell, that area must be connected to the leachate collection system (LCS) by removing (or suitably shredding by tracking with a dozer) geosynthetic rain cover (if any) and/or making any required piping connections such that all liquid collected in that area will flow to the sump. Next, just ahead of waste placement operations, the Type GT-S geotextile placed over the gravel columns is to be cut and removed such that waste will be placed in direct contact with the coarse aggregate.

Once an area has reached its effective capacity, operations will move to the next scheduled area. Prior to placing waste in a new area, it must be connected to the LCS as described above.

See **Appendix C** for cell activation forms to be used in the documentation of cell activation activities.

2.5.3.3 Placement of Initial Lift

During waste placement operations, the landfill liner system is most vulnerable during the placement of the first lift of waste. The first lift of waste should be comprised of select loads spread on top of the protective cover layer. These select loads must be free of long or large pieces of waste that may push through the protective cover layer and damage the liner system. Workers will be positioned near the working face to check for any waste which could possibly penetrate the protective cover layer. The first lift should be a minimum of four (4) feet thick and provide sufficient area for at least one day's operation without placing other areas of the liner in jeopardy.

The side slopes of the liner system are also vulnerable during placement of the first lift of waste. As with the bottom slopes, the first lift of waste against the side slopes should be comprised of select loads.

In the event that the landfill staff identifies any damage to any part of the landfill's liner system, they should immediately initiate its repair. Additionally, they should document the damage and the repair as a part of the operating record.

2.5.3.4 Equipment Operations Within the Landfill

Both the facility's operational vehicles and waste transportation vehicles must be restricted as follows within the lined landfill:

- Equipment operation directly on the protective cover will be limited to rubber-tired vehicles having a maximum ground contact, i.e., tire pressure, of less than 32 psi.
- A minimum vertical separation of 3 feet will be maintained between the

- geomembrane liner and all waste transportation vehicles.
A minimum vertical separation of 5 feet will be maintained between the geomembrane liner and waste compactors.

The operation of vehicles within those portions of the landfill not actively receiving waste should be restricted to activities associated with erosion and sedimentation control.

2.5.4 Special Waste Management

2.5.4.1 Asbestos Management (MSW or C&D Landfill Units)

The County may dispose of asbestos within either the MSW or C&D landfill units. Asbestos will only be accepted if it has been processed and packaged in accordance with State and Federal (40 CFR 61) regulations. Asbestos will arrive at the site in vehicles that contain only the asbestos waste and only after advance notification by the generator.

Once the hauler brings the asbestos to the landfill, the hauler will be directed to the designated asbestos disposal area by operations personnel. The designated disposal area will be prepared by operations personnel by leveling a small area using a dozer or loader. Prior to disposal, the landfill operators will stockpile cover soil near the designated asbestos disposal area. The volume of soil stockpiled will be sufficient to cover the waste and to provide any berms, etc. to maintain temporary separation from other landfill traffic.

Once placed in the prepared area, the asbestos waste will be covered with a minimum of 18 inches of cover soil placed in a single lift. The surface of the cover soil will be compacted and graded using a tracked dozer or loader. The landfill compactor will be prohibited from operating over asbestos disposal areas until at least 18 inches of cover are in-place.

The landfill staff will record the approximate location and elevation of the asbestos waste once cover is in-place. The Solid Waste Manager will then review pertinent disposal and location information to assure compliance with regulatory requirements and enter the information into the Operating Record.

Once disposal and recording for asbestos waste is completed, the disposal area may be covered with waste. No excavation into designated asbestos disposal areas will be permitted.

In general, for the lined landfill unit(s), no asbestos will be stored over gravel columns or over sump areas in order to minimize the potential for future disturbance.

2.5.4.2 Sewage Sludge Management (MSW Landfill Units)

Sewage sludge may be accepted for disposal within the MSW landfill units in accordance with Federal and State requirements. Sewage sludge will be co-disposed along with other wastes if the sludge passes the liquids restriction criteria (i.e., the Paint Filter Test) and has an acceptable Toxicity Characteristic Leaching Procedure (TCLP) test. Such testing will be the responsibility of the generator, but landfill staff may conduct spot testing.

In order to minimize the potential for clogging of the leachate collection and removal system, sewage sludge will not be placed within the first lift of waste. Sewage sludge may also be used as a soil conditioner incorporated into the vegetative soil layer of the final cover.

2.5.4.3 Spoiled Food and Animal Waste (MSW Landfill Units)

The disposal of spoiled foods, animal carcasses, and other animal wastes within the MSW landfill units will be handled as follows. The generator of the material must call in advance to the landfill, and a determination will be made as to whether or not the waste will be accepted. If the waste is approved, the generator will present the waste at a predetermined time. An area for disposal will already have been prepared and the waste will be covered immediately.

2.5.5 Daily or Periodic Cover

2.5.5.1 MSW Landfill Units

At the completion of waste placement each day, a 6 inch layer of earthen material or approved alternate daily cover (i.e. tarps (see **Section 2.5.5.3**), etc.) will be placed over the working face. This daily cover is intended to control vectors, fire, odors, and blowing litter. If the County should desire to use an alternate daily cover, a formal request and an appropriate demonstration will be made to the DWM.

2.5.5.2 C&D Landfill Units

At the completion of waste placement each week, or sooner if the area of exposed waste exceeds one acre in size, a 6-inch layer of earthen material or other material as approved by the DWM will be placed over the exposed waste. This periodic cover is intended to control vectors, fire, odors, and blowing debris.

2.5.5.3 Tarpomatic Alternative Daily Cover

The Tarpomatic apparatus consists of a 60' wide x 8' deep x 10' tall tubular steel support frame, a diesel engine, a hydraulic pump, stationary and remote control boxes, and a detachable 50 foot tarp spool. The frame has two carrier arms at the

top that will latch over the blade of a compactor (or dozer) allowing the apparatus to become mobile when needed. Each spool may carry three 40' x 100' tarps which provide up to 12,000 square feet of coverage. Tarps are made from a woven high density polyethylene fire retardant material with reinforced seams and edges and connecting straps on each end. Heavy steel chains are installed in pockets throughout the tarp to provide ballast to prevent wind uplift. Carrier arm adjustment, tarp spool drive, and spool locking levers are hydraulically controlled and are activated by the remote control box located inside the compactor cab.

To operate the Tarpomatic, the operator will drive the compactor up to the apparatus and align the blade with the carrier arms. The blade is then lifted upward into the carrier arms, raising the frame off the ground. Once the operator has positioned the compactor and Tarpomatic over the area of waste to be covered, each tarp is applied to the surface while backing over the waste. The tarp is unrolled at the same rate as the compactor movement so that it may be applied to the surface without pulling the tarp through the waste. Once the tarp is completely applied, the operator will detach the tarp straps and set the frame to the side. Tarps are rolled back onto the spool in the reverse order.

Typically, the Tarpomatic is used to cover over the daily working face only. As migration occurs throughout cell development, all traffic areas and side slopes are covered with daily or intermediate cover soil. Severe thunderstorms, high winds, or freezing precipitation may prohibit the use of the Tarpomatic. Daily or intermediate cover soil is used as cover every Friday or whenever inclement weather is forecasted.

Tarps that become damaged will be repaired or replaced as necessary. The County typically maintains 4 tarps on 2 spools and replaces tarps every 2 years.

2.5.6 Intermediate Cover

A 12 inch layer of soil cover should be placed on all waste surfaces that have not received waste in 30 days but are below final elevation. This intermediate cover should be seeded immediately and graded such that all precipitation run-off is channeled to the surface water systems.

2.5.7 Height Monitoring

Approximately every month, the landfill staff will monitor landfill top and side slope elevations with a level. When such elevations approach design grades, the final top-of-waste grades will be staked to limit over-placement of waste.

2.6 YARD WASTE PROCESSING AREA OPERATIONS

The operation of the yard waste processing area is as follows:

Acceptable wood and yard wastes are stockpiled to an approximate height of 10 feet over an area of approximately 1 acre (approximate weight of 1,500 to 2,000 lbs.). At that time a contractor is brought in to grind the waste. Once the waste is ground and becomes mulch, it is used either around the site, primarily for surface stabilization, or placed in windrows to be given to the public or otherwise used in the future. A full time attendant looks over both the yard waste processing area and the convenience center operations.

Adjacent to the yard waste processing area, there is approximately 14 acres available within two former borrow areas that are designated for use in the handling of debris from a natural disaster.

2.7 CONVENIENCE CENTER OPERATIONS

The operation of the citizen's convenience center is as follows:

The convenience center is set up with up to eight 40 yard roll-off containers for the collection of MSW (small loads) and recyclables. The County currently typically separately collects aluminum cans, newspaper, cardboard, mixed no. 1 and no. 2 plastics, and brown, green, and clear glass. The convenience center also includes collection facilities for white goods, used tires, waste oil, and batteries.

The white goods area currently occupies approximately a 50 foot by 100 foot area. County personnel remove the Freon, as necessary, and load the white goods into three to four 40 yard roll-off containers. Typically, every Wednesday, the County hauls the full containers to a local salvage yard, where the white goods can be recycled.

Used tires are collected at the convenience center in up to three tire trailers. Once one or more trailers are full, the used tires are taken to a tire recycler for recycling.

A full time attendant looks over both the convenience center and yard waste processing area operations.

SECTION 3.0 ENVIRONMENTAL MANAGEMENT

3.1 OVERVIEW

This section reviews the overall environmental management tasks required for the successful operation of the landfill facility. Emphasis is given to the supplemental tasks required for the lined landfill units.

3.2 SURFACE WATER CONTROL

As used herein, the definition of “surface water” is water which results from precipitation or site run-on that has not contacted the waste.

Proper control of surface water at the landfill will accomplish the following goals:

- Prevent the run-on of surface water into the lined landfill unit(s) or the active face(s);
- Prevent the run-off of surface water that has come into contact with the waste (i.e. leachate);
- Limit the erosion caused by surface waters;
- Limit sediments carried off-site by surface waters; and
- Maximize the SEPARATION of SURFACE water from LEACHATE.

Separate erosion and sedimentation control plans have been provided for the various landfill units. These plans describe both short and long term engineered features and practices for preventing erosion and controlling sedimentation at this site. The following is a brief discussion of some of these features and practices, focusing more on the landfill units.

3.2.1 Surface Water Run-On Control

The perimeter berms and/or perimeter channels around the landfill unit(s) are designed to prevent the run-on of surface water from adjacent land into the landfill. Additional structures such as diversion berms, channels, down pipes, etc. carry surface water away from the landfill.

3.2.2 Active Face Run-Off Control - MSW Landfill Units

Particular care is required to ensure that surface water coming from the active face, e.g. having potential contact with the waste, is captured by the leachate collection system (LCS). Only run-off from waste surfaces that have received adequate cover is not considered leachate and should be directed to the stormwater drainage system where

practical.

3.2.3 Erosion Control

The serviceability of the landfill relies heavily on soil berms, barrier layers, and agricultural layers that are readily eroded by flowing water. Erosion control provisions incorporated in the landfill include the following:

- The slope of the working face must be no steeper than 5H:1V where practical to limit erosion of the daily cover.
- Intermediate cover that has been exposed for more than 30 days must be seeded immediately and repaired when erosion features are identified.
- Drainage breaks (diversion berms, rain gutters, etc.) are provided on the final cover to limit the flow length of run-off.
- Water collected by each drainage break is routed to stormwater drainage channels or down pipes so that the run-off volume does not accumulate going down the slope.
- The vegetative soil layer placed over the final cover must be seeded immediately.

Additional erosion control measures have been taken within the drainage channels and at points of stormwater discharge. All final cover should be inspected regularly for erosion damage and promptly repaired.

3.2.4 Sedimentation Control

Stormwater run-off from the landfill unit(s) is conveyed to one of the on site sediment basins and/or traps. These basins and/or traps should be inspected regularly for sediment build-up or erosion damage. The basins and/or traps should be cleaned out when sediments fill the lower half of the basin.

3.2.5 Separation of Stormwater/Leachate - Lined (MSW and C&D) Landfill Units

The stormwater separation system is accomplished by dividing the lined landfill units into separate cells to reduce the volume of leachate generated and minimize the impoundment of stormwater within the landfill. The separation system allows stormwater in cells which have not yet received waste to be pumped out of the landfill to perimeter drainage features. During activation of a cell, the Owner will connect the cell to the LCS as discussed in **Section 2.5.3.2**.

3.3 LEACHATE MANAGEMENT - LINED (MSW AND C&D) LANDFILL UNITS

The leachate management system for the existing and proposed lined landfill units consists of the LCS, the leachate discharge piping, pumps, valve boxes, valves, and the existing leachate storage lagoon.

Leachate from the lined landfill units is collected in the leachate sumps at the low end(s) of each unit. Leachate collected in each sump is pumped to the leachate storage lagoon via a HDPE force main (except for Phase 5 which drains via a HDPE gravity main). From the storage lagoon, the leachate is pumped via force main to a County-owned wastewater treatment plant (WWTP) or back into the Phase 5 MSW landfill unit as part of an approved leachate recirculation plan (See **Appendix D**). Refer to the appropriate permit application for a detailed discussion and details of the leachate management system for each lined landfill unit.

The County has approval to modify the existing leachate storage lagoon for use as an equalization basin for raw wastewater. These modifications are described in **Section 3.3.6**.

3.3.1 Leachate Collection System (LCS)

A blanket drainage layer (either natural and/or geosynthetic drainage media) covers the liner system to collect and remove leachate draining from the waste. In addition, a large flow capacity network of perforated pipe and gravel drains is constructed in the blanket drain. The LCS is designed to remove inflow from a 25-year, 24-hour rainstorm. As such, its capacity is very large compared to that required to accommodate routine leachate generation rates once waste covers the landfill footprint.

The LCS has been designed to minimize the impact of long-term biological clogging as follows:

- Cleanouts are provided on the major perforated leachate collection pipes;
- No geotextiles will be used between the waste and the gravel columns; and
- The use of coarse aggregate around collection pipes (gravel columns) allows hydro-washing of the pipe and aggregate to remove biological growth.

3.3.1.1 Gravel Column Maintenance

The exposed surface of the drainage aggregate should be inspected monthly and after each large rain storm to check for buildup of sediment on the aggregate. Sediment buildup must be periodically removed carefully with a backhoe. Aggregate that is removed must be replaced with new clean material. Per **Section 2.5.3.2**, the Type GT-S geotextile overlying the gravel columns must be removed just prior to the placement of waste over that portion of gravel column.

3.3.1.2 Collection Pipe Cleanout

Remote camera inspection and flushing (if necessary) of all leachate collection piping accessible with a cleanout port will be performed every 3 years or earlier if an abnormal reduction in leachate production is observed. An abnormal reduction is defined as a drop in monthly leachate production of 30% or more as compared to the monthly average over the prior 6 month period and which does not appear to be the result of a reduction in rainfall, the covering of new cell areas, etc. If piping is mostly clean at the initial 3 year inspection, the County may petition the DWM to increase the inspection frequency to 5 year intervals.

The locations of the collection system that have sediment or biological growth buildup will be cleaned using high pressure water jetting equipment. The water jetting system should generate greater than 2,000 psi water pressure. Use of the high pressure water jetting equipment should be limited to only those portions of the piping system with buildup.

3.3.1.3 Leachate Removal

As constructed, leachate is collected in one or more sumps at the low points of the landfill and is removed from the landfill via a side riser pump or through a gravity penetration. The leachate is routed to the leachate storage lagoon via a HDPE force main or gravity main.

Under normal conditions, the County will remove (via forcemain) leachate from the storage lagoon at a rate to maintain a typical volume of 3,500,000 gallons (approximate 6.5 foot depth), or less, of leachate in the lagoon (see also **Section 3.3.6**). This allows ample volume in the lagoon to handle the anticipated “surge” event caused by a design storm and minimizes the potential for ponding within the landfill. Additional draw-down of the lagoon will be performed in advance of predicted heavy rainfall (tropical storm, hurricane, etc.).

3.3.1.4 Operation and Maintenance of Leachate Pumps and Storage Lagoon

Operation and maintenance of leachate pumps shall be in accordance with the appropriate manufacturer’s recommendations. If required, the leachate storage lagoon may require cleanout of sediment and/or maintenance of aerators. The County Solid Waste Manager or his designee will be responsible for following and documenting, as required, these activities.

3.3.2 Leak Detection System - Phase 4A MSW Landfill Unit

A leak detection system (LDS) is part of the Phase 4A MSW landfill unit. The purpose of the LDS is to provide rapid detection of a major breach in the primary liner system and to limit the head on the secondary liner to less than the thickness of the LDS.

For Phase 4A, the LDS consists of a layer of drainage geocomposite directly overlying the secondary LLDPE geomembrane and a series of four leak detection trenches. Flow that is collected in the leak detection trenches is routed through 4 inch diameter HDPE piping to a pump station. The LDS pump station consists of a prefabricated HDPE manhole, valving, and submersible pumps. Leachate collected in the LDS pump station is pumped to the existing leachate storage lagoon via the same force main as leachate collected in the LCS described above.

The LDS has been designed with an Action Leakage Rate (ALR) of 3,000 gallons per day. Should leakage collected in the LDS exceed the ALR based on routine flowmeter readings from the LDS pump station, the County will take steps (placement of soil cover, tarps, etc.) to limit leachate generation from in-place waste.

3.3.3 Leachate Quality Sampling

Semi-annual leachate quality sampling and analysis will be performed during operation of the lined landfill units. Samples will be recovered as grab samples from the following locations:

- MSW Phase 5: Sample from existing gravity line in leachate manhole;
- MSW Phase 4A (Leachate Collection System): Sample from side risers;
- MSW Phase 4A (Leak Detection System): Sample from leak detection pump station; and
- C&D Area 2: Sample from side risers.

The parameters to be analyzed will include BOD, COD, temperature, conductivity, pH, ammonia, suspended solids, Appendix I constituents, sulfates, and nitrates.

3.3.4 Record Keeping

Accurate records for the following will be maintained at the landfill in accordance with **Section 1.11**.

Leachate Generation (Monthly):

- Phase 5 (Leachate storage lagoon pump station flowmeters minus flow from Phase 4A);
- Phase 4A (Leachate collection system flowmeter); and
- Phase 4A (Leak detection system pump station flowmeter).

Leachate Quality (Quarterly and/or Semi-Annual):

- Phase 5 (Quarterly during active leachate recirculation);
- Phase 4A (Leachate Collection System); and
- Phase 4A (Leak Detection System).

3.3.5 Leachate Contingency Plan

In the unlikely event that leachate levels within the existing leachate storage lagoon approach the freeboard capacity, due to unforeseen events, the DWM will be verbally notified (see **Section 1.2.2**) and the leachate flow will be valved off and temporarily stored in the landfill until the level of leachate in the lagoon can be lowered by direct pumping. Written documentation describing the unforeseen events, the actions carried out to remove the stored leachate, and a strategy for preventing future occurrences will be provided to the DWM within 30 days following any such occurrence.

3.3.6 Modification of Leachate Pond as an Equalization Basin

The existing leachate storage lagoon (pond) has an approximate capacity of 4.2M gallons with 2 feet of freeboard. Due to the large size of the pond and typical leachate generation at the site (between 1.26M and 3.05M gallons per year based on 2004 and 2005 data), the capacity of this pond has been very much underutilized. The County received approval in October 2008 to modify the existing leachate storage lagoon for use as an equalization basin for raw wastewater. Most of the proposed modifications will be on the southwest side of the existing leachate pond.

The maximum water level in the modified pond will be maintained at approximately elevation 151 to 152. With a top of pond elevation of approximately 155, this will provide a volume of at least 1 foot (approximately 650,000 gallons) below the required 2 feet of freeboard under typical conditions. This capacity is much greater than the anticipated surge volume from a newly operational landfill unit. Additionally, considering the very large pumping capacity (two 1,300 GPM pumps) of the existing raw sewage pump station which will be connected to the pond, the ability to handle leachate generation at the site is very high.

The modified capacity and/or operation of the leachate pond as an equalization basin will not affect the County's ability to draw-down the basin in advance of predicted heavy rainfall (tropical storm, hurricane, etc.).

3.4 WATER QUALITY MONITORING

The monitoring program and procedures outlined in the current Water Quality Monitoring Plan will be followed for the monitoring of site groundwater monitoring wells and surface water monitoring locations. The results of the water quality monitoring program will be placed in the facility operating record as described in **Section 1.11**.

3.5 LANDFILL GAS (LFG) MANAGEMENT

3.5.1 MSW Landfill Units

A landfill gas (LFG) management system is included as part of the design of the MSW landfill units. Refer to the appropriate permit application for a detailed discussion and details of the LFG management system for each landfill unit.

As the operation and maintenance of this system involves contact with explosive gases, operational staff involved with the operation and maintenance of this system should be specifically trained in the management and response for situations such as fire or explosion, confined space, drilling, and overhead hazards, or any other mechanical hazards addressed by the equipment Manufacturer's literature. Although this manual does not address the operation of the LFG management system, reference is made to the Landfill Gas Operation and Maintenance Manual of Practice prepared by the Solid Waste Association of North America (SWANA)¹, which provides a general body of knowledge concerning the operation and maintenance of these systems.

3.5.2 C&D Landfill Units

Landfill gas (LFG) generated from the C&D landfill unit will be vented using passive vents placed at the time of closure. Refer to the appropriate permit application for details of these vents.

3.6 LANDFILL GAS (LFG) MONITORING PLAN

The County will implement a routine landfill gas (LFG) monitoring program for both MSW and C&D landfill units to ensure that methane concentrations do not exceed 25 percent of the lower explosive limit (LEL) (1.25% methane (CH₄)) in facility structures, or 100 percent of the LEL (5% CH₄) at property boundaries. LFG monitoring activities and remedial actions for concentrations exceeding these requirements will be in accordance with each unit's current landfill gas monitoring plan.

3.6.1 Record Keeping

Results of LFG monitoring and description of any remedial measures will be placed in the facility operating record as described in **Section 1.11**.

¹ SWANA (1997), Landfill Gas Operation and Maintenance Manual of Practice, SR-430-23070, Solid Waste Association of North America, Silver Spring, MD, March 1997.

3.7 VECTOR CONTROL

3.7.1 MSW Landfill Units

Control of insects, rodents, and birds will be accomplished by compaction of the waste and the use of daily cover. Spilled or wind-blown debris along the access road will be cleaned up daily and placed in the landfill. If vector control becomes a problem, additional measures will be taken to ensure the protection of human health.

3.7.2 C&D Landfill Units

Due to the nature of the waste disposed in the C&D landfill units, vector control is not anticipated to be of concern. Note that the use of periodic cover will discourage animals from nesting in the waste.

3.8 ODOR CONTROL

3.8.1 MSW Landfill Units

Odororous or potentially odororous materials will be covered as soon as possible to avoid odor problems. If odor control becomes a problem, additional measures will be taken to ensure odor control.

3.8.2 C&D Landfill Units

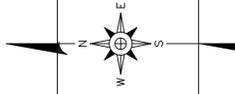
Due to the nature of the waste disposed in the C&D landfill units, odor control is not anticipated to be of concern.

3.9 DUST CONTROL

Dust related to waste hauler traffic on the access roads will be minimized by using a water truck to limit dust on the gravel portion of the road. Dust generated by excavation of cover soil will be limited by watering the cut soil areas if accessible to the water truck.

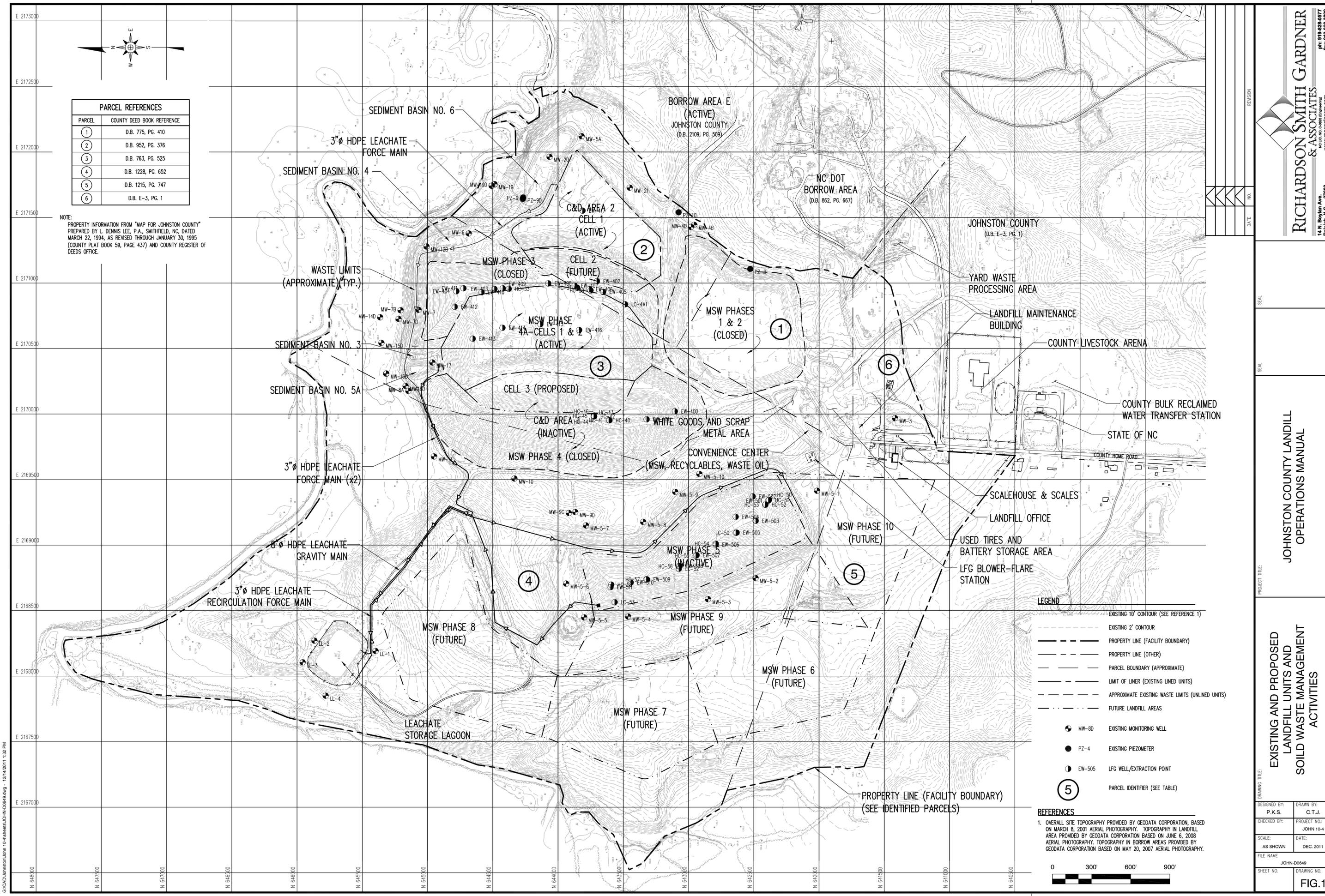
3.10 IRRIGATION OF RECLAIMED WASTEWATER

The County is approved to spray irrigate reclaimed wastewater at the landfill. The operation of the spray irrigation system will be as described in **Appendix E**. The operation of the system will also follow the requirements of the current permit issued by the NC Division of Water Quality.



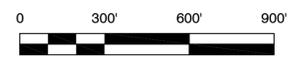
PARCEL REFERENCES	
PARCEL	COUNTY DEED BOOK REFERENCE
1	D.B. 775, PG. 410
2	D.B. 952, PG. 376
3	D.B. 763, PG. 525
4	D.B. 1228, PG. 652
5	D.B. 1215, PG. 747
6	D.B. E-3, PG. 1

NOTE:
PROPERTY INFORMATION FROM "MAP FOR JOHNSTON COUNTY"
PREPARED BY L. DENNIS LEE, P.A., SMITHFIELD, NC, DATED
MARCH 22, 1994, AS REVISED THROUGH JANUARY 30, 1995
(COUNTY PLAT BOOK 59, PAGE 437) AND COUNTY REGISTER OF
DEEDS OFFICE.



LEGEND	
	EXISTING 10' CONTOUR (SEE REFERENCE 1)
	EXISTING 2' CONTOUR
	PROPERTY LINE (FACILITY BOUNDARY)
	PROPERTY LINE (OTHER)
	PARCEL BOUNDARY (APPROXIMATE)
	LIMIT OF LINER (EXISTING LINED UNITS)
	APPROXIMATE EXISTING WASTE LIMITS (UNLINED UNITS)
	FUTURE LANDFILL AREAS
	MW-80 EXISTING MONITORING WELL
	PZ-4 EXISTING PIEZOMETER
	EW-505 LFG WELL/EXTRACTION POINT
	PARCEL IDENTIFIER (SEE TABLE)

REFERENCES
1. OVERALL SITE TOPOGRAPHY PROVIDED BY GEODATA CORPORATION, BASED ON MARCH 8, 2001 AERIAL PHOTOGRAPHY. TOPOGRAPHY IN LANDFILL AREA PROVIDED BY GEODATA CORPORATION BASED ON JUNE 6, 2008 AERIAL PHOTOGRAPHY. TOPOGRAPHY IN BORROW AREAS PROVIDED BY GEODATA CORPORATION BASED ON MAY 20, 2007 AERIAL PHOTOGRAPHY.



G:\CAD\Johnston\John 10-16\sheet\JOHN-D0649.dwg - 12/14/2011 1:32 PM

RICHARDSON SMITH GARDNER & ASSOCIATES
14 N. Boylan Ave.
Raleigh, N.C. 27603
ph: 919-228-0577
fax: 919-228-3889
www.regengineers.com

JOHNSTON COUNTY LANDFILL OPERATIONS MANUAL

EXISTING AND PROPOSED LANDFILL UNITS AND SOILD WASTE MANAGEMENT ACTIVITIES

DESIGNED BY: P.K.S.	DRAWN BY: C.T.J.
CHECKED BY:	PROJECT NO.: JOHN 10-4
SCALE: AS SHOWN	DATE: DEC. 2011
FILE NAME: JOHN-D0649	DRAWING NO.:
SHEET NO.:	FIG. 1

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix A

EPA Method 9095

Paint Filter Liquids Test

THIS PAGE INTENTIONALLY LEFT BLANK

METHOD 9095
PAINT FILTER LIQUIDS TEST
From EPA SW-846

1.0 SCOPE AND APPLICATION

- 1.1 This method is used to determine the presence of free liquids in a representative sample of waste.
- 1.2 The method is used to determine compliance with 40 CFR 264.314 and 265.314.

2.0 SUMMARY OF METHOD

- 2.1 A predetermined amount of material is placed in a paint filter. If any portion of the material passes through and drops from the filter within the 5 minute test period, the material is deemed to contain free liquids.

3.0 INTERFERENCES

- 3.1 Filter media were observed to separate from the filter cone on exposure to alkaline materials. This development causes no problem if the sample is not disturbed.

4.0 APPARATUS AND MATERIALS

- 4.1 Conical paint filter: Mesh number 60 (fine meshed size). Available at local paint stores such as Sherwin-Williams and Glidden for an approximate cost of \$0.07 each.
- 4.2 Glass funnel: If the paint filter, with the waste, cannot sustain its weight on the ring stand, then a fluted glass funnel or glass funnel with a mouth large enough to allow at least 1 inch of the filter mesh to protrude should be used to support the filter. The funnel is to be fluted or have a large open mouth in order to support the paint filter yet not interfere with the movement, to the graduated cylinder, of the liquid that passes through the filter mesh.
- 4.3 Ring stand and ring or tripod.
- 4.4 Graduated cylinder or beaker: 100-mL.

5.0 REAGENTS

- 5.1 None.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

- 6.1 All samples must be collected according to the directions in Chapter Nine of EPA SW-846.
- 6.2 A 100 mL or 100 g representative sample is required for the test. If it is not possible to obtain a sample of 100 mL or 100 g that is sufficiently representative of the waste, the analyst may use larger size samples in multiples of 100 mL or 100 g, i.e., 200, 300, 400 mL or g. However, when larger samples are used, analysts shall divide the sample into 100-mL or 100-g portions and test each portion separately. If any portion contains free liquids, the entire sample is considered to have free liquids.

7.0 PROCEDURE

- 7.1 Assemble test apparatus as shown in Figure 1.
- 7.2 Place sample in the filter. A funnel may be used to provide support for the paint filter.
- 7.3 Allow sample to drain for 5 minutes into the graduated cylinder.
- 7.4 If any portion of the test material collects in the graduated cylinder in the 5-min. period, then the material is deemed to contain free liquids for purposes of 40 CFR 264.314 and 265.314.

8.0 QUALITY CONTROL

- 8.1 Duplicate samples should be analyzed on a routine basis.

9.0 METHOD PERFORMANCE

- 9.1 No data provided.

10.0 REFERENCES

- 10.1 None required.

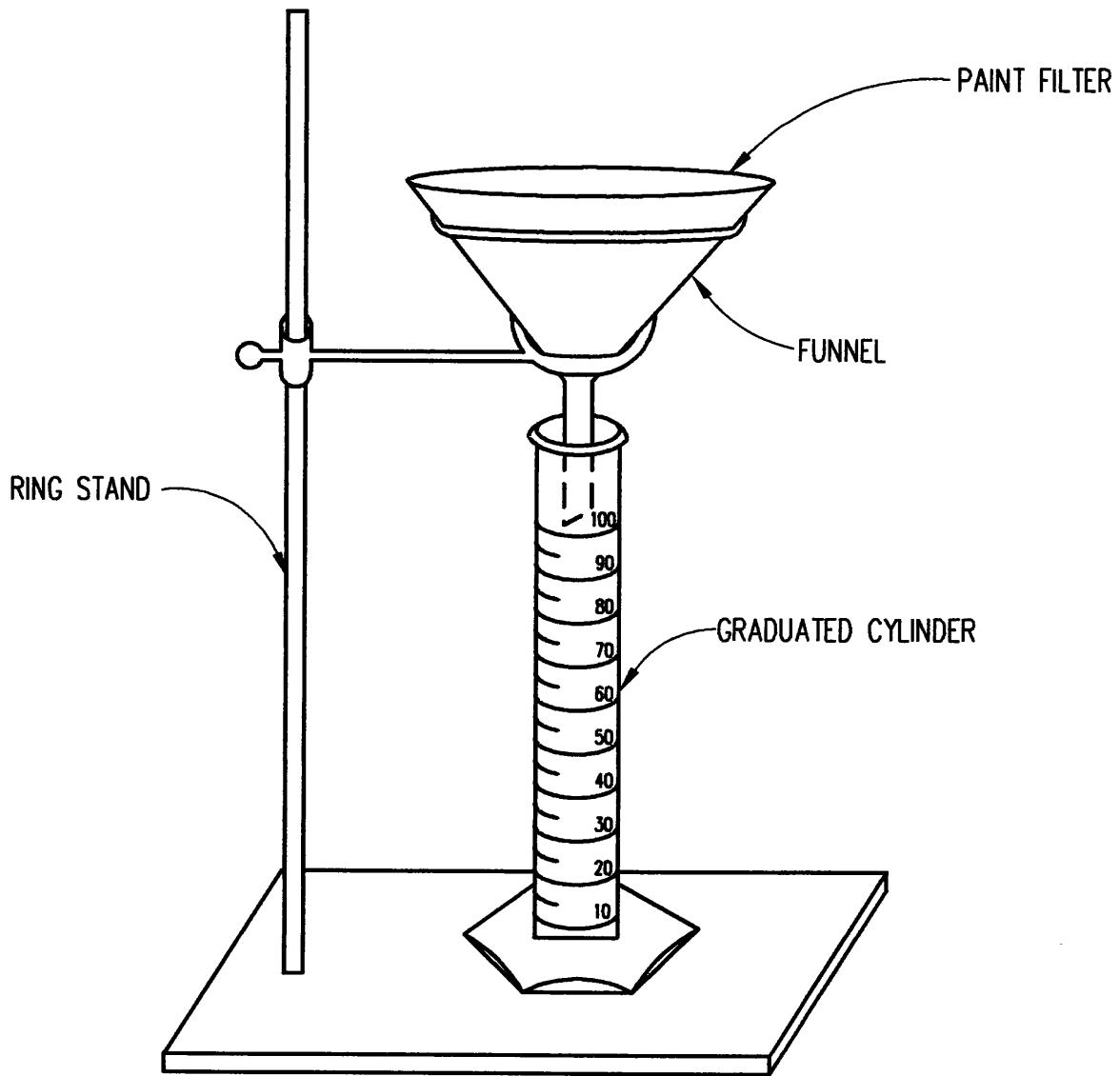
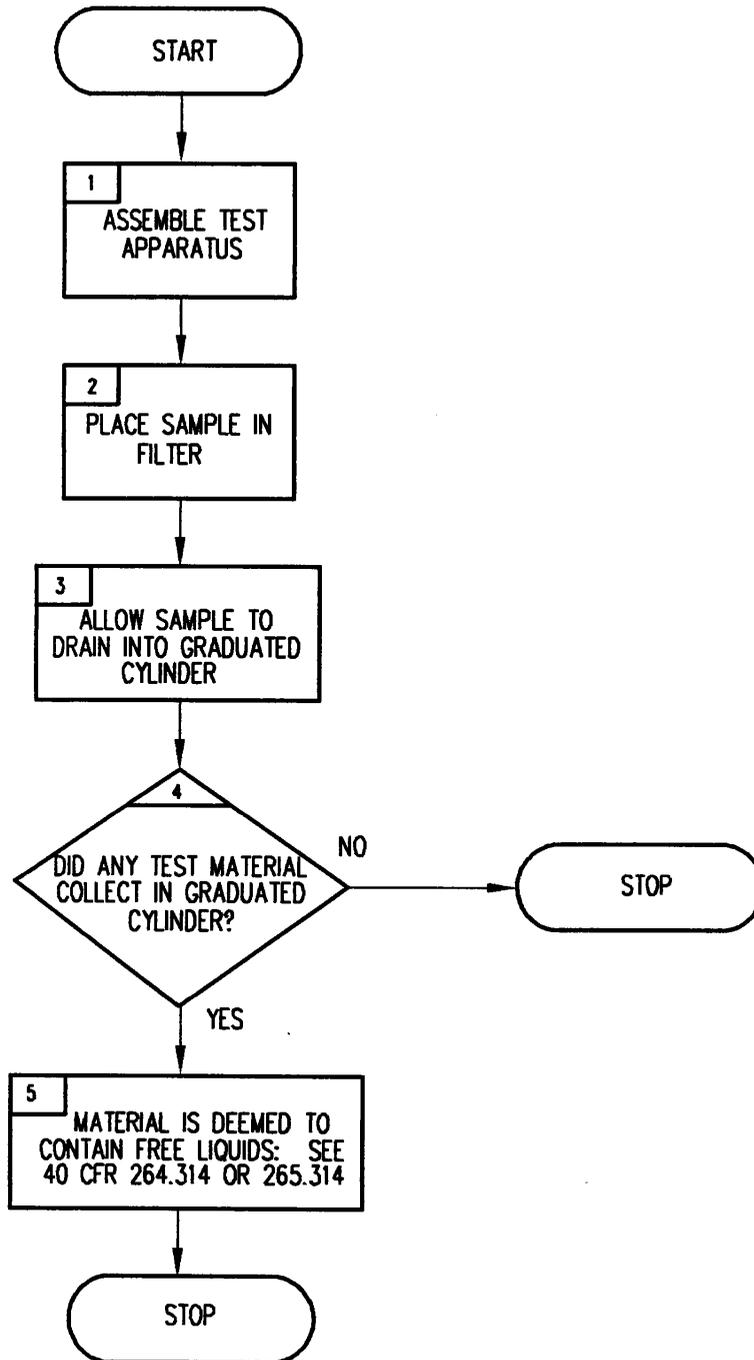


FIGURE 1. PAINT FILTER TEST APPARATUS.

METHOD 9095
PAINT FILTER LIQUIDS TEST



Appendix B

Waste Screening Form

THIS PAGE INTENTIONALLY LEFT BLANK

Johnston County Department of Public Utilities
Johnston County Landfill Facility
Permit No. 51-03
(919) 938-4750

WASTE SCREENING FORM

Day / Date: _____ Time Weighed in: _____
Truck Owner: _____ Driver Name: _____
Truck Type: _____ Vehicle ID / Tag No: _____
Weight _____ Tare: _____
Waste Generator / Source: _____

Reason Load Inspected: Random Inspection _____ Staff Initials _____
 Detained at Scales _____ Staff Initials _____
 Detained by Operating Staff _____ Staff Initials _____

Inspection Location: _____

Approved Waste Determination Form Present? Yes _____ No _____ N/A _____

Description of Load: _____

Load Accepted (signature) _____ Date _____
Load Not Accepted (signature) _____ Date _____

Reason Load Not Accepted (complete only if load not accepted)

Description of Suspicious Contents: Color _____ Haz. Waste Markings _____
 Texture _____
 Drums Present _____ Smell _____
 Est. Cu. Yds. Present in Load _____
 Est. Tons Present in Load _____

Johnston County Emergency Management Contacted? Yes _____ No _____

Company or Authority Contacted? _____
Hazardous Materials Present: _____

Hauler Notified (if waste not accepted) Phone: _____ Time Contacted: _____
Other Observations: _____

Final Disposition
Signed _____ Date _____
 Waste Screening Inspector or Solid Waste Manager

Attach related correspondence to this form.
File completed form in Operating Record.

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix C

Cell Activation Forms

THIS PAGE INTENTIONALLY LEFT BLANK

**JOHNSTON COUNTY MSW LANDFILL - PHASE 4A
CELL ACTIVATION FORM**

Date: _____

Cell: _____

Size of Geosynthetic Rain Cover Removed (Length/Width): _____

Length of Type GT-S Geotextile Removed from Gravel Column(s): _____

Remarks: _____

Signed: _____

Sketch:

THIS PAGE INTENTIONALLY LEFT BLANK

**JOHNSTON COUNTY C&D LANDFILL - AREA 2
CELL ACTIVATION FORM**

Date: _____

Cell: _____

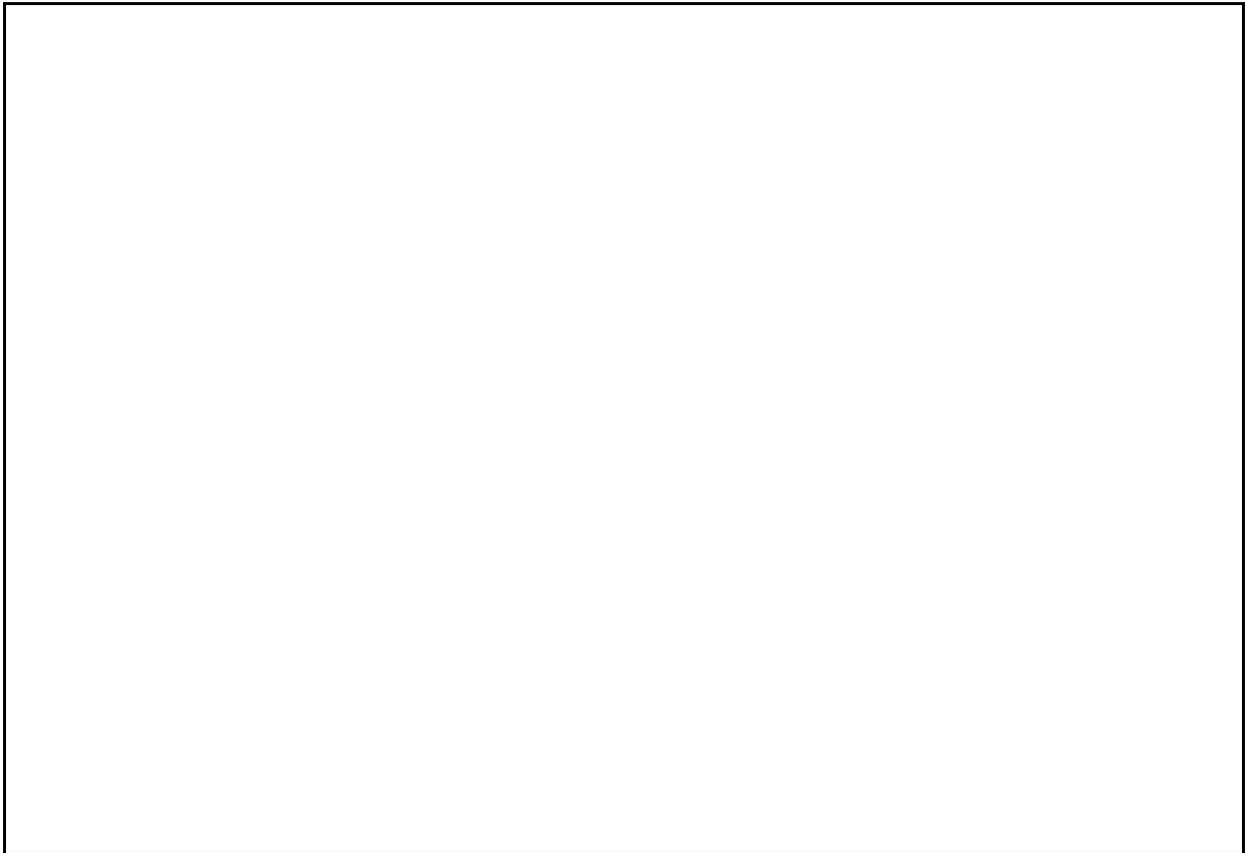
Size of Geosynthetic Rain Cover Removed (Length/Width): _____

Length of Type GT-S Geotextile Removed from Gravel Column(s): _____

Remarks: _____

Signed: _____

Sketch:

A large empty rectangular box with a black border, intended for a sketch. It occupies the lower half of the page.

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix D

Leachate Recirculation Plan

THIS PAGE INTENTIONALLY LEFT BLANK

**Operations Manual
Appendix D: Leachate Recirculation Plan**

**Johnston County Landfill Facility
Smithfield, North Carolina**

Prepared for:

**Johnston County Department of Public Utilities
Smithfield, NC**

June 2007



RICHARDSON SMITH GARDNER & ASSOCIATES

Engineering and Geological Services

14 N. Boylan Avenue
Raleigh, North Carolina 27603

THIS PAGE INTENTIONALLY LEFT BLANK

**JOHNSTON COUNTY
JOHNSTON COUNTY LANDFILL FACILITY**

**OPERATIONS MANUAL
APPENDIX D: LEACHATE RECIRCULATION PLAN**

1.0 OVERVIEW

Water is the most significant factor influencing waste stabilization and leachate quality. Moisture addition has been demonstrated repeatedly to have a stimulating effect on methanogenesis (Barlaz et al, 1990), although some researchers indicate that it is the movement of moisture through the waste as much as it is water addition that is important (Klink and Ham, 1982). Moisture within the landfill serves as a reactant in the hydrolysis reactions, transports nutrients and enzymes, dissolves metabolites, provides pH buffering, dilutes inhibitory compounds, exposes surface area to microbial attack, and controls microbial cell swelling (Noble, et al, 1991). Lu, et al, (1985) stated that high moisture flow rates can flush soluble organics and microbial cells out of the landfill and in such cases microbial activity plays a lesser role in determining leachate quality. Also, high moisture application rates can remove the majority of waste contaminants early in the life of the fill. Under low flow rate conditions, anaerobic microbial activity is the significant factor governing leachate organic strength (McBean et al, 1995). The quantity of moisture is important because it directly affects stabilization rates within the landfill. Sulfito et al, (1992) and Miller, et al, (1994) both noted the important role of moisture in supporting methanogenic fermentation of solid waste when examining samples removed from operating landfills. Relatively dry landfills (i.e. 20-40% water) have very slow stabilization rates because there is only a small quantity of moisture for biological degradation. Recommended moisture content reported in the literature ranges from a minimum of 25 percent (wet basis) to optimum levels of 40 to 70 percent (Barlaz, et al, 1990; Chen and Bowerman, 1974).

Leachate is recirculated in MSW landfills for one or more of the following reasons:

- as an alternative to leachate treatment,
- to promote biodegradation of the waste as detailed above to produce a smaller and more stable waste mass, and
- to accelerate the production of landfill gas (LFG).

Johnston County's plan to recirculate leachate within the Phase 5 area of their Subtitle D landfill is based on a desire to stabilize the waste and associated contaminants prior to placement of the final cover. The County facility is presently equipped with a leachate force main to a County owned and operated wastewater treatment plant (WWTP) so that disposal of leachate is not a concern. As such, this recirculation plan is developed with the goal of maximizing the rate of degradation of the waste and not for the purpose of leachate disposal.

2.0 REGULATORY REQUIREMENTS

The recirculation of leachate within lined MSW landfills is provided for in Federal RCRA Subtitle D regulations and not prohibited in North Carolina regulations. It is anticipated that design and operational requirements for recirculation will evolve from guidance provided by the Solid Waste Section of the North Carolina Division of Waste Management (DWM).

2.1 40 CFR 258 RCRA Subtitle D

Federal regulations provide both specific and implied requirements that must be met by landfills recirculating leachate. Relevant sections of the Federal regulations are as follows:

§258.28 (a): Bulk or non-containerized liquid waste may not be placed in the MSWLF units unless: (1) The waste is household waste other than septic waste; or (2) The waste is leachate or gas condensate from the MSWLF unit and the MSWLF unit, whether it is a new or existing MSWLF, or lateral expansion, is designed with a composite liner and leachate collection system as described in §258.40(a)(2) of this part...

§258.40(a)(2): With a composite liner, as defined in paragraph (b) of this section and a leachate collection system that is designed and constructed to maintain less than a 30-cm depth of leachate over the liner. (b) For purposes of this section, *composite liner* means a system consisting of two components: the upper component must consist of a minimum 30-mil flexible membrane liner (FML), and the lower component must consist of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec...

2.2 North Carolina Rule NCAC T15A: 13B.1600

North Carolina regulations mirror the above referenced Federal regulations in Rule .1624(b)(1) related to design and construction, Rule .1624(b)(2)(A) related to maximum head, and Rule .1626(9)(a)(ii) related to recirculation of leachate. Currently, however, implementation of leachate recirculation is administered using policy established in DWM guidance for leachate recirculation. This guidance establishes basic elements that must be incorporated into a leachate recirculation plan prior to implementation of a 120-day trial period and eventual long-term operation. Key elements of this guidance are listed on **Table 1** along with the location in this manual where the element is addressed.

3.0 FACILITY LIQUIDS CONTROL - ENGINEERED PERFORMANCE

Significant engineering effort has been expended to ensure that the maximum head acting on the liner system during routine recirculation does not exceed 30 cm and that the recirculation system itself does not adversely affect the integrity or stability of the landfill. This section provides a general description of these systems and the technical evaluation performed to ensure adequate performance.

3.1 Leachate Recirculation System

The leachate recirculation system uses a network of horizontal porous galleries to both inject leachate into the waste and to vent landfill gas (LFG) generated by the degradation of the waste. The galleries are designed to minimize leachate short circuiting of the waste and the potential for landfill fires in the LFG collection system. Each gallery consists of a family of parallel trench drains that are individually fitted with a leachate injection pipe. The **Project Drawings** show the general geometry and placement of the injection/LFG galleries and details for their construction. The galleries are placed at an approximate 30 foot vertical spacing and a maximum 80 foot horizontal spacing. Each successive vertical gallery is staggered to provide for more uniform leachate distribution and gas collection. The porous LFG collection and leachate distribution media can be constructed using gravel, tire chips, or other relatively inert media having a permeability greater than 1×10^{-2} cm/sec. The leachate injection and LFG collection pipes are high density polyethylene (HDPE) fusion welded pipe having a maximum SDR of 11. Leachate is injected under a minimum 10 psi pressure through a series of 1/8 inch holes spaced 10 feet apart. Field tests by GNRA have confirmed that this hole size and spacing allows for a very uniform release of leachate from each hole for pipe lengths up to 800 feet in length. For this project, lengths were designed up to ± 400 feet in length. Installation details for each injection/LFG gallery are recorded using the form provided in **Appendix D1**.

Significant settlement of the waste is anticipated during the service life of the recirculation system. HDPE was selected for use in the injection/LFG pipes due to both its chemical resistance and its low coefficient of friction which minimizes potential tensile forces caused by differential settlement of the waste. The selected SDR of the pipes is based on anticipated maximum tensile forces related to differential settlement and not the stresses generated by the leachate pressure.

3.2 Leachate Collection System (LCS)

The leachate collection system (LCS) for Phase 5 was modified by the County as follows. The modification consisted of removal of 12 inches of sand and a geotextile that had originally been placed between the primary leachate collection pipes and the waste. This material was replaced with a NC DOT #57 stone that provides a significant increase in the transmissivity of the pipe/stone drain and resistance to bioclogging of the drain. This conversion of the primary collection pipe system is performed just in advance of the placement of waste immediately on the #57 stone to ensure that the stone remains free of fines from the protective cover.

The HELP (v. 3.07) Model was used to evaluate the impact of leachate recirculation on the head acting on the composite liner system. This analysis indicates that the average head acting on the liner system is less than 12 inches when a minimum of 30 feet of waste is in place prior to initiating recirculation. The short-term HELP evaluations are conservative in that only a single 30 foot lift of waste is modeled for a 5 year period. As the height of waste is increased, the storage capacity within the waste increases and the

resulting head on the liner system decreases. For example, modeling a 60 foot layer of waste under intermediate cover reduces the short term head from 10.2 inches to 5.4 inches.

4.0 FACILITY EQUIPMENT AND OPERATING PRACTICES

Leachate recirculation must be performed in a manner that does not create odor or stability problems and produces heads on the liner system less than 30 cm. Odor problems are minimized in the proposed system by the use of leachate injection galleries such that raw leachate is not applied to the surface of the waste. The permanent system for injection of leachate is shown in the **Project Drawings** and requires operational steps as follows:

- Leachate to be recirculated is collected in the existing leachate pump station located adjacent to the existing leachate storage lagoon.
- Leachate is pumped from the pump station to the injection galleries using a submersible high-head pump capable of maintaining a minimum 10 psi pressure at the inlet of the injection gallery. Each injection gallery is provided with a positive on-off ball valve as shown in the **Project Drawings**.
- Leachate is pumped into individual injection galleries in metered $\pm 6,000$ gallon slugs designed to prevent localized saturation of the waste and stability problems. Injection is sequenced between the galleries and recorded using the form provided in **Appendix D1**.
- A backup system can be provided using a water truck that receives leachate from the leachate lagoon and then transports it back to the top of Phase 5 and injects it directly from the truck to one of the injection galleries. This system may be utilized in the event of a shutdown of the recirculation pump.

The general recirculation philosophy is to avoid visible discharge of leachate, e.g., spraying into the air by truck, sprinklers, or hoses, to minimize the potential for odor problems and excessive discharge in one zone of waste to minimize stability and seep related problems. This section discusses the facility hardware and operational procedures employed to successfully recirculate leachate to the waste.

4.1 Leachate Injection Gallery

Each injection gallery extends horizontally from the face of the final cover into the waste a distance of no more than about 400 ($\pm 10\%$) feet in length. Each injection gallery consists of a granular windrow or trench drain containing a HDPE leachate injection pipe. The details of this system are discussed in **Section 3.1**. Each leachate injection gallery pipe is fitted at its exposed end with a positive on-off valve connected to the supply line. A check valve and cleanout are also provided for each injection gallery pipe.

The injection pipe diameter and pressure are selected to ensure that leachate flow velocities are sufficient to prevent fouling of the injection pipe and the perforations. It is not anticipated that the leachate injection pipes will require servicing during their estimated 5-8 year service life. The granular drain surrounding the injection pipe is designed to both allow a more uniform distribution of the leachate and for the collection of LFG within the waste. The size and permeability of the granular trench drain is based on the desire to maintain internal LFG pressures less than 6-inches H₂O (0.22 psi). All injection gallery installation details will be recorded using the form provided in **Appendix D1**.

4.2 Leachate Injection Equipment

One submersible pump will be provided in the existing pump station for recirculating leachate. This pump is rated for a flow of 50 gpm at a head of 210 feet. This pump was selected to provide the required minimum inlet pressure to the leachate injection gallery of 10 psi and approximately 2 hours pumping time to inject 6,000 gallons of leachate. The injection pump is equipped with on-off controls within the pump station.

4.3 Leachate Amendment

With time it is anticipated that the leachate draining from Phase 5 will become increasingly acidic. Research by Barlaz (1990) has shown that the rate of waste decomposition actually decreases with increasing acidity. Therefore it may be necessary to buffer the leachate prior to future recirculation. This will be accomplished using a liquid lime injector as needed. Currently there are no plans for leachate amendment other than buffering.

5.0 FACILITY MONITORING PRACTICES

The facility must be monitored to ensure that the combination of leachate recirculation and natural precipitation does not produce excessive head on the liner system, side slope seeps, or stability problems. This section reviews a monitoring system to be installed at Phase 5 to monitor both weather and leachate quantities.

5.1 Weather Monitoring

Daily weather monitoring will be obtained using a rain gauge and tell-tale equipped thermometer located at the landfill office. Daily readings would be obtained for the maximum temperature, total rainfall, and general weather conditions. This information would be recorded on the form provided in **Appendix D1**. This data allows an accurate evaluation of the water-balance over time within the waste.

5.2 Leachate Monitoring

Leachate from Phase 5 gravity drains to the leachate lagoon. The cumulative flow through the gravity drain line will be monitored via flowmeters for all pumps. Calculations commonly performed to determine action leakage rates (ALR) for leak detection systems show that the flow rate will be 130,600 gallons per day when the maximum head acting on the liner is 30 cm. The cumulative flow monitoring will provide verification that the head acting on the liner system is less than 30 cm.

Landfill personnel will pay particular attention to sudden increases in leachate generation during or immediately after recirculation activities. Sudden increases in rate of leachate generation from the facility not accompanied by precipitation indicates that injected leachate is moving through the waste faster than normal. This may imply either saturation of the waste due to over injection of leachate or short circuiting (via voids in the waste) of the waste by a single injection. Both situations require a cessation of injection to the injection gallery in question and a modification of the injection sequence.

6.0 REPORTS

The following reports will be prepared:

- Pre-Operational Report;
- 120-Day Trial Period Reporting (Progress and Final Reports); and
- Quarterly Operational Reports.

Reporting forms proposed in this pre-operational report will be revised with experience.

6.1 Pre-Operational Report

The pre-operational report provides sufficient information to justify the 120-day trial recirculation period. This Leachate Recirculation Plan is the pre-operational report for the Johnston County Phase 5 leachate recirculation program.

6.1.1 Weather Monitoring

A daily rain gauge and thermometer will be installed at the landfill office to allow daily recording of total rainfall and maximum temperature. This data will be recorded at the end of each working day.

6.1.2 Baseline Leachate Sampling

Baseline leachate quality data for Phase 5 will be provided within the last 30 days prior to the initiation of leachate recirculation. This data will include test results

for BOD, COD, temperature, conductivity, pH, ammonia, suspended solids, metals, and volatiles.

6.1.3 Operational Procedures

Johnston County plans on proceeding with the installation of the recirculation pump and force main. Thus, the operational procedures during the 120-day trial recirculation period will be the same as for long-term operations as previously described in **Section 4**.

6.1.4 Operational Equipment

The operational equipment during the 120-day trial will include the recirculation pump and force main and a portion of the first level of injection galleries as shown in the **Project Drawings** and installed at a nominal elevation of 30 feet of waste.

6.1.5 Record Keeping

Daily readings for rainfall, maximum temperature, quantity of leachate generated/recirculated, and leachate injection galleries used will be maintained using the form provided in **Appendix D1**. This form provides for a week of data and allows comments on the daily weather conditions and unusual operating conditions, e.g., odor or seeps. These data sheets will be provided to the State as part of the technical report submitted to DWM in support of implementation of the long-term leachate recirculation program.

6.2 **120-Day Trial Period Reporting**

6.2.1 Progress Report

After a minimum of 60 days, a progress report will be prepared which describes and documents the monitoring activities since initiation of the 120-day trial period, presents observed difficulties and/or operational modifications, and presents leachate quality data. Leachate quality data will include test results for BOD, COD, temperature, conductivity, pH, ammonia, suspended solids, metals, and volatiles.

6.2.2 Final Report

At the completion of the 120-day trial period, a final report will be prepared which describes and documents the monitoring activities for the entire trial period, presents observed difficulties and/or operational modifications, and presents leachate quality data. Leachate quality data will include test results for BOD, COD, temperature, conductivity, pH, ammonia, suspended solids, metals, and volatiles. The most critical aspect of this report is confirmation that the

proposed leachate injection sequence results in acceptable performance. Final drawings and specifications for the facility modifications will also be submitted with this report. Based on this report, Johnston County will request approval by DWM to implement the long-term leachate recirculation program.

6.3 Quarterly Operational Reports

Quarterly leachate recirculation operational reports will be submitted to DWM after the 120-day trial period. These reports will provide the daily log sheets provided in **Appendix D1**, identify all leachate injection galleries in service, and provide updated leachate quality data.

7.0 REFERENCES

- 1- Barlaz, M.A., R.K. Ham, and D.M. Schaefer, 1990. "Methane Production from Municipal Refuse: A review of Enhancement Techniques and Microbial Dynamics," Critical Reviews in Environmental Control, 19(6): 557.
- 2- Chen, K.Y. and F.R. Bowerman, 1974. "Mechanisms of Leachate Formation in Sanitary Landfills," in: Recycling and Disposal of Solid Wastes: Industrial, Agricultural, Domestic., Yen, T.F. editor, Ann Arbor, Ann Arbor Science Publication.
- 3- Klink, R.E. and R.K. Ham, 1982. "Effect of Moisture Movement on Methane Production in Solid Waste Landfill Samples," Resources and Conservation, 8: 29.
- 4- Lu, J.C.S., et al., editor, 1985. Leachate from Municipal Landfills, Production and Management, Noyes Publisher, Park Ridge, New Jersey.
- 5- McBean, E.A., F.A. Rovers, and G.J. Farquhar, 1995. Solid Waste Landfill Engineering and Design, Prentice Hall, Englewood Cliffs, NJ.
- 6- Miller, W.L., T. Townsend, J. Earle, H. Lee, and D.R. Reinhart, 1994. "Leachate Recycle and the Augmentation of Biological Decomposition at Municipal Solid Waste Landfills," Presented at the Second Annual Research Symposium, Florida center for Solid and Hazardous Waste Management, Florida.
- 7- Noble, J.J. and A.E. Arnold, 1991. "Experimental and Mathematical Modeling of Moisture Transport in Landfills," Chemical Eng. Comm., 100: 95-111.
- 8- Sulfito, J., C. Gerba, R. Ham, A. Palmisano, W. Rathje, and J. Robinson, 1992. "The World's Largest Landfill," Environmental Science & Technology, 26(8): 1486-1495.

TABLE 1: NC DWM POLICY ELEMENTS FOR LEACHATE RECIRCULATION

Conditions	Policy Element	Section(s)
Preoperative Conditions	A rain gauge and thermometer shall be placed on the site.	6.1.1
	A Baseline sampling of leachate shall be performed.	6.1.2
	An outline of expected operational procedures shall be submitted.	4.0
	A brief description of the equipment and its' associated specifications shall be submitted.	4.0 & Specs.
	A brief description of record-keeping forms shall be submitted including: <ul style="list-style-type: none"> ● daily/weekly record of leachate generated ● daily/weekly record of leachate recirculated ● weather conditions and other pertinent daily information ● a log for reporting operating or other unusual problems, and their subsequent rectification ● any other forms or procedures, etc., that the owner/operator will use. 	5.0/6.0
	An estimation of height of waste in the cell where leachate is anticipated to be applied.	Project Drawings
Operating Conditions	Records shall be kept on a daily/weekly basis as outlined.	6.0
	No leachate shall be applied on less than one lift (10 feet) of waste.	3.1
	No leachate shall be spray applied or surface circulated when it is raining, or when the waste is too wet.	4.0
	No run-off or side seepage will be allowed.	4.0
	Odors will be controlled.	4.0
	Leachate depth shall be monitored in the manhole to ensure that the head on the liner does not exceed one foot for more than 24 hours.	5.2
	Leachate will be spray applied or surface circulated during daylight hours only.	N/A
	The application system will be properly maintained and documented.	5.0/6.0
	Subsurface distribution systems will be outlined.	4.1
	Operation and maintenance of subsurface systems will be proposed.	4.0

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix D1

Reporting Forms and Logs

THIS PAGE INTENTIONALLY LEFT BLANK

**JOHNSTON COUNTY MSW LANDFILL - PHASE 5
LEACHATE RECIRCULATION
120-DAY TRIAL PERIOD MONTHLY REPORTING FORM**

Start Date (Day 1): _____

Day	Rain (Inch)	Max. Temp.	Leachate Generated	Leachate Recirculated	Injection Galleries Used	Problems/Weather (Use Extra Sheet if Required)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						

**JOHNSTON COUNTY MSW LANDFILL - PHASE 5
LEACHATE RECIRCULATION
LEACHATE RECIRCULATION MONTHLY REPORTING FORM**

Start Date (Day 1): _____

Day	Rain (Inch)	Max. Temp.	Leachate Generated	Leachate Recirculated	Injection Galleries Used	Problems/Weather (Use Extra Sheet if Required)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						

**JOHNSTON COUNTY MSW LANDFILL - PHASE 5
LEACHATE RECIRCULATION
HORIZONTAL WELL INSTALLATION LOG**

Well Number: _____

Date(s) Installed: _____

Length Installed: _____

Elevation: _____

Number of Holes/Spacing: _____

Hole Size: _____

Coordinates:

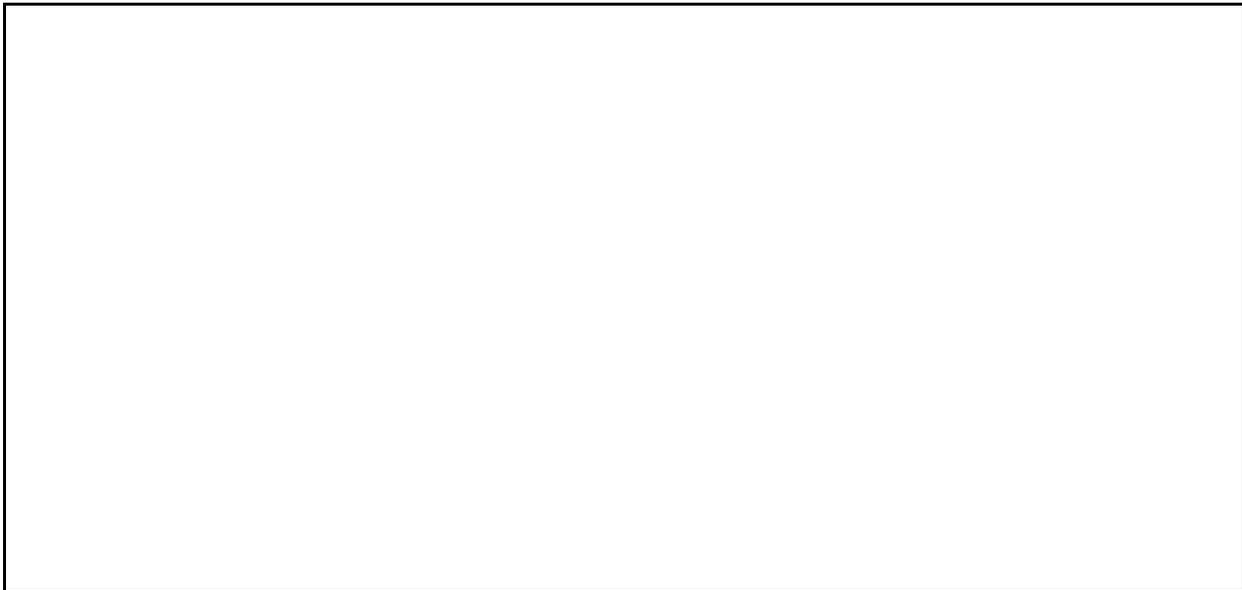
Point #: _____ X: _____ Y: _____ Z: _____

Point #: _____ X: _____ Y: _____ Z: _____

Point #: _____ X: _____ Y: _____ Z: _____

Remarks: _____

Installation Sketch:



Appendix E

Irrigation of Reclaimed Wastewater

THIS PAGE INTENTIONALLY LEFT BLANK

**Operations Manual
Appendix E: Irrigation of Reclaimed Wastewater**

**Johnston County Landfill Facility
Smithfield, North Carolina**

Prepared for:

**Johnston County Department of Public Utilities
Smithfield, NC**

June 2007

Revised: December 2008



RICHARDSON SMITH GARDNER & ASSOCIATES
Engineering and Geological Services
14 N. Boylan Avenue
Raleigh, North Carolina 27603

THIS PAGE INTENTIONALLY LEFT BLANK

**JOHNSTON COUNTY
JOHNSTON COUNTY LANDFILL FACILITY**

**OPERATIONS MANUAL
APPENDIX E: IRRIGATION OF RECLAIMED WASTEWATER**

TABLE OF CONTENTS

	<u>Page</u>
1.0 Overview	1
2.0 Contact Information	1
3.0 Irrigation System Operation	1
3.1 Areas to be Irrigated	1
3.2 Periods of Operation	2
3.3 Irrigation Amounts	2
3.4 Irrigation Restrictions	2
3.4.1 Monitoring Wells	2
3.4.2 Closed Landfill Areas	3
3.4.3 Future Landfill Areas	3
3.4.4 Borrow Areas	3
3.5 Site Monitoring of Irrigation Program	3
3.6 System Maintenance and Inspections	4

FIGURES

Figure 1 Landfill Site Irrigation Plan

THIS PAGE INTENTIONALLY LEFT BLANK

**JOHNSTON COUNTY
JOHNSTON COUNTY LANDFILL FACILITY**

**OPERATIONS MANUAL
APPENDIX E: IRRIGATION OF RECLAIMED WASTEWATER**

1.0 OVERVIEW

This Operations Manual Addendum was prepared for the Johnston County MSW Landfill located off of Highway 210 on County Home Road for the purpose of describing the operation of an irrigation system for reclaimed wastewater. The system is owned and operated by Johnston County.

2.0 CONTACT INFORMATION

All correspondence and questions concerning the operation of the reclaimed wastewater irrigation system should be directed to the appropriate County personnel listed below:

Johnston County Department of Public Utilities
309 E. Market Street, P.O. Box 2263
Smithfield, NC 27577
Phone: (919) 209-8333 (Downtown); (919) 938-4750 (Landfill)
Fax: (919) 934-7174 (Downtown); (919) 989-7152 (Landfill)

Solid Waste Manager: Rick Proctor
Public Utilities Director: Tim Broome, P.E.

3.0 IRRIGATION SYSTEM OPERATION

3.1 Areas to be Irrigated

Areas to be irrigated and order of priority (1 being the highest) include the following:

Priority 1:

- Wooded area behind (south and east of) NC Forest Service building (Field 1) (Not on Solid Waste Permit Site);
- Agricultural fields to the south and west of the landfill office (Field 2) (majority not on Solid Waste Permit Site);
- Area behind (west of) landfill office (Fields 3 & 4 - future Phases 6, 9, and 10); and
- Wooded area south of the leachate storage lagoon (Fields 6, 7, & 8 - future Phases 7 and 8).

Priority 2:

- Closed landfill areas on Phase 1 & 2, 3, 4, and 5 (LF Cap 1 & 2, LF Cap 3, LF Cap 4, and LF Cap 5).

Priority 3:

- Inactive borrow areas (Field 5 - future Phases 6 and 7) (Fields 9, 10, & 11).

In addition to these areas, the County plans to use reclaimed wastewater for the control of dust within the facility and around the County livestock arena (not on Solid Waste Permit Site). **Figure 1** presents the location of the various planned irrigation areas.

3.2 Periods of Operation

The irrigation system will be operated during the months of April through October with the exception of Fields 1, 2, and 3. In addition, irrigation will be discontinued on any day that rainfall exceeds 0.2 inches.

For Fields 1, 2, and 3, irrigation will be year-round. A winter cover crop, such as annual rye, will be used as required. No irrigation will take place during freezing temperatures. Equipment will be drained as required to prevent problems due to freezing temperatures.

3.3 Irrigation Amounts

Irrigation amounts off the landfills will be in accordance with the agronomic rates determined for the landfill site (based on “wettest” year amounts) in an analysis performed by Robert Evans, Ph.D., P.E. of N.C. State University and entitled “Hydrologic Wastewater Reuse Irrigation Analysis for Johnston County”. Irrigation amounts on the landfill final covers will be in accordance with HELP model evaluations performed by Richardson Smith Gardner & Associates, Inc. (formerly G.N. Richardson & Associates, Inc.). A tabulation of amounts to be irrigated is given in **Table 1**. Restrictions to these amounts are as stated herein. Note that based on site monitoring of the irrigation program (see **Section 3.5**), future increases to these amounts may be allowed.

3.4 Irrigation Restrictions

3.4.1 Monitoring Wells

No irrigation will occur within 100 feet of an actively monitored site monitoring well.

3.4.2 Closed Landfill Areas

Irrigation over closed landfill areas shall only take place over closed areas which have at least 2 feet of soil cover or at least 1.5 feet of soil cover and a synthetic barrier.

3.4.3 Future Landfill Areas

Irrigation over areas designated as future landfill areas (or areas within 300 feet of future landfill areas) will be discontinued within 2 years before the anticipated start of construction for that area unless it is demonstrated by use of piezometers, monitoring wells, or other method (see **Section 3.5**) that irrigation rates are not creating an artificial rise in groundwater levels. Closed landfill areas, if to be lined over as part of a future landfill area may be irrigated in accordance with **Section 3.4.2**.

3.4.4 Borrow Areas

No irrigation will be performed in active borrow areas. Irrigation may be performed in inactive borrow areas as long as the ground surface is prepared to promote vegetation (soil type, nutrients, etc.).

3.5 Site Monitoring of Irrigation Program

In order to monitor the effect of the irrigation program both to ground water quality and to the ground water table a monitoring program will be implemented. This program will consist of two elements. One will be the addition of sampling and testing of the treated irrigation water as part of the regular Spring and Fall ground water sampling/testing events already performed as part of site operations. After sampling, the irrigation water will be tested for the same detection monitoring parameters as for the other site samples.

In addition, the second element of the monitoring program will be the installation of piezometers in each future landfill area to be irrigated (i.e. Phases 6-10). At a minimum, one piezometer will be installed roughly in the central portion of the proposed future landfill phase before irrigation can begin over that area. The water elevations in these piezometers will be measured and recorded both during the spring and fall, concurrent with regular site ground water monitoring, and in the mid-summer. These levels will be evaluated in order to determine if there appears to be a rise in ground water elevations due to the irrigation activities. Should ground water elevations be maintained within a couple of feet of initial levels or levels that might otherwise be considered normal considering other factors such as weather, etc., the irrigation amounts for that area may be increased. Likewise, if there appears to be a significant (more than a couple of feet) increase in ground water elevation, which cannot be otherwise explained, irrigation activities in this area will be reduced or suspended. Also, as stated in **Section 3.4.3**, irrigation in future landfill areas will be halted at least two years prior to planned construction activities in that area.

3.6 System Maintenance and Inspections

Inspection of the irrigation system during periods of operation will be performed by landfill staff on a weekly basis for the closed landfill areas. Other areas may be inspected less frequently, but not less than once per month. As much of the proposed system will be above ground, inspection for damaged piping, valves, sprinklers, etc. will be done on a mostly visual basis. Should maintenance be required to any portion of the irrigation system, that part of the system will be shut off until adequate repairs are made.

Table 1: Irrigation Amounts

Field	Max. Daily Application Rate cm/day (inch/day)	Annual Application Rate cm/year (inch/year)
Fields 1 and 2	0.60 (0.25)	70 (28)
Fields 3, 4, and 5	0.60 (0.25)	62 (25)
Fields 6, 7, and 8	0.60 (0.25)	42 (17)
Fields 9 and 10 Livestock Arena	0.60 (0.25)	50 (20)
Dust Control	0.60 (0.25)	45 (18)
Field 11	0.60 (0.25)	40 (16)
Landfill Final Cover ¹	0.25 (0.1)	12 (5)

Note:

- 1) At a rate less than that which would cause saturation of the upper 9 inches of soil cover. This will be controlled by the use of soil moisture devices, which will automatically shut off the irrigation system if the upper 9 inches becomes saturated.

THIS PAGE INTENTIONALLY LEFT BLANK

Closure and Post-Closure Plan

**Johnston County Landfill
Smithfield, North Carolina**

Prepared for:

**Johnston County Department of Public Utilities
Smithfield, NC**

December 2011



14 N. BOYLAN AVENUE
RALEIGH, NORTH CAROLINA 27603
NC LIC. NO. C-0828 (ENGINEERING)

THIS PAGE INTENTIONALLY LEFT BLANK

JOHNSTON COUNTY LANDFILL
CLOSURE AND POST-CLOSURE PLAN

TABLE OF CONTENTS

		<u>Page</u>
1.0	CLOSURE PLAN	
1.1	Overview	1.0-1
1.2	Maximum Closure Area and Waste Capacity	1.0-1
1.3	Final Cover System	1.0-2
1.4	Landfill Gas System	1.0-2
1.5	Surface Water Systems	1.0-2
	1.5.1 Incremental Operation	1.0-3
	1.5.2 Required Maintenance	1.0-3
1.6	Closure Schedule	1.0-3
1.7	Closure Verification	1.0-4
2.0	POST-CLOSURE PLAN	
2.1	Overview	2.0-1
2.2	Post-Closure Contact	2.0-1
2.3	Post-Closure Use	2.0-1
2.4	Maintenance	2.0-2
	2.4.1 Repair of Security Control Devices	2.0-2
	2.4.2 Erosion Damage Repair	2.0-2
	2.4.3 Correction of Settlement, Subsidence, and Displacement	2.0-2
	2.4.4 Leachate Management System (Lined Units)	2.0-2
	2.4.5 Closure of Leachate Storage Lagoon	2.0-2
	2.4.6 Repair of Run-On/Run-Off Control Structures	2.0-3
	2.4.7 Landfill Gas System	2.0-3
	2.4.8 Groundwater Monitoring Wells	2.0-4
2.5	Monitoring Plan	2.0-4
	2.5.1 Inspection Frequencies	2.0-4
	2.5.2 Quarterly Inspections	2.0-4
	2.5.3 Semi-Annual Inspections	2.0-4
2.6	Engineering Certification	2.0-5
3.0	CLOSURE/POST-CLOSURE COST ANALYSIS	
3.1	Overview	3.0-1
3.2	Estimated Closure Costs	3.0-1
3.3	Estimated Post-Closure Costs	3.0-1
3.4	Estimated Assessment and Corrective Action Costs	3.0-1
3.5	Financial Assurance Mechanism	3.0-1

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 1.0 CLOSURE PLAN

1.1 OVERVIEW

This plan is intended to serve as a guide for the proposed closure. A formalized Closure Plan for each landfill unit (or incremental portion thereof) will be submitted to the Solid Waste Section of the North Carolina Department of Environment and Natural Resources Division of Waste Management (DWM) for approval prior to beginning closure construction.

1.2 MAXIMUM CLOSURE AREA AND WASTE CAPACITY

The following are the estimated areas and capacity for each landfill unit to be closed under this plan.

Landfill Unit	Closure Area (Acres)	Gross Capacity (CY) ¹	Net (Waste) Capacity (CY/Tons) ¹
MSW Landfill Units			
Phase 4A (Through Cell 3 - Fill Sequence 1)	29.4	2,531,948	2,152,156 CY 1,383,316 Tons
Phase 5	19.2	1,087,199	884,625 CY 514,181 Tons
Total (MSW):	48.6	3,619,147	3,036,781 CY 1,897,497 Tons
C&D Units			
Area 1 (See Note 3)	12.9 (See Note 2)	614,472	515,563 CY 304,780 Tons
Area 2 (Cell 1)	11.9	410,675	353,056 CY 212,920 Tons
Total (C&D):	24.8	1,027,345	868,619 CY 517,700 Tons

Notes:

1. The volume and tonnage figures assumed for each landfill unit are based on the site's Facility Plan. Refer to Section 2.0 (Facility Report) of the Facility and Engineering Plan (**Attachment A**).
2. The Area 1 C&D landfill unit has a total area of 16.2 acres but has a reduced closure area due to the overlying Phase 4A - Cell 3 MSW landfill unit.
3. The Area 1 C&D landfill unit is currently closed and is awaiting approval of the closure certification.

1.3 FINAL COVER SYSTEM

The final cover system will consist of the following components (top-down):

- a 24-inch thick vegetative soil layer (including 6 inches of topsoil);
- a drainage geocomposite (with drainage breaks)
- a 30-mil textured LLDPE geomembrane; and
- a 12-inch thick intermediate cover layer.

The final cover system will be placed on prepared intermediate cover at a maximum slope of 4H:1V. Surface water control devices will also be incorporated into the final cover of each landfill unit and some units will have a landfill gas (LFG) control system. The final cover surface will be vegetated upon completion of the final cover installation according to the project seeding specifications.

Placement of the vegetative soil layer over the cover geosynthetics must be done with care to avoid damage to these materials. This soil layer should be placed from the bottom up using a small dozer equipped with low ground contact pressure (6 psi or less) tracks. A minimum of 12 inches of soil should be maintained between the dozer tracks and the underlying geosynthetics. The soil buffer should receive no compaction other than that provided by the dozer tracks. Pans or other heavy equipment should not operate on the vegetative soil layer.

Refer to the appropriate permit application for a detailed discussion and details related to the design of the final cover system for each landfill unit.

1.4 LANDFILL GAS SYSTEM

For the MSW landfill units and C&D landfill units overlying MSW units, a landfill gas system is provided in the final cover design. This system includes a system of collection wells placed within the waste to capture the gas and either passively vent or flare the gas via utility flares or, as required, actively collect and flare the gas via header piping and a blower/flare system. The collection wells should be placed before any geosynthetics are placed.

Refer to the appropriate permit application for a detailed discussion and details related to the design of the landfill gas system for each landfill unit.

1.5 SURFACE WATER SYSTEMS

Precipitation falling on the cover will infiltrate into the cover or run off the cover. Short-term the run-off runs down the surface of the intermediate cover. Long-term the run-off is collected in a series of drainage breaks built into the areas covered by final cover. These drainage breaks are provided along side slopes (rain gutters and diversion berms). Water captured by rain gutters or diversion berms is routed toward one of the down pipes. Flow in the down pipes is routed to the base of the landfill and to one of the site sediment basins.

Refer to the appropriate permit application for a detailed discussion and details related to the

design of surface water systems for each landfill unit.

1.5.1 Incremental Operation

During much of the life of the landfill, surface run-off will be handled by the intermediate cover system. Operations must strive to provide operational grading that encourages run-off from the intermediate cover to drain to the perimeter channels along the perimeter berms or to areas covered by final cover. Corrugated polyethylene (CPE) piping and temporary soil berms must be installed if required to accomplish this run-off routing.

1.5.2 Required Maintenance

The surface water systems must be inspected annually and immediately after every major storm. Sediment build-up in the drainage features/devices must be cleaned out on a regular basis to promote run-off. Sediments removed can be used as daily or intermediate cover.

1.6 CLOSURE SCHEDULE

In general, closure activities will occur on the following schedule:

MSW Landfill Units (15A NCAC 13B.1627(c)(5)):

- No later than 30 days after the date on which the MSWLF unit receives the known final receipt of wastes; or
- If the MSWLF unit has remaining capacity and there is a reasonable likelihood that the MSWLF unit will receive additional wastes, no later than one year after the most recent receipt of wastes.

C&D Landfill Units (15A NCAC 13B.0543(c)(5)):

- No later than 30 days after the date on which the C&DLF unit receives the known final receipt of wastes;
- No later than 30 days after the date that a 10 acre or greater area of waste, is within in 15 feet of final design grades; or
- No later than one year after the most recent receipt of wastes, if the C&DLF unit has remaining capacity.

Prior to beginning closure of any landfill unit, the County will notify the DWM that a notice of the intent to close the unit has been placed in the operating record.

All closure activities shall be completed within 180 days. Exemptions and extensions may be approved by the DWM.

1.7 CLOSURE VERIFICATION

The following procedures will be implemented following closure:

- A Construction Quality Assurance (CQA) report will be submitted to the DWM. This report will describe the observations and tests used before, during, and upon completion of construction to ensure that the construction materials meet the final cover design specifications and the construction and certification requirements. The CQA report will contain as-built drawings.
- A signed certification from a registered Professional Engineer verifying that closure has been completed in accordance with the closure plan will be submitted to the DWM.
- At least one sign notifying all persons of the closing of the landfill (or incremental portions thereof) and that wastes are no longer accepted will be posted. Suitable barriers will be installed as necessary at former access points to prevent new waste from being deposited.
- Within 90 days, a survey plat, prepared by a registered Professional Land Surveyor, indicating the location and dimensions of landfill disposal areas, will be prepared.
- A notation will be recorded on the deed notifying any potential purchaser of the property that the land has been used as a landfill facility and that future use is restricted under the approved closure plan. A copy of the deed notation as recorded will be filed with the operating record.

SECTION 2.0 POST-CLOSURE PLAN

2.1 OVERVIEW

This Post-Closure Plan has been developed to outline steps to be taken to ensure the integrity of the landfill during its post-closure care period. The post-closure care period will last at least 30 years after final closure and, at a minimum, will consist of the following:

- Maintaining the integrity and effectiveness of final cover system;
- Performing groundwater and surface water monitoring;
- Maintaining and operating a gas monitoring system; and
- Maintaining run-on/run-off controls.

No wastes will remain exposed after closure of the landfill. Access to the closed site by the public will not pose a health hazard.

2.2 POST-CLOSURE CONTACT

All correspondence and questions concerning the post-closure care of the unit should be directed to:

Johnston County Department of Public Utilities
Attn: Director
309 E. Market Street
Smithfield, NC 27577
Phone: (919) 209-8333
Fax: (919) 934-7174.

2.3 POST-CLOSURE USE

After filling operations cease at the landfill and the landfill is officially closed in accordance with the Closure Plan, each landfill unit will be maintained as a grassy hill. Johnston County will maintain control of the property and prevent public access to it during the post-closure period.

There may be (an) access road(s) on the final cover to allow proper maintenance during post-closure. Precise location of the access road(s) will be determined as a part of operations. Low ground pressure and rubber tire vehicles will be used for maintenance. Additionally, the County will maintain access to all site monitoring locations throughout the post-closure period.

2.4 MAINTENANCE

2.4.1 Repair of Security Control Devices

All security control devices will be inspected and maintained as necessary to ensure access to the site is controlled. Locks, vehicular gates, and fencing will be replaced if functioning improperly. Warning signs will be kept legible at all times and will be replaced if damaged by inclement weather or vandalism.

2.4.2 Erosion Damage Repair

If erosion of the final cover occurs during post-closure, the affected area will be repaired and reseeded as necessary. If necessary, rolled erosion control products (RECPs) will be used to expedite rapid revegetation of slopes and to secure topsoil in place.

2.4.3 Correction of Settlement, Subsidence, and Displacement

Minimum slopes of 5 percent will be maintained after settlement in order to prevent ponding and allow for proper drainage without infiltration. If vertical or horizontal displacement occurs due to differential settlement, cracks will be filled with appropriate material and final cover will be reestablished. Excessive vertical displacement is not anticipated.

2.4.4 Leachate Management System (Lined Units)

In order to maintain the free flow in leachate collection piping, they will be cleared of debris using the manholes or cleanout locations for access. If pipes should crush or buckle within the landfill, leachate will flow through the gravel columns. The leachate collection system (LCS) includes a continuous blanket drain on the base of the landfill which will allow drainage of leachate even in the very unlikely event of total failure of the leachate collection pipes.

2.4.5 Closure of Leachate Storage Lagoon

After closure of the lined landfill units has been achieved, the generation of leachate will eventually curtail. The flow rate immediately after closure should decrease to approximately 100 gallons/acre/day. Toward the end of the 30-year post-closure period, the flow should approach zero, at which time the storage lagoon will not be required. The following procedures will be followed to properly close the leachate storage lagoon:

- Completely drain and remove all liquids, sludges, sediments, etc. from the storage lagoon.
- Disassemble the lagoon, piping, and appurtenances and dispose of the contents in a manner approved by the DWM.
- Sample and analyze the underlying soil for appropriate constituents

inherent to leachate. Assess the results for evidence of contaminant migration.

- If contamination of underlying soils is exhibited, perform an assessment as to the degree of contamination and develop remedial actions.
- Obtain approval of the DWM for the assessment and associated remedial measures.
- Perform the remedial actions as necessary to limit any threats to public health and the environment.
- Restore the area to closely match pre-existing conditions in the vicinity of the containment areas. Activities may include: filling, grading, topsoiling, and seeding.

2.4.6 Repair of Run-On/Run-Off Control Structures

All drainage swales, ditches, and perimeter channels will be repaired, cleaned, or realigned in order to maintain their original condition. Any culverts that are damaged will be repaired or replaced.

2.4.7 Landfill Gas System

The landfill gas (LFG) system will be maintained by the County and operated in accordance with any site air quality permits. Proper operation of the system is verified through testing at the landfill gas monitoring wells.

If gas wells/vents do not function as a result of irregular settlement, accumulation of liquids (condensate, leachate, water), binding or corrosion, additional and/or replacement wells/vents can be installed if necessary in accordance with the current LFG Management Plan.

At the point that LFG recovery drops below the minimum rates necessary for operation of an active gas collection and control system, the active system will be decommissioned and the wells will be converted to passive vents or capped as appropriate. Decommissioning of the active system will consist of the removal of the LFG flare, blower and equipment skids, fencing, and related electrical components. Piping and structures which have been in contact with LFG condensate will be removed and disposed of in a manner approved by the DWM. LFG piping and structures within the limits of the landfill units will be abandoned in-place if possible in a manner approved by the DWM to minimize the potential for damage to the final cover system of each unit. Once decommissioning activities are complete, the area(s) will be restored (grading as required and revegetation).

Any damage caused to the landfill liner or final cover systems as the result of

maintenance, repair, or decommissioning of the LFG system will be repaired following the appropriate specifications and construction quality assurance (CQA) requirements.

2.4.8 Groundwater Monitoring Wells

Procedures outlined in the current Water Quality Monitoring (WQM) Plan or subsequent revision will take precedence; however, a brief description follows. All groundwater monitoring wells have been installed with concrete pads and protective casings to prevent accidental damage by vehicles and equipment. The wells are also equipped with a locking cap to discourage vandalism. Groundwater wells will be inspected regularly (at the time of sampling) to ensure integrity. Persons inspecting a well should look at the overall condition of the well, for signs of well tampering, and cracking or degradation of the concrete pad. Should a well require replacement, the defective well should be abandoned in accordance with specifications provided in the WQM Plan and a new well installed at a location that is approved by the DWM.

2.5 MONITORING PLAN

The closed unit will be monitored for a minimum of 30 years. A series of inspections will be scheduled to ensure the integrity and effectiveness of the final cover system, surface water systems, groundwater monitoring system, landfill gas system, and to protect human health and the environment.

2.5.1 Inspection Frequencies

Inspections to be conducted during the post-closure care period will occur regularly as shown in **Table 2.1**.

2.5.2 Quarterly Inspections

Quarterly inspections of the closed site will be conducted by the County. These inspections will include examination of the security control devices for signs of deterioration or vandalism to ensure access to the site is limited to authorized persons. Each disposal area will be checked to ensure the integrity of the final cover system is maintained, erosion damage is repaired, vegetative cover persists, and that cover settlement, subsidence, and displacement are minimal. Drainage swales and channels will be cleared of litter and debris and benchmark integrity will be noted and maintained.

2.5.3 Semi-Annual Inspections

Semi-annual inspections of the site during the post-closure period will be conducted by the County with attention paid to integrity and drainage of the final cover system and condition of the groundwater and gas monitoring systems.

A report of findings will be made to the responsible party, including recommendations for actions deemed necessary to ensure the site continues to meet the closure performance

standard.

2.6 ENGINEERING CERTIFICATION

Based on the County's monitoring reports, annual certifications by a registered engineer will be placed in the operating record. They will certify that the closure plan has been followed, noting discrepancies along with the corrective actions undertaken. At the end of the post closure period, the individual certifications will be compiled into a final document and forwarded to the DWM.

TABLE 2.1: POST-CLOSURE INSPECTION FREQUENCIES

INSPECTION ACTIVITY	YEAR 1	YEARS 2-30
Security Control Devices	Quarterly	Quarterly
Vegetative Cover Condition	Quarterly ¹	Quarterly
Surface Water Systems	Quarterly ¹	Quarterly
Erosion Damage	Quarterly ¹	Quarterly
Cover Drainage System	Quarterly ¹	Semi-Annually
Cover Settlement, Subsidence, and Displacement	Quarterly ¹	Semi-Annually
Leachate Management System	Quarterly	Semi-Annually
Landfill Gas System	Quarterly ²	Semi-Annually ²
Water Quality Monitoring	Semi-Annually ³	Semi-Annually ³
Landfill Gas Monitoring	Quarterly ⁴	Quarterly ⁴
Benchmark Integrity	Annually	Annually
Leachate Collection Pipe Inspection/Cleanout	See Note 5	

Notes:

1. These items will be inspected after each large storm event (i.e. ≥ 1 inch in any 24 hours).
2. Or in accordance with the current Landfill Gas Management Plan or air quality permit(s).
3. Or in accordance with groundwater monitoring schedule described in the current Water Quality Monitoring Plan.
4. Or in accordance with the current LFG Monitoring Plan.
5. Remote camera inspection and flushing (if necessary) of leachate collection piping (portion that can be inspected and cleaned) will be performed every 3 years. If piping is mostly clean at a 3-year interval, the County may petition the DWM to increase the inspection/cleaning frequency to a 5-year interval.

SECTION 3.0 CLOSURE/POST-CLOSURE COST ANALYSIS

3.1 OVERVIEW

The purpose of this section is to provide a written estimate in current dollars of costs associated with all activities specified in the written closure and post-closure plans which have been developed for the MSW and C&D landfill units of the Johnston County Landfill.

3.2 ESTIMATED CLOSURE COSTS

Tables 3.1A, 3.1B, 3.1C, and 3.1D summarize the estimated costs for complete closure of the MSW Phase 4A (Cells 1-3), MSW Phase 5, C&D Area 1, and C&D Area 2 (Cell 1) landfill units, respectively (the maximum area to be closed). The cost estimate for each unit is based on a third party providing the necessary services and includes labor in the unit prices given. The estimated closure costs will be reviewed and updated as required to reflect adjustments for inflation, increased costs in construction or materials, or any other adjustments to the Closure Plan.

3.3 ESTIMATED POST-CLOSURE COSTS

Tables 3.2A and 3.2B summarize the estimated costs for the post-closure care maintenance activities for MSW Phases 1-4A and C&D Areas 1-2¹ and the MSW Phase 5 landfill unit. The cost estimate for each is based on a third party providing the necessary services and includes labor in the unit prices given. The estimated post-closure costs will be reviewed and updated as required to reflect adjustments for inflation, rising costs of anticipated post-closure care, or any other adjustments to the Post-Closure Plan.

3.4 ESTIMATED ASSESSMENT AND CORRECTIVE ACTION COSTS

Table 3.3 summarizes the current potential assessment and corrective (remedial) action cost for the landfill facility. This cost is based on the required minimum amount (\$2,000,000) per NCGS 130A 295.2(h) (as modified by Session Law 2011-262) and includes amounts for water quality and landfill gas (LFG) monitoring and reporting (per NC DWM policy) plus contingency funds to cover potential future assessment and corrective action costs.

3.5 FINANCIAL ASSURANCE MECHANISM

Johnston County intends to continue to use the Local Government Financial Test (15A NCAC 13B.1628(e)(1)(f)) to demonstrate financial assurance for this facility.

¹The MSW Phases 1-4 units (previously closed), the MSW Phase 4A unit, and the C&D Areas 1 and 2 units are combined in that these units are in the same portion of the site.

TABLE 3.1A: MSW - PHASE 4A - CLOSURE COST ESTIMATE¹

ITEM	QUANTITY	UNITS	UNIT COST	ITEM COST (2011 \$)
Surface Preparation	29.4	Acre	\$10,000	\$294,000
Landfill Gas System	29.4	Acre	\$15,000	\$441,000
30 mil Textured LLDPE Geomembrane	1,281,000	SF	\$0.45	\$576,450
Drainage Geocomposite	1,281,000	SF	\$0.55	\$704,550
Vegetative Soil Layer (24")	95,000	CY	\$5.00	\$475,000
Erosion Control (Rain Gutters, Diversion Berms, Down Pipes, Drainage Channels, Etc.)	29.4	Acre	\$15,000	\$441,000
Revegetation	29.4	Acre	\$1,500	\$44,100
Surveying	29.4	Acre	\$2,000	\$58,800
Subtotal:				\$3,034,900
Bonds, Mobilization, & Insurance	(4% of Subtotal):			\$121,396
Subtotal:				\$3,156,296
Contingency (10%):				\$315,630
Construction Subtotal:				\$3,471,926
Engineering	29.4	Acre	\$2,000	\$58,800
CQA	29.4	Acre	\$6,000	\$176,400
TOTAL:				\$3,707,126

Notes:

1. Assumes closure of 29.4 acres (Phase 4A).

TABLE 3.1B: MSW - PHASE 5 - CLOSURE COST ESTIMATE¹

ITEM	QUANTITY	UNITS	UNIT COST	ITEM COST (2011 \$)
Surface Preparation	19.2	Acre	\$10,000	\$192,000
Landfill Gas System	19.2	Acre	\$15,000	\$288,000
30 mil Textured LLDPE Geomembrane	837,000	SF	\$0.45	\$376,650
Drainage Geocomposite	837,000	SF	\$0.55	\$460,350
Vegetative Soil Layer (24")	62,000	CY	\$5.00	\$310,000
Erosion Control (Rain Gutters, Diversion Berms, Down Pipes, Drainage Channels, Etc.)	19.2	Acre	\$15,000	\$288,000
Revegetation	19.2	Acre	\$1,500	\$28,800
Surveying	19.2	Acre	\$2,000	\$38,400
Subtotal:				\$1,982,200
Bonds, Mobilization, & Insurance	(4% of Subtotal):			\$79,288
Subtotal:				\$2,061,488
Contingency (10%):				\$206,149
Construction Subtotal:				\$2,267,637
Engineering	19.2	Acre	\$2,000	\$38,400
CQA	19.2	Acre	\$6,000	\$115,200
TOTAL:				\$2,421,237

Notes:

1. Assumes closure of 19.2 acres (Phase 5).

TABLE 3.1C: C&D - AREA 1 - CLOSURE COST ESTIMATE¹

ITEM	QUANTITY	UNITS	UNIT COST	ITEM COST (2011 \$)
Surface Preparation	12.9	Acre	\$10,000	\$129,000
Landfill Gas System	12.9	Acre	\$15,000	\$193,500
30 mil Textured LLDPE Geomembrane	562,000	SF	\$0.45	\$252,900
Drainage Geocomposite	562,000	SF	\$0.55	\$309,100
Vegetative Soil Layer (24")	42,000	CY	\$5.00	\$210,000
Erosion Control (Rain Gutters, Diversion Berms, Down Pipes, Drainage Channels, Etc.)	12.9	Acre	\$15,000	\$193,500
Revegetation	12.9	Acre	\$1,500	\$19,350
Surveying	12.9	Acre	\$2,000	\$25,800
Subtotal:				\$1,333,150
Bonds, Mobilization, & Insurance	(4% of Subtotal):			\$53,326
Subtotal:				\$1,386,476
Contingency (10%):				\$138,648
Construction Subtotal:				\$1,525,124
Engineering	12.9	Acre	\$2,000	\$25,800
CQA	12.9	Acre	\$6,000	\$77,400
TOTAL:				\$1,628,324

Notes:

1. Assumes closure of 12.9 acres (Area 1).

TABLE 3.1D: C&D - AREA 2 - CLOSURE COST ESTIMATE¹

ITEM	QUANTITY	UNITS	UNIT COST	ITEM COST (2011 \$)
Surface Preparation	11.9	Acre	\$10,000	\$119,000
Landfill Gas System	11.9	Acre	\$15,000	\$178,500
30 mil Textured LLDPE Geomembrane	519,000	SF	\$0.45	\$233,550
Drainage Geocomposite	519,000	SF	\$0.55	\$285,450
Vegetative Soil Layer (24")	39,000	CY	\$5.00	\$195,000
Erosion Control (Rain Gutters, Diversion Berms, Down Pipes, Drainage Channels, Etc.)	11.9	Acre	\$15,000	\$178,500
Revegetation	11.9	Acre	\$1,500	\$17,850
Surveying	11.9	Acre	\$2,000	\$23,800
Subtotal:				\$1,231,650
Bonds, Mobilization, & Insurance	(4% of Subtotal):			\$49,266
Subtotal:				\$1,280,916
Contingency (10%):				\$128,092
Construction Subtotal:				\$1,409,008
Engineering	11.9	Acre	\$2,000	\$23,800
CQA	11.9	Acre	\$6,000	\$71,400
TOTAL:				\$1,504,208

Notes:

1. Assumes closure of 11.9 acres (Area 2 - Cell 1).

TABLE 3.2A: MSW PHASES 1-4A - C&D AREAS 1-2 - POST-CLOSURE COST ESTIMATE¹

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL (2011 \$)
Site Inspection And Record Keeping	80	HR	\$75	\$6,000
Revegetation (5% Total Area)	5	Acre	\$1,500	\$7,500
Mowing (once per year)	100	Acre	\$100	\$10,000
Erosion Control	1	LS	\$5,000	\$5,000
Gates/Fences/Access	1	LS	\$2,000	\$2,000
LFG System ²	1	LS	\$5,000	\$5,000
Leachate Management ³	1	LS	\$45,149	\$45,149
Subtotal:				\$80,649
Contingency (10%):				\$8,065
ANNUAL TOTAL:				\$88,714
30-YEAR TOTAL:				\$2,661,420

Notes:

1. Assumes post-closure of 100 acres (MSW Phases 1-4A and C&D Areas 1 and Area 2 - Cell 1).
2. LFG system costs include basic maintenance necessary for regulatory compliance (\$4,000 per year) and decommissioning (\$1,000 per year to account for half of assumed \$60,000 cost) at end of post-closure period.
3. Leachate treatment based on 100 gal/ac/day x 41.3 acres lined x 365 x \$20/1,000 gal. (\$30,149/year) plus \$5,000/year staff cost plus \$3,000/year lab cost plus \$2,000/year leachate collection line cleanout costs. Also include \$5,000 per year to account for decommissioning leachate facilities (storage lagoon) (half of assumed \$300,000 assumed cost) at the end of the post-closure period.

TABLE 3.2B: MSW PHASE 5 - POST-CLOSURE COST ESTIMATE¹

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL (2011 \$)
Site Inspection And Record Keeping	20	HR	\$75	\$1,500
Revegetation (5% Total Area)	1	Acre	\$1,500	\$1,500
Mowing (once per year)	20	Acre	\$100	\$2,000
Erosion Control	1	LS	\$5,000	\$5,000
Gates/Fences/Access	1	LS	\$2,000	\$2,000
LFG System ²	1	LS	\$5,000	\$5,000
Leachate Management ³	1	LS	\$29,016	\$29,016
Subtotal:				\$46,016
Contingency (10%):				\$4,602
ANNUAL TOTAL:				\$50,618
30-YEAR TOTAL:				\$1,518,540

Notes:

1. Assumes post-closure of 19.2 acres (MSW Phase 5).
2. LFG system costs include basic maintenance necessary for regulatory compliance (\$4,000 per year) and decommissioning (\$1,000 per year to account for half of assumed \$60,000 cost) at end of post-closure period.
3. Leachate treatment based on 100 gal/ac/day x 19.2 acres lined x 365 x \$20/1,000 gal. (\$14,016/year) plus \$5,000/year staff cost plus \$3,000/year lab cost plus \$2,000/year leachate collection line cleanout costs. Also include \$5,000 per year to account for decommissioning leachate facilities (storage lagoon) (half of assumed \$300,000 assumed cost) at the end of the post-closure period.

TABLE 3.3: ASSESSMENT & CORRECTIVE ACTION COST ESTIMATE¹

ITEM	ANNUAL COST	30-YEAR TOTAL (2011 \$)
MSW - Phases 1-4A - C&D Areas 1-2 (See Notes 2 and 4):		
Water Quality Monitoring & Reporting	\$66,000	\$1,980,000
LFG Monitoring & Reporting	\$ 3,000	\$90,000
MSW - Phase 5 (See Notes 3 and 4):		
Water Quality Monitoring & Reporting	\$34,000	\$1,020,000
LFG Monitoring & Reporting	\$ 3,000	\$90,000
TOTAL:		\$3,180,000

Notes:

1. Per NCGS 130A 295.2(h) (as modified by Session Law 2011-262).
2. The water quality monitoring and reporting cost for MSW Phases 1-4A and C&D Areas 1-2 assumes 33 long-term wells/points sampled semi-annually @ \$33,000 per event (annual cost = \$66,000).
3. The water quality monitoring and reporting cost for MSW Phase 5 assumes 17 long-term wells/points sampled semi-annually @ \$17,000 per event (annual cost = \$34,000).
4. The LFG monitoring and reporting costs assume quarterly monitoring for each unit at a cost of: \$750/event (MSW Phases 1-4A and C&D Areas 1-2) (annual cost = \$3,000); \$750/event (MSW Phase 5) (annual cost = \$3,000). Cost is reflective of combined monitoring events for both areas.



North Carolina Department of Environment and Natural Resources

Division of Waste Management

Beverly Eaves Perdue
Governor

Dexter R. Matthews
Director

Dee Freeman
Secretary

Solid Waste Section

December 16, 2011

Mr. Tim Broome, Director
Johnston County Public Utilities Department
Post Office Box 2263, Smithfield, NC 27577-2633

Re: Clarification of the Re-issuance of the Comment Letter

Dear Mr. Broome:

I write this letter to you to clarify the reason of issuance of the final comment letter to the Construction Documentation Report (Report) – Landfill Gas Collection and Control System Expansion 2011” dated November 17, 2011. The Report is on your behalf prepared by the SCS Engineers, PC (SCS Engineers).

Via an e-mail message dated November 29, 2011, I sent your consultant Mr. Steve Lamb, P.E. with SCS Engineers a draft comment letter for clarification of issues related to the Report. Via e-mail messages and phone conversations, Mr. Lamb promptly communicated with me and cleared concerns addressed in the draft comment letter without any objection. According to information provided by Mr. Lamb, the draft responses to the November 29 2011 comments have been prepared and sent to you or your designee for a review and approval prior to submitting to the Solid Waste Section. To complete the document record processes and for your reference, I send out this final version comment letter without any change from the draft one.

If you have any questions of this matter, please contact me at (919) 707-8251.

Sincerely,

Ming-Tai Chao, P.E.
Environmental Engineer II
Permitting Branch, Solid Waste Section

cc:
Central Files



North Carolina Department of Environment and Natural Resources

Division of Waste Management

Dexter R. Matthews

Director

Beverly Eaves Perdue
Governor

Dee Freeman
Secretary

Solid Waste Section

December 16, 2011

Mr. Tim Broome, Director
Johnston County Public Utilities Department
Post Office Box 2263
Smithfield, NC 27577-2633

Re: Comments on Construction Documentation Report
Landfill Gas Collection and Control System Expansion 2011
Johnston County Landfill Facility, Johnston County, North Carolina
Permit No. 51-03, Document ID No. (Doc ID) 15642

Dear Mr. Broome:

On November 17, 2011, the Division of Waste Management (DWM), Solid Waste Section (SWS) received the following document:

- *Construction Documentation Report – Landfill Gas Collection and Control System Expansion 2011*, Johnston County Landfill (Permit # 51-03). Dated November 17, 2011. Prepared by C21 Methane Partners in New York, New York and SCS Engineers, PC (SCS) in Charlotte, North Carolina (Doc ID 15611).

After conducting a review, the SWS has comments on the Construction Documentation Report (Report) for the constructed landfill gas collection and control system (LFGCCS). Your responses to the following comments will expedite the review of the report:

1. The gas well EW-417 is likely removed from the proposed LFGCCS because no information of this well is provided in the Report. If this is correct, please add status of well EW-417 to the Report.
2. (Section 2.2 – Landfill Gas Extraction Wells)
 - i. As described in this sub-section the well borings were backfilled by a NC DOT No. 57 stone, bentonite seals, and soil which is consistent with the approved work plan (Doc ID 12972). However, the well logs in Appendix C described that # 4 washed aggregates were used as backfill around well screens/slots. Please clarify the discrepancy.
 - ii. The approved specification for a gas well (see Note 10 on the Drawing No. 4 of 6 of the approved work plan) requires the stone gradation in the ranges from ½ -inches to 1 and 1/2

– inches determined by ASTM Method D 421 at the testing frequency of one test per 250 cubic yards. Please provide the type and quantity of the stone used for this project and stone gradation testing results.

3. (Section 4 - Summary and Conclusion) The submitted final Report must be signed, sealed, and certified by a professional engineer registered in the State of North Carolina.
4. (Appendix B - SCS Daily Field Reports) The descriptions of well relocation in the field (EW-406, EW-408, EW-410, EW-411, EW-414, and EW-505) in the Daily Field Report are inconsistent with remarks made to the well logs in Appendix C. Please clarify.
5. (Appendix C – Landfill Gas Extraction Well Logs)
 - i. Please double check the consistency of the present data against the sketch of boring log. For example, the well log for EW-503, the total depth is noted 40 feet, but the boring log shown 41 feet.
 - ii. Well logs of EW-510 & EW-511 are incomplete. There is no “description” of excavated material / waste in the log.
 - iii. According to the data shown on the well logs for EW-509, EW-510, & EW-511 and the baseliner elevations at these two locations shown on the Drawing No. 4 of 6 in the approved work plan, the wells have likely penetrated the landfill baseliner system. The well logs indicated each “well was constructed at surveyed location and terminated at the specific depth.” However, the well depths do not terminate at the proposed depth or adjust according to the ground surface elevation provided by a surveyor. The County must provide the SWS solid information to demonstrate the landfill baseliner system is intact and not damaged by the well installation. Should the baseliner system have been damaged due to well installation, within 15 calendar days after receiving this comment letter, the County must submit a work plan to assess and restore the damaged landfill liner system in the areas surround the wells. The SWS will review the submitted plan, and the County shall not conduct any baseliner restoration activities prior to the SWS approval.
6. (Appendix D – Record Drawing No. 1 of 1)
 - i. The as-built drawing must be signed and sealed by a professional engineer or licensed surveyor registered in the State of North Carolina.
 - ii. Please provide the final well schedule (tabulated format) in consistent with the well logs on the as-built drawing. For example final data of the ground elevation, well depth, etc is based on survey results. Well EW-417 is removed from the project scope. Since many wells are relocated in the field, so the final northing & easting coordinates of these well must be provided in the record report.

7. (Appendix F – Leak Test Results) Air testing that was conducted at 14:00 p.m., June 25, 2011 through 07:00 a.m., June 26, 2011 on the 2-inch forcemain and 2 X 4 DC shown the pressure drop/ air loss "1 lb." Please explain why the test result is acceptable.
8. (Appendix G – Correspondence) The NCDHHS letter dated December 6, 2010 is a review/comment correspondence to inquire clarification and more information and not an approval document. Please provide the documentation issued by NCDHHS that approved the asbestos-containing material/waste plan associated with the construction of LFGCCS.
9. In the February 18, 2011 letter (Doc ID 12976), the SWS has requested the County to submit the revised document including the modification of Operation Plan and Closure and Post-Closure Plan to the existing *Permit Amendment Application, Johnston County MSW Landfill, Phase 4A, Cell 3*, which was approved by the SWS in 2009. Via the February 28 2011 e-mail message, the SWS has further agreed the County's consultant request that the above-mentioned document would be submitted to SWS within four (4) weeks after the LFGCCS starts. Since the Report and the report cover letter do not mention the schedule of submittal of the aforementioned document, please provide the firm submittal date.

Please respond the above-mentioned comments and provide the SWS one hard copy and an electronic copy (in the pdf format) of the revised Report. The Solid Waste Section appreciates your efforts and cooperation in this matter. If you have any questions or would like to schedule a meeting to discuss this matter further, please contact me at (919) 707-8251.

Sincerely,



Ming-Tai Chao, P.E.
Environmental Engineer II
Permitting Branch, Solid Waste Section

cc:

Steven C. Lamb, P.E., SCS
Donna Wilson, DWM
Mary Whaley, DWM

Ed Mussler, Permitting Branch Supervisor
Dennis Shackelford, DWM
Central Files

Chao, Ming-tai

From: Lamb, Steve [SLamb@scsengineers.com]
Sent: Tuesday, November 29, 2011 1:21 PM
To: Chao, Ming-tai
Cc: Mussler, Ed; Wilson, Donna
Subject: RE: Construction Record Report for LFGCCS, Johnston County MSWLF, 51-03

Ming:

Thanks for the draft comments letter. We will review this week and revise report accordingly. In regards to EW509, EW510, and EW511, we did not drill through the liner. After we submitted the permit drawings to you we obtained better as-built data of the liner grades in Phase 5, revised the drawing/well schedule and adjusted the drilling depths to maximize LFG extraction. Sorry for the confusion on this one, we should have documented that better in the report.

Steve

From: Chao, Ming-tai [<mailto:ming.chao@ncdenr.gov>]
Sent: Tuesday, November 29, 2011 9:31 AM
To: Lamb, Steve
Cc: Mussler, Ed; Wilson, Donna
Subject: Construction Record Report for LFGCCS, Johnston County MSWLF, 51-03

Dear Mr. Lamb:

After completing a review of the "Construction Documentation Report (Report) – Landfill Gas Collection and Control System Expansion 2011" dated November 17, 2011, I made comments on the Report to request for more information and clarification on several issues associated with the project. The attached is the "draft" comment letter for you to review so that certain comments such as the request for supplemental data and the correction of typos can be removed from the final official comment letter if you agree to provide a revised copy of the report including an electronic copy in a CD (pdf format).

Please pay special attention to the Comment No. 5 iii. Based on the data in the report, the landfill baseliner is likely damaged by advancing soil borings – EW509, EW-510, & EW-511. However, I don't want to make the final conclusion on this matter without discussing with you and your associates in charge of the construction activities. Please feel free to contact me if you have any questions on the draft comment letter.

Best regards,

Ming-Tai Chao, P.E.
Environmental Engineer II
Permitting Branch, Solid Waste Section
Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646 (Mailing Address)

Green Square, 217 West Jones Street
Raleigh, NC 27603
Tel. 919-707-8251
ming.chao@ncdenr.gov
<http://portal.ncdenr.org/web/wm/sw>



North Carolina Department of Environment and Natural Resources

Division of Waste Management

Dexter R. Matthews

Director

Beverly Eaves Perdue
Governor

Dee Freeman
Secretary

Solid Waste Section

November 29, 2011

Mr. Tim Broome, Director
Johnston County Public Utilities Department
Post Office Box 2263
Smithfield, NC 27577-2633

Re: Comments on Construction Documentation Report
Landfill Gas Collection and Control System Expansion 2011
Johnston County Landfill Facility, Johnston County, North Carolina
Permit No. 51-03, Document ID No. (Doc ID) 15642

Dear Mr. Broome:

On November 17, 2011, the Division of Waste Management (DWM), Solid Waste Section (SWS) received the following document:

- *Construction Documentation Report – Landfill Gas Collection and Control System Expansion 2011*, Johnston County Landfill (Permit # 51-03). Dated November 17, 2011. Prepared by C21 Methane Partners in New York, New York and SCS Engineers, PC (SCS) in Charlotte, North Carolina (Doc ID 15611).

After conducting a review, the SWS has comments on the Construction Documentation Report (Report) for the constructed landfill gas collection and control system (LFGCCS). Your responses to the following comments will expedite the review of the report:

1. The gas well EW-417 is likely removed from the proposed LFGCCS because no information of this well is provided in the Report. If this is correct, please add status of well EW-417 to the Report.
2. (Section 2.2 – Landfill Gas Extraction Wells)
 - i. As described in this sub-section the well borings were backfilled by a NC DOT No. 57 stone, bentonite seals, and soil which is consistent with the approved work plan (Doc ID 12972). However, the well logs in Appendix C described that # 4 washed aggregates were used as backfill around well screens/slots. Please clarify the discrepancy.
 - ii. The approved specification for a gas well (see Note 10 on the Drawing No. 4 of 6 of the approved work plan) requires the stone gradation in the ranges from ½ -inches to 1and1/2 – inches determined by ASTM Method D 421 at the testing frequency of one test per 250

cubic yards. Please provide the type and quantity of the stone used for this project and stone gradation testing results.

3. (Section 4 - Summary and Conclusion) The submitted final Report must be signed, sealed, and certified by a professional engineer registered in the State of North Carolina.
4. (Appendix B - SCS Daily Field Reports) The descriptions of well relocation in the field (EW-406, EW-408, EW-410, EW-411, EW-414, and EW-505) in the Daily Field Report are inconsistent with remarks made to the well logs in Appendix C. Please clarify.
5. (Appendix C – Landfill Gas Extraction Well Logs)
 - i. Please double check the consistency of the present data against the sketch of boring log. For example, the well log for EW-503, the total depth is noted 40 feet, but the boring log shown 41 feet.
 - ii. Well logs of EW-510 & EW-511 are incomplete. There is no “description” of excavated material / waste in the log.
 - iii. According to the data shown on the well logs for EW-509, EW-510, & EW-511 and the baseliner elevations at these two locations shown on the Drawing No. 4 of 6 in the approved work plan, **the wells have likely penetrated the landfill baseliner system.** The well logs indicated each “well was constructed at surveyed location and terminated at the specific depth.” However, the well depths do not terminate at the proposed depth or adjust according to the ground surface elevation provided by a surveyor. The County must provide the SWS solid information to demonstrate the landfill baseliner system is intact and not damaged by the well installation. Should the baseliner system have been damaged due to well installation, within 15 calendar days after receiving this comment letter, the County must submit a work plan to assess and restore the damaged landfill liner system in the areas surround the wells. The SWS will review the submitted plan, and the County shall not conduct any baseliner restoration activities prior to the SWS approval.
6. (Appendix D – Record Drawing No. 1 of 1)
 - i. The as-built drawing must be signed and sealed by a professional engineer or licensed surveyor registered in the State of North Carolina.
 - ii. Please provide the final well schedule (tabulated format) in consistent with the well logs on the as-built drawing. For example final data of the ground elevation, well depth, etc is based on survey results. Well EW-417 is removed from the project scope. Since many wells are relocated in the field, so the final northing & easting coordinates of these well must be provided in the record report.
7. (Appendix F – Leak Test Results) Air testing that was conducted at 14:00 p.m., June 25, 2011 through 07:00 a.m., June 26, 2011 on the 2-inch forcemain and 2 X 4 DC shown the pressure drop/ air loss ”1 lb.” Please explain why the test result is acceptable.
8. (Appendix G – Correspondence) The NCDHHS letter dated December 6, 2010 is a review/comment correspondence to inquire clarification and more information and not an

approval document. Please provide the documentation issued by NCDHHS that approved the asbestos-containing material/waste plan associated with the construction of LFGCCS.

9. In the February 18, 2011 letter (Doc ID 12976), the SWS has requested the County to submit the revised document including the modification of Operation Plan and Closure and Post-Closure Plan to the existing *Permit Amendment Application, Johnston County MSW Landfill, Phase 4A, Cell 3*, which was approved by the SWS in 2009. Via the February 28 2011 e-mail message, the SWS has further agreed the County's consultant request that the above-mentioned document would be submitted to SWS within four (4) weeks after the LFGCCS starts. Since the Report and the report cover letter do not mention the schedule of submittal of the aforementioned document, please provide the firm submittal date.

Please respond the above-mentioned comments and provide the SWS one hard copy and an electronic copy (in the pdf format) of the revised Report. The Solid Waste Section appreciates your efforts and cooperation in this matter. If you have any questions or would like to schedule a meeting to discuss this matter further, please contact me at (919) 707-8251.

Sincerely,

Ming-Tai Chao, P.E.
Environmental Engineer II
Permitting Branch, Solid Waste Section

cc:

Steven C. Lamb, P.E., SCS
Donna Wilson, DWM
Mary Whaley, DWM

Ed Mussler, Permitting Branch Supervisor
Dennis Shackelford, DWM
Central Files

Table of Contents

Section	Page
1 INTRODUCTION.....	1
1.1 Background	1
1.2 Project Documents.....	2
1.3 Contact List.....	2
2 LANDFILL GAS COLLECTION AND CONTROL SYSTEM.....	3
2.1 Landfill Gas Collection Piping	3
2.2 Landfill Gas Extraction Wells.....	4
2.3 HDPE Pipe Welding	5
2.4 Existing Solar Flares.....	5
2.5 Blower Flare Station.....	5
3 CONSTRUCTION RECORDS	5
3.1 Construction Photographs	6
3.2 SCS Daily Field Reports	6
3.3 LFG Extraction Well Logs.....	6
3.4 Record Drawings.....	6
3.5 NCDHHS Correspondence	6
4 SUMMARY AND CONCLUSION	6

Appendices

A	Photographs
B	SCS Engineers Daily Field Reports
C	Landfill Gas Extraction Well Logs
D	As-built Well Schedule
E	Stone Gradation Documentation
F	Record Drawings
G	Flare Documentation and DAQ Information
H	Leak Test Results
I	Correspondence
J	NESHAP Documentation

CERTIFICATION STATEMENT

Certification: I certify that based on information and belief formed after reasonable inquiry, the statements and information contained in this document are true, accurate, and complete to the best of my knowledge. I further certify that based on the field observations by SCS staff, it is my professional opinion that the installation of the Landfill Gas Collection and Control System project described herein was constructed in general accordance with the Construction Drawings except as noted in this report.

Registered Engineer:

(Printed Name)

(Seal)

(Signature)

(Date)

1 INTRODUCTION

This Construction Certification Report, prepared by SCS Engineers, PC (SCS), summarizes the initial Landfill Gas (LFG) Collection and Control System (GCCS) installed at the Johnston County Landfill (Site), located near the town of Smithfield, Johnston County, North Carolina. The Site is located at 680 County Home Road and is owned and operated by Johnston County.

The objectives of the 2011 GCCS project were to construct an active voluntary GCCS for the destruction of LFG in support of a greenhouse gas credit project and to support a future landfill gas to energy (LFGE) project.

The primary components of the GCCS included the following:

- Twenty-three new LFG wells.
- LFG collection piping (header and laterals).
- Isolation valves.
- Condensate sumps and pumps – CS-H2, CS-3A, & CS-4B.
- Airline and forcemain piping for LFG condensate sumps and pumps.
- Blower flare station (1,250 SCFM utility flare).

The GCCS project was a design/build type project developed by C2I Methane Partners (formerly BlueSource), SCS Engineers, PC (SCS) and SCS Field Services (SCS FS). Construction began on the GCCS project in April 2011 and the piping was substantially completed in July 2011. The flare and air compressor were installed in September 2011. The remaining items were completed in early October 2011 and the complete GCCS startup occurred on October 13, 2011.

1.1 BACKGROUND

The Johnston County MSW and C&D Landfill Facility (Landfill) is located near Smithfield, North Carolina. A Request for Proposal for a Landfill Gas to Energy Project at the Johnston County Landfill was issued by the Johnston County Department of Utilities. The Development Team of C2I Methane Partners and SCS Engineers proposed to develop a landfill gas collection and control system and a beneficial use project for the LFG at the Landfill. The Development Team will finance, design, permit, build, commission, own, operate, and maintain the GCCS and plans to implement a Landfill Gas Energy system

The Landfill includes several waste disposal areas designated as Phase 1, 2, 3, 4, 4A, and 5. No GCCS construction activities are planned in Phase 1 and 2. Drilling and pipe installation will take place in Phase 3, 4A and 5. For Phase 4, no drilling is planned and pipe installation will only occur within the existing soil cover.

A solid waste permit modification (dated November 30, 2010) for the installation of a voluntary GCCS was prepared by SCS and submitted to the Division of Waste Management (DWM), Solid Waste Section on behalf of the Johnston County MSW and C&D Landfill Facility (Permit No. 51-03).

1.2 PROJECT DOCUMENTS

The following documents defined the design and technical aspects of the project and governed construction:

- “Construction Drawings for Johnston County Landfill Gas Project”, prepared by SCS, dated November 2010 and revised February 2011.
- Solid Waste Permit Modification submittal, prepared by SCS, dated November 30, 2010, and subsequent correspondences with NCDENR.
- Minor Source Permit to Construct Application, prepared by SCS Engineers, dated August 16, 2010 (for flare).
- Surveying results, by M-III Engineering.

1.3 CONTACT LIST

The parties involved in construction of the GCCS project at the Johnston County Landfill are listed below:

Project Developer:

C2I Methane Partners
93 St. Marks Place, Suite 2
New York, NY 10009
(212) 804-6279

General Contractor:

SCS Field Services
11260 Roger Bacon Drive, Suite 300
Reston, Virginia 20190
(703) 709-0004

Design Engineer and CQA Firm:

SCS Engineers, P.C.
2520 Whitehall Park Drive, Suite 450
Charlotte, North Carolina 28273
(704) 504-3107

Surveyor:

M-III Engineering
970 Trinity Road
Raleigh, NC 27607
(919) 822-2222

Drilling Subcontractor:

B&H Drilling Services, Inc
7180 SW 18th St.
Plantation, FL 33317
(954) 614-0492

2 LANDFILL GAS COLLECTION AND CONTROL SYSTEM

Construction on the GCCS began in April 2011 and ended in July 2011. The construction and installation was performed by SCS Field Services with SCS Engineers providing construction inspection and field engineering services. The project consisted of constructing/installing the following primary components:

- 943 vertical feet drilled
- 2,225 ft. of 12-inch diameter HDPE SDR 17 header pipe
- 2,447 ft of 10-inch diameter HDPE SDR 17 LFG header pipe
- 2,725 ft of 8-inch diameter HDPE SDR 17 LFG header pipe
- 475 ft of 6-inch diameter HDPE SDR 17 LFG lateral pipe
- 4,642 ft of 4-inch diameter HDPE SDR 17 LFG lateral pipe
- 5,645 ft of 2-inch diameter HDPE SDR 9 airline pipe
- 5,965 ft of 2-inch diameter HDPE SDR 11 forcemain pipe
- One 12-inch butterfly-type isolation valves
- Three 10-inch butterfly-type isolation valves with 5-foot valve extension
- Two 8-inch butterfly-type isolation valves with 5-foot valve extension
- 200 ft of 18-inch CMP for road crossings
- Three 12-inch HDPE condensate sumps and pumps

2.1 LANDFILL GAS COLLECTION PIPING

As stated above, 12-, 10-, and 8-inch diameter LFG header pipe and 8-, 6-, and 4-inch diameter lateral pipe were installed during this construction project. Previously installed header and lateral pipes for the passive collection system remain in place and were connected to the active collection system. The new GCCS piping consists of high density polyethylene (HDPE) pipe (PE 3408) with a Standard Dimension Ratio (SDR) of 17.

Leak testing was conducted on the new LFG, air, and condensate forcemain piping and the results can be found in *Appendix H*. The leak test results all showed no pressure loss over the required 4-hour period except for one test that was performed overnight for 17 hours. This test was performed on all the 2-inch forcemain and the 2x4-inch dual-contained forcemain installed. A pressure drop of one inch was observed at the end of the test at 7am the next day. Using the ideal gas law and the change in temperature from 2 pm on June 25 to 7 am on June 26, this amount of pressure drop can be attributed the cooling of the air in the pipe.

Using the ideal gas law of $PV=nRT$ and assuming that n , R , and V are constant, the temperatures for the beginning and the end of the test were input into the equation $P_1/T_1 = P_2/T_2$. This resulted in an ending pressure of 7.7 psi attributed to the change in temperature. Because most of the pipe is insulated by the ground it is assumed that the temperature of the air in the pipe did not experience the complete 20° change in temperature. Another calculation using the ideal gas law and the beginning and ending pressures of the test and solving for the temperature at the end of the test resulted in a 10° change in temperature which is not unrealistic. Further the system has

been in operation for two months and has not shown any signs of leaks in the forcemain. The forcemain is under pressure so the liquid would push out creating a large wet spot at the landfill and a loss of pressure in the line. The site periodically monitors the wells and inspects the GCCS on a monthly basis at a minimum and often more frequently.

The GCCS piping was sized to handle the maximum LFG design flow rate anticipated during the next several years, or until the piping is replaced. As landfilling operations progress and LFG production rates increase, the initial piping may be replaced with larger diameter piping or additional GCCS piping installed, as necessary.

To promote positive drainage of LFG condensate to collection points, the LFG collection piping inside the waste footprint was typically constructed at a minimum slope of three percent when possible.

At no time during trenching activities were portions of the permitted cap damaged.

Record drawings depicting the LFG piping are provided in *Appendix F*.

2.2 LANDFILL GAS EXTRACTION WELLS

Vertical LFG extraction wells were constructed with a 6-inch diameter SCH 80 PVC pipe centered inside 36-inch diameter borings. The drilling contractor was B&H Drilling. The well borings were backfilled using 467M stone which is an acceptable substitute for NC DOT No. 57 stone. Also a double bentonite seal, and soil were used to complete each well. A total of 90 tons of stone was provided by Hanson Princeton Quarry and was used for the extraction wells. Using a conversion of 130 lbs/cubic foot, a total of 51 cubic yards were used. The required rate of one gradation test for every 250 cubic yards resulted in one test which is provided in *Appendix E*. The length of solid pipe is typically one third of total well depth below grade and the remaining length of the well is slotted pipe. Well drilling logs prepared by SCS are provided in *Appendix C* and reflect the actual construction location and depth of the extraction wells. As-built data pertaining to the extraction wells is provided in *Appendices D* and *F* (well schedule and record drawings, respectively).

Some wells were relocated from the locations denoted in the design drawings. This is typically done to accommodate site conditions (i.e., to allow the drill rig to reach the well location) and such relocations are usually in an uphill direction. One extraction well was moved laterally, three were moved uphill, and two were moved downhill. Downhill relocation was a distance of less than five feet resulting in a minimal decrease of waste depth.

Extraction well EW-417 was removed from the design on April 22, 2011.

Each LFG extraction well was outfitted with a Lee Supply 2-inch Waste Management Style wellhead equipped with a valve to control LFG flow and vacuum, and monitoring ports on either side of the valve to measure LFG quality, pressure, and temperature. A removable end cap on top of the wellhead allows access to the interior of the well pipe for measurement of liquid levels and pumping of the liquid, if necessary. Flexible Cannoflex piping connects the wellhead with

the GCCS lateral pipe and is intended to accommodate differential settlement in the vicinity of each well.

SCS submitted the required information to the Health Hazards Control Unit (HHCU) of the Division of Public Health that addressed the potential to disturb asbestos-containing materials (ACMs). This is further discussed in Section 3.5.

2.3 HDPE PIPE WELDING

All LFG header and lateral piping was constructed using fusion welding. The contractor used a variety of welding machines, determined by the diameter of the pipe in question. Fusion equipment was manufactured by McElroy and worked as intended during construction.

Welding temperatures were checked at the start of welding and following any extended breaks. Additionally, temperatures were monitored periodically during the welding process. Welding temperature was 425°F or greater per ISCO HDPE Fusion Manual.

In order to connect new LFG piping to the existing LFG piping, the contractor used electrofusion couplers. A coupler is fitted over the ends of the two pieces of pipe, and then an electrofusion machine runs electricity through wiring installed in the coupler to produce heat. The amount of time required to sufficiently melt the coupler and sections of pipe together is determined by the diameter of the pipe, with larger couplers requiring more time.

2.4 EXISTING SOLAR FLARES

Nine passive solar flares already existed at the site, labeled T-1 through T-9. The contractor attached wellheads to these passive wells and connected them to the new GCCS according to the construction drawings. These wells were given new names as seen in the Table on the record drawing in *Appendix F*.

2.5 BLOWER FLARE STATION

A new 1,250 SCFM blower skid and utility flare were installed near Phase V to combust the collected LFG. The Landfill received an Air Permit to Construct from the NCDENR Division of Air Quality. The Permit to Construct issued by the DAQ is provided in *Appendix G*.

Additional information for the flare provided by the flare manufacture is also included in *Appendix G*.

3 CONSTRUCTION RECORDS

The following construction documentation is provided as appendices:

- Appendix A: Construction Photographs
- Appendix B: SCS Daily Field Reports (April 26, 2011 thru April 30, 2011)
- Appendix C: LFG Extraction Well Logs

- Appendix D: As-built Well Schedule
- Appendix E: Stone Gradation Documentation
- Appendix F: Record Drawings
- Appendix G: Flare Documentation and DAQ Information
- Appendix H: Leak Test Results
- Appendix I: Correspondence
- Appendix J: NESHAP Documentation

3.1 CONSTRUCTION PHOTOGRAPHS

Photographs were taken by SCS on a regular basis during the drilling phase of the construction. SCS also took photographs of completed components of the GCCS during the flare startup. Photographs are included in *Appendix A* to provide a general representation of the drilling activities and methods and completed components of the GCCS.

3.2 SCS DAILY FIELD REPORTS

SCS maintained daily field reports during the drilling process. These reports, along with the contractor's record drawings, were used to prepare this Construction Certification Report and SCS's Record Drawings. The daily reports are included in *Appendix B*.

3.3 LFG EXTRACTION WELL LOGS

The LFG extraction well logs are provided in *Appendix C* and include a description of the well construction and excavated material (type, degree of decomposition, moisture, and temperature). The well construction logs detail the depth and diameter of the borehole, length of solid and perforated pipe, thickness of stone and soil backfills, and location of bentonite plugs.

3.4 RECORD DRAWINGS

Record Drawings depicting the constructed components of the GCCS are provided in *Appendix F*.

3.5 NCDHHS CORRESPONDENCE

Correspondence between SCS and the North Carolina Department of Health and Human Services (NCDHHS) Health Hazards Control Unit regarding waste disturbance are provided in *Appendix J*. It should be noted that the dates of SCS' submittals and the dates referenced in NCDHHS' responses do not match; SCS is unsure as to why this is the case, but the final version of all SCS documents are included with this report. A copy of the notification and the approval from HHCU is provided in *Appendix J*. No ACMs were encountered during drilling activities.

4 SUMMARY AND CONCLUSION

Based on the field observations of the SCS Senior CQA Technicians and periodic reviews by SCS' Senior Engineer, it is our professional opinion that the installation of the Landfill Gas

Collection and Control System at the Johnston County Landfill described in this report was conducted in accordance with industry practice and the requirements of the Construction Drawings and applicable permit documents.

APPENDICIES

APPENDIX A

Photographs



Photo 1. Drilling EW-412



Photo 2. Drilling EW-405

SCS ENGINEERS

"Superior Customer Service"

Photographs
Johnston County Landfill
680 County Home Road
Smithfield, NC 27577

Project Number:
02210301.00

Page 1



Photo 3. Installing well casing in EW-415



Photo 4. Installing bentonite seal in EW-507

SCS ENGINEERS

"Superior Customer Service"

Photographs
Johnston County Landfill
680 County Home Road
Smithfield, NC 27577

Project Number:
02210301.00

Page 2



Photo 5. Installed Valve V-301 and V-4A1



Photo 6. Installed Condensate Sump CS-3A

SCS ENGINEERS

"Superior Customer Service"

Photographs
Johnston County Landfill
680 County Home Road
Smithfield, NC 27577

Project Number:
02210301.00

Page 3



Photo 7. Completed well EW-511 with available airline and forccemain



Photo 8. Completed valve V-403 with booted observation risers

SCS ENGINEERS

"Superior Customer Service"

Photographs
Johnston County Landfill
680 County Home Road
Smithfield, NC 27577

Project Number:
02210301.00

Page 4



Photo 9. Blower skid and flare stack in gated area



Photo 8. Control panel and air compressor in protective building

SCS ENGINEERS

"Superior Customer Service"

Photographs
Johnston County Landfill
680 County Home Road
Smithfield, NC 27577

Project Number:
02210301.00

Page 5

APPENDIX B
SCS Daily Field Reports

SCS ENGINEERS DAILY FIELD REPORT

Project Name: Johnston County Landfill		Project Number: 02210301.00	
		Task: NA	Labor Code: 99000
Project Manager: Steve Lamb		Field Personnel: Michael Cobb	
Date: 4/26/11	Vehicle: fleet	Miles Billed: 0	Travel Time: 1 hr.
Weather: Clear, 85°			
Summary of Work:			
<p>On-site at 0650.</p> <p>EW-405 – Elevation on stake matched well schedule. Drilling started at 0720 and completed at 0857. Asbestos inspector not on-site.</p> <p>EW-406 – Elevation on stake was one foot higher than well schedule. Ted Blevins moved well 10' towards EW-407 to avoid existing tiki torch flare. Drilling started at 0921 and completed at 1036.</p> <p>EW-407 – Elevation on stake matched well schedule. Drilling started at 1052 and completed at 1220.</p> <p>EW-408 – Elevation on stake matched well schedule. Moved well downhill less than five feet to accommodate drill rig. Drilling started at 1235 and completed at 1345.</p> <p>EW-409 – Elevation on stake matched well schedule. Drilling started at 1415 and completed at 1525.</p> <p>Drilling stopped for the day due to weather.</p> <p>Off-site at 1545.</p>			
Prepared by: Michael Cobb		Reviewed by:	

SCS ENGINEERS DAILY FIELD REPORT

Project Name: Johnston County Landfill		Project Number: 02210301.00	
		Task: NA	Labor Code: 99000
Project Manager: Steve Lamb		Field Personnel: Michael Cobb	
Date: 4/27/11	Vehicle: fleet	Miles Billed: 0	Travel Time: 1 hr.
Weather: Overcast, 85°			
Summary of Work:			
<p>On-site at 0650.</p> <p>EW-410 – Elevation on stake matched well schedule. Moved downhill less than five feet to accommodate drill rig. Drilling started at 0728 and completed at 0855.</p> <p>EW-411 – Elevation on stake matched well schedule. Moved uphill less than five feet to accommodate drill rig. Drilling started at 0918 and completed at 1033.</p> <p>EW-412 – Elevation on stake matched well schedule. Drilling started at 1108 and completed at 1215.</p> <p>EW-413 – Elevation on stake matched well schedule. Drilling started at 1248 and completed at 1355.</p> <p>EW-415 – Stake marked as “EW-15”. Spoke with J Morgan about this, he said to go ahead and drill well and he’d talk to Steve Lamb and Guy Lewis. Elevation on stake matched well schedule. Drilling started at 1440 and completed at 1712.</p> <p>Off-site at 1745.</p>			
Prepared by: Michael Cobb		Reviewed by:	

SCS ENGINEERS DAILY FIELD REPORT

Project Name: Johnston County Landfill

Project Number: 02210301.00

Task: NA

Labor Code: 99000

Project Manager: Steve Lamb

Field Personnel: Michael Cobb

Date: 4/28/11

Vehicle: fleet

Miles Billed: 0

Travel Time: 1 hr.

Weather: Overcast, raining, 85°

Summary of Work:

On-site at 0650.

Work canceled for the day due to rain.

Off-site at 0745.

Prepared by: Michael Cobb

Reviewed by:

SCS ENGINEERS DAILY FIELD REPORT

Project Name: Johnston County Landfill		Project Number: 02210301.00	
		Task: NA	Labor Code: 99000
Project Manager: Steve Lamb		Field Personnel: Michael Cobb	
Date: 4/29/11	Vehicle: fleet	Miles Billed: 0	Travel Time: 1 hr.
Weather: Overcast, 85°			
Summary of Work:			
<p>On-site at 0700.</p> <p>EW-416 - Elevation on stake matched well schedule. Drilling started at 0719 and completed at 0943.</p> <p>EW-414 – Original stake not there, new stake put in place by SCS FS. Cannot verify elevation. Spoke with Steve Lamb, he said to drill to 75% of waste depth (67'). Ted Blevins said he and Guy Lewis checked all stakes and is adamant that stake was put within 5' of original. I gave go-ahead to drill to original planned depth. Drilling started at 1020 and completed at 1245.</p> <p>EW-501 - Elevation on stake matched well schedule. Drilling started at 1355 and completed at 1433.</p> <p>EW-502 - Elevation on stake matched well schedule. Drilling started at 1620 and completed at 1655.</p> <p>EW-503 - Elevation on stake matched well schedule. Well was moved approximately 30' uphill from stake. Drilling started at 1453 and completed at 1605.</p> <p>Off-site at 1745.</p>			
Prepared by: Michael Cobb		Reviewed by:	

SCS ENGINEERS DAILY FIELD REPORT

Project Name: Johnston County Landfill

Project Number: 02210301.00

Task: NA

Labor Code: 99000

Project Manager: Steve Lamb

Field Personnel: Michael Cobb

Date: 4/30/11

Vehicle: fleet

Miles Billed: 0

Travel Time: 1 hr.

Weather: Overcast, 85°

Summary of Work:

On-site at 0720.

EW-505 - Elevation on stake matched well schedule. Drilling started at 0715 and completed at 0745.

EW-507 - Elevation on stake matched well schedule. Drilling started at 0817 and completed at 0928.

EW-506 - Elevation on stake matched well schedule. Drilling started at 0946 and completed at 1032.

EW-504 - Elevation on stake matched well schedule. Drilling started at 1050 and completed at 1202.

EW-508 - Elevation on stake matched well schedule. Drilling started at 1223 and completed at 1318.

EW-509 - Elevation on stake matched well schedule. Drilling started at 1329 and completed at 1410.

Last two wells will be drilled Monday, 5/2/11, and logged by SCS FS personnel.

Off-site at 1500.

Prepared by: Michael Cobb

Reviewed by:

APPENDIX C

Landfill Gas Extraction Well Logs

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-405

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0							0-3' - Top cover	
3							3' - Liner	
10							3-10' - Household waste, carpet	
12							10-12' - Day cover	
30							12-30' - Household waste, metal, wood, carpet, cables	
31							30-31' - Day cover	
42							31-42' - Household waste	
4	Bentonite							
8	Soil Backfill							
12	68°							
12	Bentonite							
20	83°							
22	NC DOT #57 Stone							
26	Slotted Pipe (25 ft.)							
30	86°							
40	82°							

Drilling Company: B&H Drilling Services, Inc.

Date Started: 4/26/11

Time Started: 0720

Drilling Method: Landfill Bucket Auger

Date Ended: 4/26/11

Time Ended: 0857

Logged By: M. Cobb

Boring Diameter: 36-inch

Surface Elevation: 256'

Well Diameter: 6.0-inch

Total Depth: 42'

Casing Material: PVC

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-406

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0-3'	Bentonite						0-3' - Top cover	
3-10'	Soil Backfill						3-10' - Household waste, carpet	
10-12'	72°						10-12' - Day cover	
12-30'	Bentonite						12-30' - Household waste, metal, wood, carpet, cables	
30-31'							30-31' - Day cover	
31-42'							31-42' - Household waste	
20	78°							
22	NC DOT #57 Stone							
26	Slotted Pipe (25 ft.)							
30	85°							
40	84°							

Drilling Company:	B&H Drilling Services, Inc.	Date Started:	4/26/11	Time Started:	0921
Drilling Method:	Landfill Bucket Auger	Date Ended:	4/26/11	Time Ended:	1036
Logged By:	M. Cobb	Boring Diameter:	36-inch	Surface Elevation:	256'
		Well Diameter:	6.0-inch	Total Depth:	42'
		Casing Material:	PVC		

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

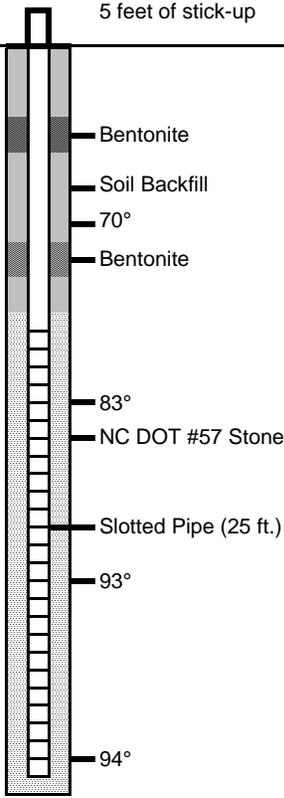
LFG EXTRACTION WELL

EW-407

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0							0-3' - Top cover	
3							3-10' - Household waste, carpet	
10							10-12' - Day cover	
12							12-30' - Household waste, metal, wood, carpet, cables	
30							30-31' - Day cover	
31							31-42' - Household waste	
42								



Drilling Company: B&H Drilling Services, Inc.
 Drilling Method: Landfill Bucket Auger
 Logged By: M. Cobb

Date Started: 4/26/11
 Date Ended: 4/26/11
 Boring Diameter: 36-inch
 Well Diameter: 6.0-inch
 Casing Material: PVC

Time Started: 1052
 Time Ended: 1220
 Surface Elevation: 248'
 Total Depth: 42'

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-408

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0							0-3' - Top cover	
3							3-10' - Household waste, carpet	
10							10-12' - Day cover	
12							12-30' - Household waste, metal, wood, carpet, cables	
30							30-31' - Day cover	
31							31-42' - Household waste	
42								

Drilling Company: B&H Drilling Services, Inc.

Date Started: 4/26/11

Time Started: 1235

Drilling Method: Landfill Bucket Auger

Date Ended: 4/26/11

Time Ended: 1345

Logged By: M. Cobb

Boring Diameter: 36-inch

Surface Elevation: 248'

Well Diameter: 6.0-inch

Total Depth: 42'

Casing Material: PVC

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-409

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG		SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
	5 feet of stick-up								
0	5 feet of stick-up								Northing 644,423.8 Easting 2,170,959.4
0-3'	Bentonite							0-3' - Top cover	
3-10'	Soil Backfill							3-10' - Household waste, carpet	
10-12'	80°							10-12' - Day cover	
12-30'	Bentonite							12-30' - Household waste, metal, wood, carpet, cables	
30-31'	82°							30-31' - Day cover	
31-42'	NC DOT #57 Stone							31-42' - Household waste	
26-31'	Slotted Pipe (25 ft.)								
30-32'	84°								
40-42'	82°								

Drilling Company: B&H Drilling Services, Inc.
 Drilling Method: Landfill Bucket Auger
 Logged By: M. Cobb

Date Started: 4/26/11
 Date Ended: 4/26/11
 Boring Diameter: 36-inch
 Well Diameter: 6.0-inch
 Casing Material: PVC

Time Started: 1235
 Time Ended: 1345
 Surface Elevation: 236'
 Total Depth: 42'

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-410

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0-3'	Bentonite						0-3' - Top cover	
3-10'	Soil Backfill						3-10' - Household waste, carpet	
10-12'	70°						10-12' - Day cover	
12-30'	Bentonite						12-30' - Household waste, metal, wood, carpet, cables	
30-31'							30-31' - Day cover	
31-42'							31-42' - Household waste	
20	73°							
22	NC DOT #57 Stone							
26	Slotted Pipe (25 ft.)							
30	84°							
40	85°							

Drilling Company: B&H Drilling Services, Inc.

Date Started: 4/27/11

Time Started: 0728

Drilling Method: Landfill Bucket Auger

Date Ended: 4/27/11

Time Ended: 0855

Logged By: M. Cobb

Boring Diameter: 36-inch

Surface Elevation: 233'

Well Diameter: 6.0-inch

Total Depth: 42'

Casing Material: PVC

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-411

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0-3'	Bentonite						0-3' - Top cover	
3-10'	Soil Backfill						3-10' - Household waste, carpet	
10-12'	73°						10-12' - Day cover	
12-30'	Bentonite						12-30' - Household waste, metal, wood, carpet, cables	
30-31'							30-31' - Day cover	
31-42'							31-42' - Household waste	
20	83°							
22	NC DOT #57 Stone							
26	Slotted Pipe (25 ft.)							
30	86°							
40	84°							

Drilling Company:	B&H Drilling Services, Inc.	Date Started:	4/27/11	Time Started:	0918
Drilling Method:	Landfill Bucket Auger	Date Ended:	4/27/11	Time Ended:	1033
Logged By:	M. Cobb	Boring Diameter:	36-inch	Surface Elevation:	221'
		Well Diameter:	6.0-inch	Total Depth:	42'
		Casing Material:	PVC		

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-412

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
0	5 feet of stick-up							
0-3'	Bentonite						0-3' - Top cover	
3-10'	Soil Backfill						3-10' - Household waste, carpet	
10-12'	81°						10-12' - Day cover	
12-30'	Bentonite						12-30' - Household waste, metal, wood, carpet, cables	
30-31'							30-31' - Day cover	
31-42'							31-42' - Household waste	
20	82°							
22	NC DOT #57 Stone							
26	Slotted Pipe (25 ft.)							
30	83°							
40	86°							

Drilling Company:	B&H Drilling Services, Inc.	Date Started:	4/27/11	Time Started:	1108
Drilling Method:	Landfill Bucket Auger	Date Ended:	4/27/11	Time Ended:	1215
Logged By:	M. Cobb	Boring Diameter:	36-inch	Surface Elevation:	218'
		Well Diameter:	6.0-inch	Total Depth:	42'
		Casing Material:	PVC		

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-413

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0	Soil Backfill						0-3' - Top cover	
2	Bentonite						3-10' - Household waste, carpet	
4							10-12' - Day cover	
6	Bentonite						12-30' - Household waste, metal, wood, carpet, cables	
8							30-31' - Day cover	
10	82°						31-39' - Household waste	
12								
14								
16								
18								
20	86°							
22	NC DOT #57 Stone							
24								
26	Slotted Pipe (26 ft.)							
28								
30	91°							
32								
34								
36								
38								
40	91°							
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								

Drilling Company: B&H Drilling Services, Inc.

Date Started: 4/27/11

Time Started: 1248

Drilling Method: Landfill Bucket Auger

Date Ended: 4/27/11

Time Ended: 1355

Logged By: M. Cobb

Boring Diameter: 36-inch

Surface Elevation: 218'

Well Diameter: 6.0-inch

Total Depth: 39'

Casing Material: PVC

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-414

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	COORDINATES	
							Northing	Easting
DESCRIPTION							REMARKS	
0	5 feet of stick-up						644,425.9	2,170,659.0
0-5'	Bentonite							
5-22'	81°							
22-23'	Soil Backfill							
23-45'	Bentonite							
45-47'	83°							
47-65'	Slotted Pipe (49')							
65-67'	87°							
67-74'	NC DOT #57 Stone							
	92°							
	88°							

Drilling Company: B&H Drilling Services, Inc.
 Drilling Method: Landfill Bucket Auger
 Logged By: M. Cobb

Date Started: 4/29/11
 Date Ended: 4/29/11
 Boring Diameter: 36-inch
 Well Diameter: 8.0-inch
 Casing Material: PVC

Time Started: 1020
 Time Ended: 1245
 Surface Elevation: 264'
 Total Depth: 74'

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

Project No. 02210301.00

LFG EXTRACTION WELL

EW-415

Page 1 of 1

Depth in Feet	BORING LOG		SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	COORDINATES	
								Northing	Easting
	DESCRIPTION		REMARKS						
0	5 feet of stick-up								
0-4	Bentonite								
4-8	80°								
8-12	Soil Backfill								
12-16									
16-20	Bentonite								
20-24	84°								
24-32									
32-36	Slotted Pipe (49')								
36-40									
40-44	88°								
44-48	NC DOT #57 Stone								
48-52									
52-56									
56-60									
60-64	91°								
64-68									
68-72									
72-76	95°								
76-80									
80-84									
84-88									
88-92									
92-96									
96-100									
100-104									
104-108									
108-112									
112-116									
116-120									
120-124									
124-128									
128-132									
132-136									
136-140									

0-5' - Top cover
 5-22' - Household waste, carpet
 22-23' - Day cover
 23-45' - Household waste, metal, wood, carpet, cables
 45-47' - Day cover
 47-65' - Household waste, metal
 65-67' - Day Cover
 67-74' - Household waste, metal, plastics

Drilling Company: B&H Drilling Services, Inc.
 Drilling Method: Landfill Bucket Auger
 Logged By: M. Cobb

Date Started: 4/27/11
 Date Ended: 4/27/11
 Boring Diameter: 36-inch
 Well Diameter: 8.0-inch
 Casing Material: PVC

Time Started: 1440
 Time Ended: 1712
 Surface Elevation: 270'
 Total Depth: 74'

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-416

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0	Soil Backfill						0-5' - Top cover	
4	Bentonite						5-22' - Household waste, carpet	
6							22-23' - Day cover	
8	68°						23-45' - Household waste, metal, wood, carpet, cables	
10							45-47' - Day cover	
12							47-67' - Household waste, metal	
14								
16								
18	Bentonite							
20	88°							
22	NC DOT #57 Stone							
24								
26								
28	Slotted Pipe (45 ft.)							
30	86°							
32								
34								
36								
38								
40	90°							
42								
44								
46								
48								
50	91°							
52								
54								
56								
58								
60	86°							
62								
64								
66								
68	92°							
70								

Drilling Company: B&H Drilling Services, Inc.

Date Started: 4/29/11

Time Started: 0719

Drilling Method: Landfill Bucket Auger

Date Ended: 4/29/11

Time Ended: 0943

Logged By: M. Cobb

Boring Diameter: 36-inch

Surface Elevation: 270'

Well Diameter: 6.0-inch

Total Depth: 67'

Casing Material: PVC

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-501

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0	Soil Backfill						0-3' - Top cover	
2	Bentonite						3-10' - Household waste, carpet	
4	Bentonite						10-12' - Day cover	
6	Bentonite						12-27' - Household waste, metal, wood, carpet, cables	
8	82°							
10	82°							
12	82°							
14	82°							
16	82°							
18	82°							
20	84°							
22	NC DOT #57 Stone							
24	82°							
26	82°							
28	82°							
30								
32								
34								
36								
38								
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								

Drilling Company: B&H Drilling Services, Inc.

Date Started: 4/27/11

Time Started: 1355

Drilling Method: Landfill Bucket Auger

Date Ended: 4/27/11

Time Ended: 1433

Logged By: M. Cobb

Boring Diameter: 36-inch

Surface Elevation: 272

Well Diameter: 6.0-inch

Total Depth: 27'

Casing Material: PVC

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-502

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG		SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
	5 feet of stick-up								
0	Soil Backfill							0-3' - Top cover	
2	Bentonite							3-10' - Household waste, carpet	
4	Bentonite							10-12' - Day cover	
6	69°							12-27' - Household waste, metal, wood, carpet, cables	
8	Slotted Pipe(15')								
10	79°								
12	NC DOT #57 Stone								
14	84°								
16									
18									
20									
22									
24									
26									
28									
30									
32									
34									
36									
38									
40									
42									
44									
46									
48									
50									
52									
54									
56									
58									
60									
62									
64									
66									
68									
70									

Drilling Company:	B&H Drilling Services, Inc.	Date Started:	4/27/11	Time Started:	1620
Drilling Method:	Landfill Bucket Auger	Date Ended:	4/27/11	Time Ended:	1655
Logged By:	M. Cobb	Boring Diameter:	36-inch	Surface Elevation:	270'
		Well Diameter:	6.0-inch	Total Depth:	27'
		Casing Material:	PVC		

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-503

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0-3'	Bentonite						0-3' - Top cover	
3-10'	Soil Backfill						3-10' - Household waste, carpet	
10-12'	77°						10-12' - Day cover	
12-30'	Bentonite						12-30' - Household waste, metal, wood, carpet, cables	
30-31'							30-31' - Day cover	
31-40'							31-40' - Household waste	
20	82°							
22	NC DOT #57 Stone							
26	Slotted Pipe (25 ft.)							
30	79°							
40	82°							

Drilling Company:	B&H Drilling Services, Inc.	Date Started:	4/29/11	Time Started:	1453
Drilling Method:	Landfill Bucket Auger	Date Ended:	4/29/11	Time Ended:	1605
Logged By:	M. Cobb	Boring Diameter:	36-inch	Surface Elevation:	279'
		Well Diameter:	6.0-inch	Total Depth:	40'
		Casing Material:	PVC		

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-504

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0	Soil Backfill						0-3' - Top cover	
2							3-10' - Household waste, carpet	
4	Bentonite						10-12' - Day cover	
6							12-30' - Household waste, metal, wood, carpet, cables	
8	Bentonite						30-31' - Day cover	
10	74°						31-42' - Household waste	
12								
14								
16								
18								
20	85°							
22	NC DOT #57 Stone							
24								
26	Slotted Pipe (28 ft.)							
28								
30	96°							
32								
34								
36								
38								
40	83°							
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								

Drilling Company:	B&H Drilling Services, Inc.	Date Started:	4/30/11	Time Started:	1050
Drilling Method:	Landfill Bucket Auger	Date Ended:	4/30/11	Time Ended:	1202
Logged By:	M. Cobb	Boring Diameter:	36-inch	Surface Elevation:	283'
		Well Diameter:	6.0-inch	Total Depth:	42'
		Casing Material:	PVC		

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-505

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0	Soil Backfill						0-3' - Top cover	
2							3-10' - Household waste, carpet	
4	Bentonite						10-12' - Day cover	
6							12-30' - Household waste, metal, wood, carpet, cables	
8	Bentonite						30-31' - Day cover	
10	62°						31-38' - Household waste	
12								
14								
16								
18								
20	74°							
22	NC DOT #57 Stone							
24								
26	Slotted Pipe (25 ft.)							
28								
30	84°							
32								
34								
36								
38	82°							
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								

Drilling Company:	B&H Drilling Services, Inc.	Date Started:	4/30/11	Time Started:	0715
Drilling Method:	Landfill Bucket Auger	Date Ended:	4/30/11	Time Ended:	0745
Logged By:	M. Cobb	Boring Diameter:	36-inch	Surface Elevation:	275'
		Well Diameter:	6.0-inch	Total Depth:	38'
		Casing Material:	PVC		

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-506

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0	Soil Backfill						0-3' - Top cover	
2							3-10' - Household waste, carpet	
4	Bentonite						10-12' - Day cover	
6							12-30' - Household waste, metal, wood, carpet, cables	
8								
10	74°							
12	Bentonite							
14								
16	Slotted Pipe(15')							
18								
20	77°							
22	NC DOT #57 Stone							
24								
26								
28								
30	88°							
32								
34								
36								
38								
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								

Drilling Company: B&H Drilling Services, Inc.

Date Started: 4/30/11

Time Started: 0946

Drilling Method: Landfill Bucket Auger

Date Ended: 4/30/11

Time Ended: 1032

Logged By: M. Cobb

Boring Diameter: 36-inch

Surface Elevation: 272'

Well Diameter: 6.0-inch

Total Depth: 30'

Casing Material: PVC

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

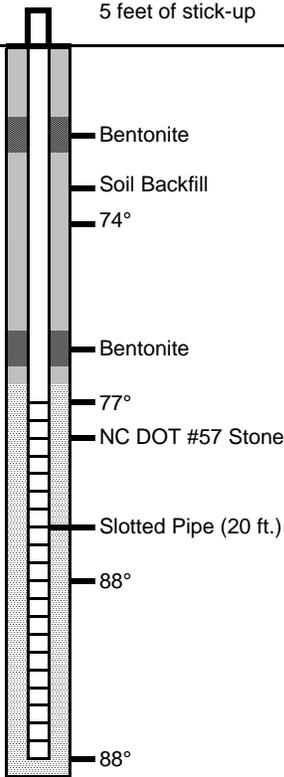
LFG EXTRACTION WELL

EW-507

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
0	5 feet of stick-up						
0						0-3' - Top cover	
3						3-10' - Household waste, carpet	
10						10-12' - Day cover	
12						12-30' - Household waste, metal, wood, carpet, cables	
30						30-31' - Day cover	
31						31-41' - Household waste	
40							



Drilling Company: B&H Drilling Services, Inc.
 Drilling Method: Landfill Bucket Auger
 Logged By: M. Cobb

Date Started: 4/30/11
 Date Ended: 4/30/11
 Boring Diameter: 36-inch
 Well Diameter: 6.0-inch
 Casing Material: PVC

Time Started: 0817
 Time Ended: 0928
 Surface Elevation: 269'
 Total Depth: 41'

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-508

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							Northing 643,068.0 Easting 2,168,841.4
0							0-3' - Top cover	
3							3-10' - Household waste, carpet	
10							10-12' - Day cover	
12							12-30' - Household waste, metal, wood, carpet, cables	
30							30-31' - Day cover	
31							31-35' - Household waste	
18	Bentonite							
20	79°							
22	NC DOT #57 Stone							
26	Slotted Pipe (12 ft.)							
30	84°							
34	84°							

Drilling Company:	B&H Drilling Services, Inc.	Date Started:	4/30/11	Time Started:	1223
Drilling Method:	Landfill Bucket Auger	Date Ended:	4/30/11	Time Ended:	1318
Logged By:	M. Cobb	Boring Diameter:	36-inch	Surface Elevation:	261'
		Well Diameter:	6.0-inch	Total Depth:	35'
		Casing Material:	PVC		

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-509

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							
0	Soil Backfill						0-3' - Top cover	
4	Bentonite						3-10' - Household waste, carpet	
10	84°						10-12' - Day cover	
12	Bentonite						12-28' - Household waste, metal, wood, carpet, cables	
16	Slotted Pipe(12')							
20	79°							
22	NC DOT #57 Stone							
28	82°							
30								
32								
34								
36								
38								
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								

Drilling Company:	B&H Drilling Services, Inc.	Date Started:	4/30/11	Time Started:	1329
Drilling Method:	Landfill Bucket Auger	Date Ended:	4/30/11	Time Ended:	1410
Logged By:	M. Cobb	Boring Diameter:	36-inch	Surface Elevation:	249'
		Well Diameter:	6.0-inch	Total Depth:	28'
		Casing Material:	PVC		

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-510

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG	SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
							DESCRIPTION	REMARKS
0	5 feet of stick-up							Northing 643,442.7 Easting 2,168,722.4
0	Soil Backfill						0-6' - Soil cover	
2							6-10' - Dirt, wood, MSW	
4	Bentonite						10-20' - Dirt, MSW	
6							20-28' - Dirt, MSW	
8								
10	65°							
12	Bentonite							
14								
16	Slotted Pipe(12')							
18								
20	71°							
22	#4 Washed Aggregate							
24								
26								
28	76°							
30								
32								
34								
36								
38								
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								
70								

Drilling Company: B&H Drilling Services, Inc.

Date Started: 5/2/11

Time Started:

Drilling Method: Landfill Bucket Auger

Date Ended: 5/2/11

Time Ended:

Logged By: T. Blevins

Boring Diameter: 36-inch

Surface Elevation: 245'

Well Diameter: 6.0-inch

Total Depth: 28'

Casing Material: PVC

SCS ENGINEERS

Environmental Consultants
 2520 Whitehall Park Drive
 Suite 450
 Charlotte, NC 28273
 704 504-3107 FAX 704 504-3174

JOHNSTON COUNTY LANDFILL

LFG EXTRACTION WELL

EW-511

Page 1 of 1

Project No. 02210301.00

Depth in Feet	BORING LOG		SAMPLES	RECOVERED	PID	GROUNDWATER	USCS	DESCRIPTION	REMARKS
	5 feet of stick-up							DESCRIPTION	REMARKS
0	Soil Backfill							0-7' - Soil cover	
2	Bentonite							7-10' - Dirt, MSW	
4	Bentonite							10-20' - Dirt, wood, MSW	
6	74°							20-26' - MSW	
8	Bentonite								
10	74°								
12	Bentonite								
14	74°								
16	Slotted Pipe(12')								
18	73°								
20	73°								
22	#4 Washed Aggregate								
24	68°								
26	68°								
28									
30									
32									
34									
36									
38									
40									
42									
44									
46									
48									
50									
52									
54									
56									
58									
60									
62									
64									
66									
68									
70									

Drilling Company: B&H Drilling Services, Inc.

Date Started: 5/2/11

Time Started:

Drilling Method: Landfill Bucket Auger

Date Ended: 5/2/11

Time Ended:

Logged By: T. Blevins

Boring Diameter: 36-inch

Surface Elevation: 239'

Well Diameter: 6.0-inch

Total Depth: 26'

Casing Material: PVC

APPENDIX D

As-built Well Schedule

Johnston County As-built Well Schedule
29-Nov-11

WELL ID	NORTHING	EASTING	FINAL GROUND SURFACE ELEVATION	BASELINER ELEVATION	LANDFILL DEPTH	WELL DEPTH	LENGTH OF 6" SOLID PIPE BELOW GRADE	LENGTH OF 6" SOLID PIPE ABOVE GRADE	LENGTH OF 6" PERFORATED PIPE LENGTH
EW-405	643,655	2,170,934	264			42	17	4	25
EW-406	643,760	2,170,953	266			42	17	4	25
EW-407	643,873	2,170,980	253			42	17	4	25
EW-408	644,076	2,170,998	246			42	17	4	25
EW-409	644,424	2,170,959	231			42	17	4	25
EW-410	644,587	2,170,930	232			42	17	4	25
EW-411	644,725	2,170,961	226			42	17	4	25
EW-412	644,792	2,170,819	219			42	17	4	25
EW-413	644,654	2,170,576	218	164	54	39	12	4	26
EW-414	644,426	2,170,659	269	175	94	74	24	4	49
EW-415	644,135	2,170,686	276	182	94	74	23	4	49
EW-416	643,838	2,170,642	276	188	88	67	21	4	45
EW-417	REMOVED FROM WELL SCHEDULE (4/22/11)								
EW-501	642,389	2,169,340	273	230	42	27	11	4	15
EW-502	642,509	2,169,372	271	228	42	27	11	4	15
EW-503	642,486	2,169,186	288	225	63	40	14	4	25
EW-504	642,639	2,169,216	283	227	57	42	13	4	28
EW-505	642,632	2,169,096	283	223	60	38	12	4	25
EW-506	642,792	2,169,005	274	224	50	30	14	4	15
EW-507	642,938	2,168,923	269	214	56	41	20	4	20
EW-508	643,068	2,168,841	261	212	50	35	22	4	12
EW-509	643,319	2,168,739	250	206	44	28	15	4	12
EW-510	643,443	2,168,716	246	202	44	28	15	4	12
EW-511	643,598	2,168,680	242	198	44	26	13	4	12
TOTAL						952	376	92	561

NOTES:

1. BASE GRADE DATA FOR PHASE 4A WAS TAKEN FROM RSG.
2. BASE GRADE DATA FOR PHASE 5 WAS TAKEN FROM FDL & ASSOC. "TOP OF CLAY & TOP OF OPERATIONAL COVER" DATED 11/7/96, REV. 2/21/97.
3. FINAL LANDFILL SURFACE TOPOGRAPHY FROM SURVEYS ON 4/14/11, 4/15/11, 5/3/11, 5/24/11, 6/27/11, 6/28/11, 6/28/11, AND 7/8/11,
4. CONFIRMED BASE GRADES FOR WELLS EW-509, EW-510, AND EW-511 ON 4/26/11.

Permit No.	Date	Document ID No.
51-03	February 08, 2012	16063

RECEIVED - By FedEx
Date: February 08, 2012
Solid Waste Section
Raleigh Central Office

APPENDIX E

Stone Gradation Documentation



Product Quality Summary Report

Princeton Quarry CA064
 #467M & #57 Average Gradation Report
 SCS Field Services

Period 01/19/2011 - 04/19/2011

Plant E016-PRINCETON QUARRY

	Product	20046 #467M	20057 #57
	Specification	#467M	#57
2" (50mm)		100	
1 1/2" (37.5mm)		100	100
1" (25mm)		68	100
3/4" (19mm)		42	84
1/2" (12.5mm)		15	38
3/8" (9.5mm)		6	22
#4 (4.75mm)		2	6
#8 (2.36mm)			2
#200 (75um)			0.0
PAN (0um)		0.0	0.0



Product Quality Summary Report

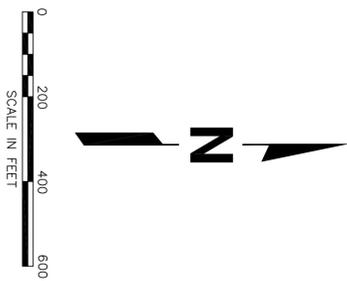
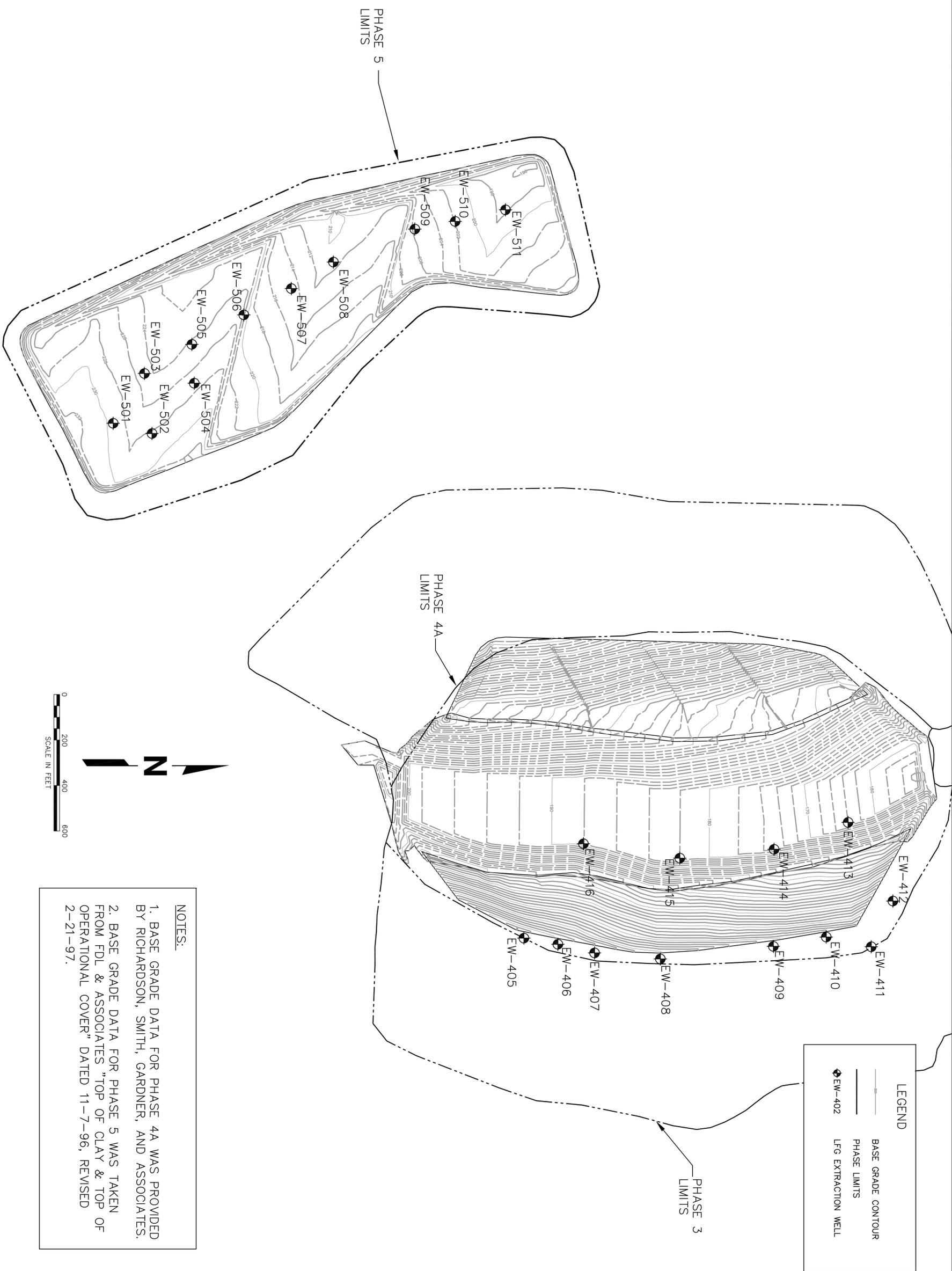
Princeton Quarry CA064 #467M & #57 Average Gradation Report SCS Field Services

Period 01/19/2011 - 04/19/2011
Plant E016-PRINCETON QUARRY
Comments Sales Contact:
Jim Landmark 910-639-3855
Jim.Landmark@Hanson.com

Technical Contact:
Chip Lawler 919-417-4656
Chip.Lawler@Hanson.com
Query Query Selections
Date Created 04/19/2011
Date Range 01/19/2011 - 04/19/2011
Plant PRINCETON QUARRY
Sample Type Shipping

APPENDIX F
Record Drawings

Note: All record drawings are in a separate file labeled “2011 GCCS Johnston County CQA Appendix F.pdf”.



NOTES:

1. BASE GRADE DATA FOR PHASE 4A WAS PROVIDED BY RICHARDSON, SMITH, GARDNER, AND ASSOCIATES.
2. BASE GRADE DATA FOR PHASE 5 WAS TAKEN FROM FDL & ASSOCIATES "TOP OF CLAY & TOP OF OPERATIONAL COVER" DATED 11-7-96, REVISED 2-21-97.

LEGEND	
	BASE GRADE CONTOUR
	PHASE LIMITS
	LFG EXTRACTION WELL

NO.	REVISION	DATE

SHEET TITLE
BASE GRADES WITH WELLS

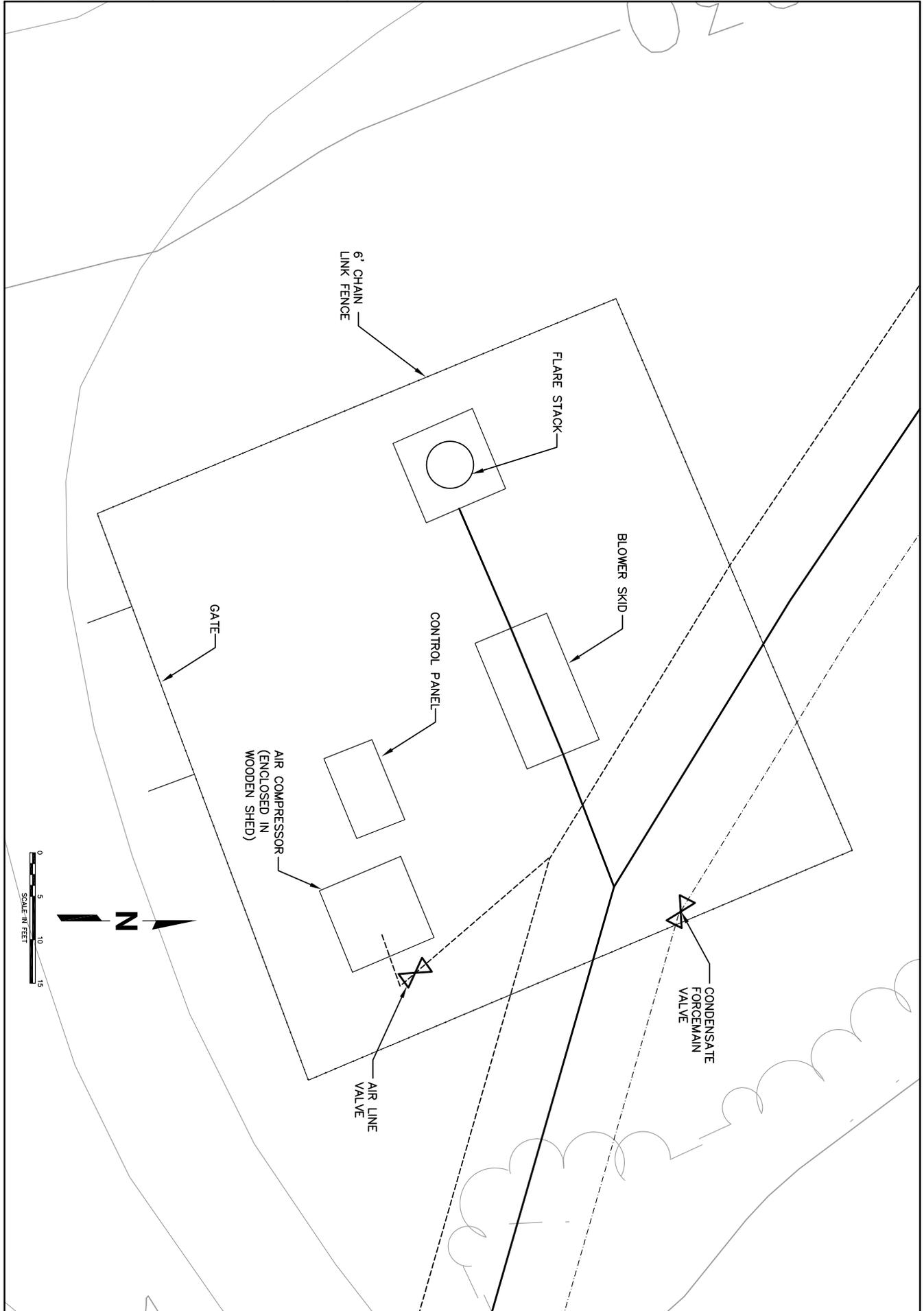
PROJECT TITLE
**JOHNSTON COUNTY LANDFILL
 LANDFILL GAS PROJECT**

CLIENT
BLUE SOURCE LLC
 26 W 17th STREET, SUITE 504
 NEW YORK, NY 10011

SCS ENGINEERS, PC
 2520 WHITEHALL PARK DRIVE, SUITE 450
 CHARLOTTE, NORTH CAROLINA 28273
 PHONE: (704) 504-3107 FAX: (704) 504-3174

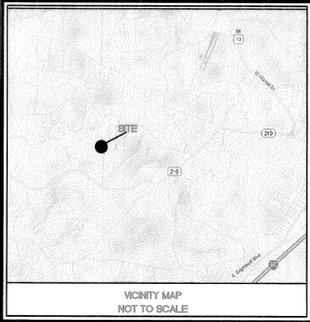
PROJ. NO. 02210301.00	DWN. BY: DMC	Q/A R/W BY: SRN
DSN. BY: SCL	CHK. BY: JLM	APP. BY: SCL

DATE: NOVEMBER 2011
 SCALE: AS SHOWN



1 of 1	SCS ENGINEERS, PC 2520 WHITEHALL PARK DRIVE, SUITE 450 CHARLOTTE, NORTH CAROLINA 28273 PHONE: (704) 504-3107 FAX: (704) 504-3174	CLIENT BLUE SOURCE LLC 26 W 17TH STREET, SUITE 504 NEW YORK, NY 10011	SHEET TITLE 2011 FLARE AS-BUILT SITE PLAN PROJECT TITLE JOHNSTON COUNTY LANDFILL LANDFILL GAS PROJECT	NO. <table border="1" style="width: 100%; height: 40px; border-collapse: collapse;"> <tr><td style="width: 20px;"> </td><td> </td></tr> <tr><td> </td><td> </td></tr>																

 REVISION <table border="1" style="width: 100%; height: 40px; border-collapse: collapse;"> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DATE <table border="1" style="width: 100%; height: 40px; border-collapse: collapse;"> | | | | | | | | | | | | | | | | | | | | | | | | | TITLE <table border="1" style="width: 100%; height: 40px; border-collapse: collapse;"> | | | | | | | | | | | | | | | | | | | | | | | | || DATE: DECEMBER 2011 SCALE: AS SHOWN DRAWING NO. | PROJ. NO.: 02210301.00 DESIGNED BY: JLM CHECKED BY: SCL | QA REVIEW BY: CL APPROVED BY: CL | | | | |
| | | | | | | | |

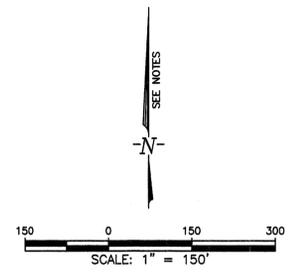
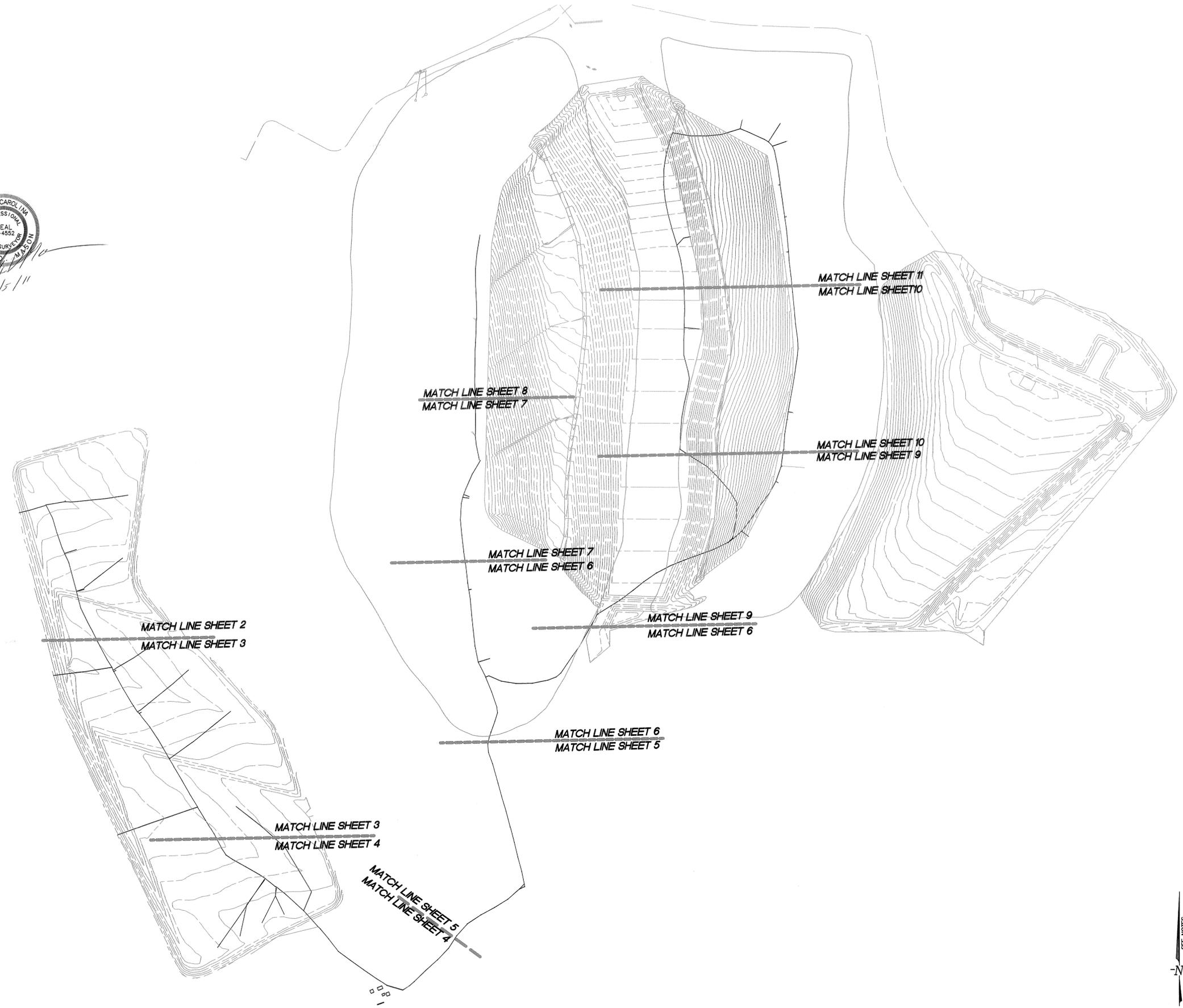


SURVEY CERTIFICATE
 I, RANDY D. MASON, AS A PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, DO HEREBY CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION AND COMPLETED ON 07-08-2011, THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DASHED LINES DRAWN FROM INFORMATION FOUND IN THE REFERENCES THAT THIS MAP WAS PREPARED IN ACCORDANCE WITH NORTH CAROLINA BROAD RULES TITLE 21, CHAPTER 56-1600, AS APPLICABLE, WITH MY ORIGINAL SIGNATURE AND SEAL THIS 8TH DAY OF December, A.D., 2011.



SURVEY NOTES
 1. BASIS OF BEARING/NO. 83/86 CONTROL, PROVIDED BY GEO DATA CORP.
 2. VERTICAL DATUM NAD 83 PROVIDED BY GEO DATA CORP.
 3. THE SOLE PURPOSE OF THIS MAP IS TO SHOW AS-BUILT INFORMATION FOR THE GAS PIPE LINE, WELLS AND APPURTENANCES.
 4. ELEVATIONS OF THE TOP OF THE INSTALLED PIPES WAS ESTABLISHED BY TEMPORARY VERTICAL PIPE MARKERS, WITH GRADES, PLACED ON TOP OF THE BACKFILLED PIPES BY THE CONTRACTOR.

Randy D. Mason
 12/5/11



P:\110065 - Johnston County Landfill Gas Survey\AS-Built.dwg - Monday, December 05, 2011 10:42:29 AM - M-E DWG/RSW

970 TRINITY ROAD
 RALEIGH, NC 27607
 TEL: 919-822-2222
 WWW.M-III.COM
 LICENSE # P-0661



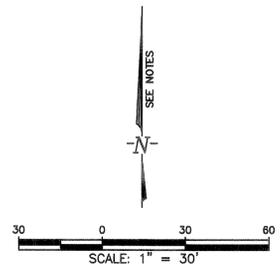
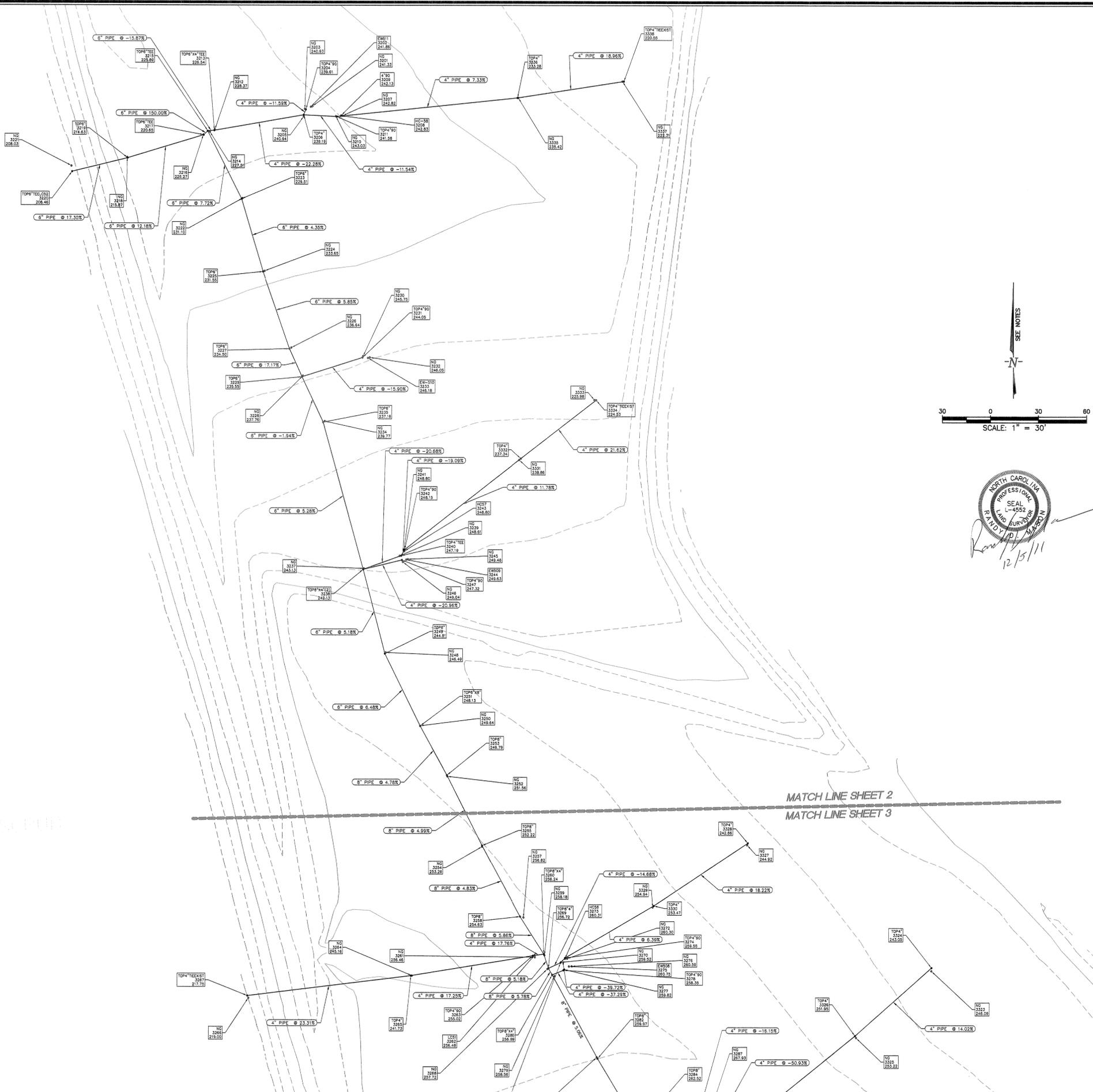
JOHNSTON COUNTY
 LANDFILL GAS PROJECT
 AS-BUILTS MAP

JOHNSTON COUNTY
 NORTH CAROLINA

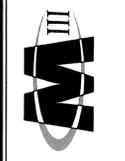
NO.	DESCRIPTION	DATE	BY

DATE: 12-2-11 SCALE: 1" = 150'
 DRAWN: RDM CHECKED: MWY
 SHEET: 1 of 12
 CAD FILE: ASBUILTS.DWG
 PROJECT NO: 110065

P:\110065 - Johnston County Landfill Gas Recovery - as-builts.dwg - Monday, December 05, 2011 10:42:22 AM - 11 - E:\DWG\110065



970 TRINITY ROAD
 RALEIGH, NC 27607
 TEL: 919-822-2222
 WWW.M-III.COM
 LICENSE # P-0661



**JOHNSTON COUNTY
 LANDFILL GAS PROJECT**

JOHNSTON COUNTY
 NORTH CAROLINA

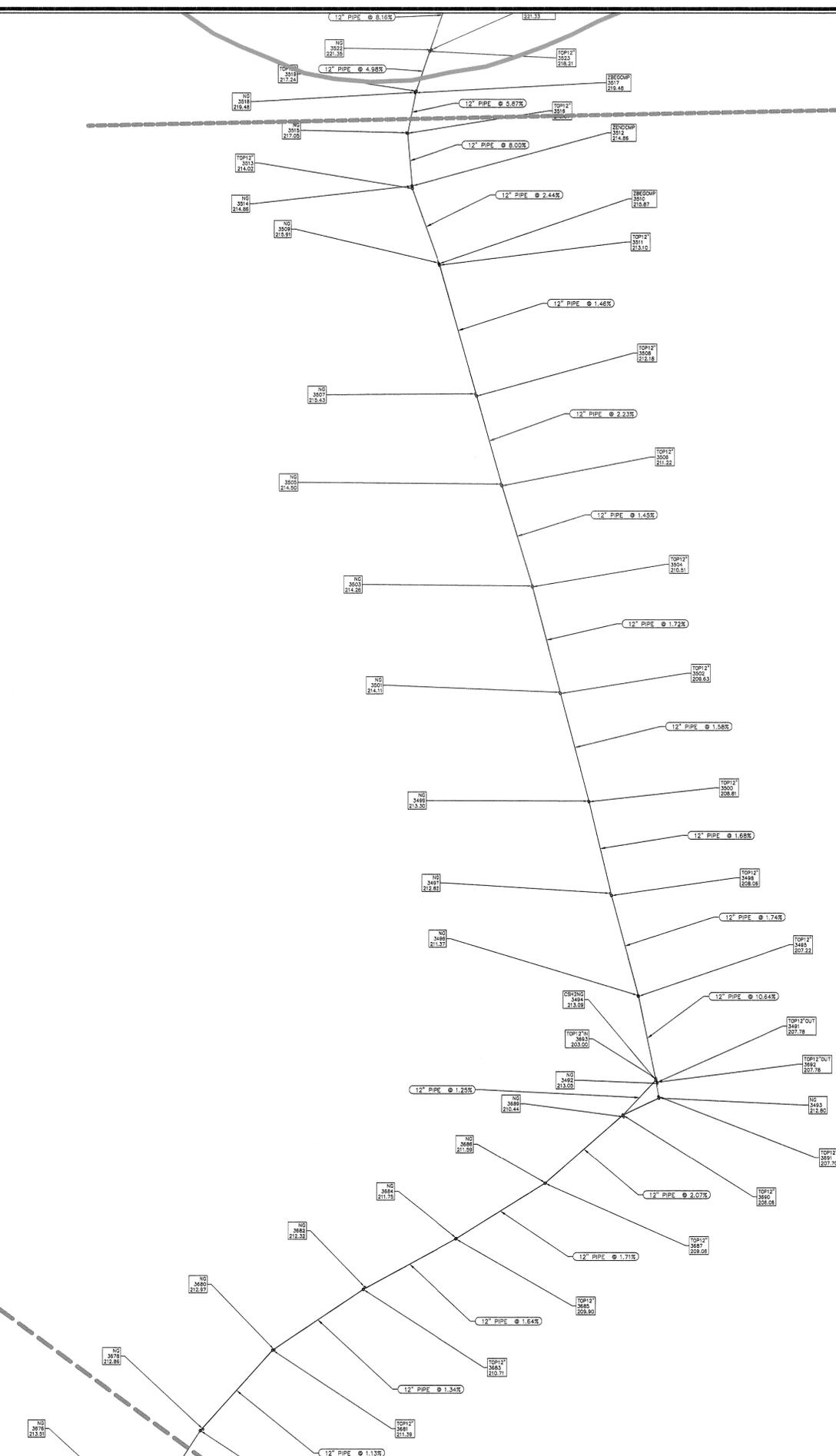
JOHNSTON COUNTY
 AS-BUILTS MAP

NO.	DATE	DESCRIPTION	BY

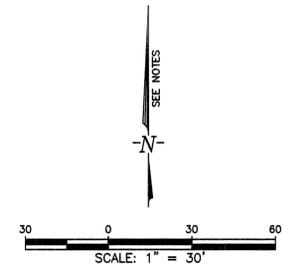
DATE: 12-2-11 SCALE: 1" = 30'
 DRAWN: RDM CHECKED: MWY
 SHEET: 2 OF 12
 CAD FILE: ASBUILT.DWG
 PROJECT NO: 110065

P:\110065 - Johnston County Landfill Survey\110065.dwg - built.mwg Monday, December 05, 2011 10:46:19 AM - M. H. ENGINEERING

MATCH LINE SHEET 5
MATCH LINE SHEET 4



MATCH LINE SHEET 6
MATCH LINE SHEET 5



NORTH CAROLINA
 PROFESSIONAL ENGINEER
 SEAL
 L-4562
 D. J. [unclear]
 12/5/11

970 TRINITY ROAD
 RALEIGH, NC 27607
 TEL: 919-822-2222
 WWW.M-HI.COM
 LICENSE # P-0661



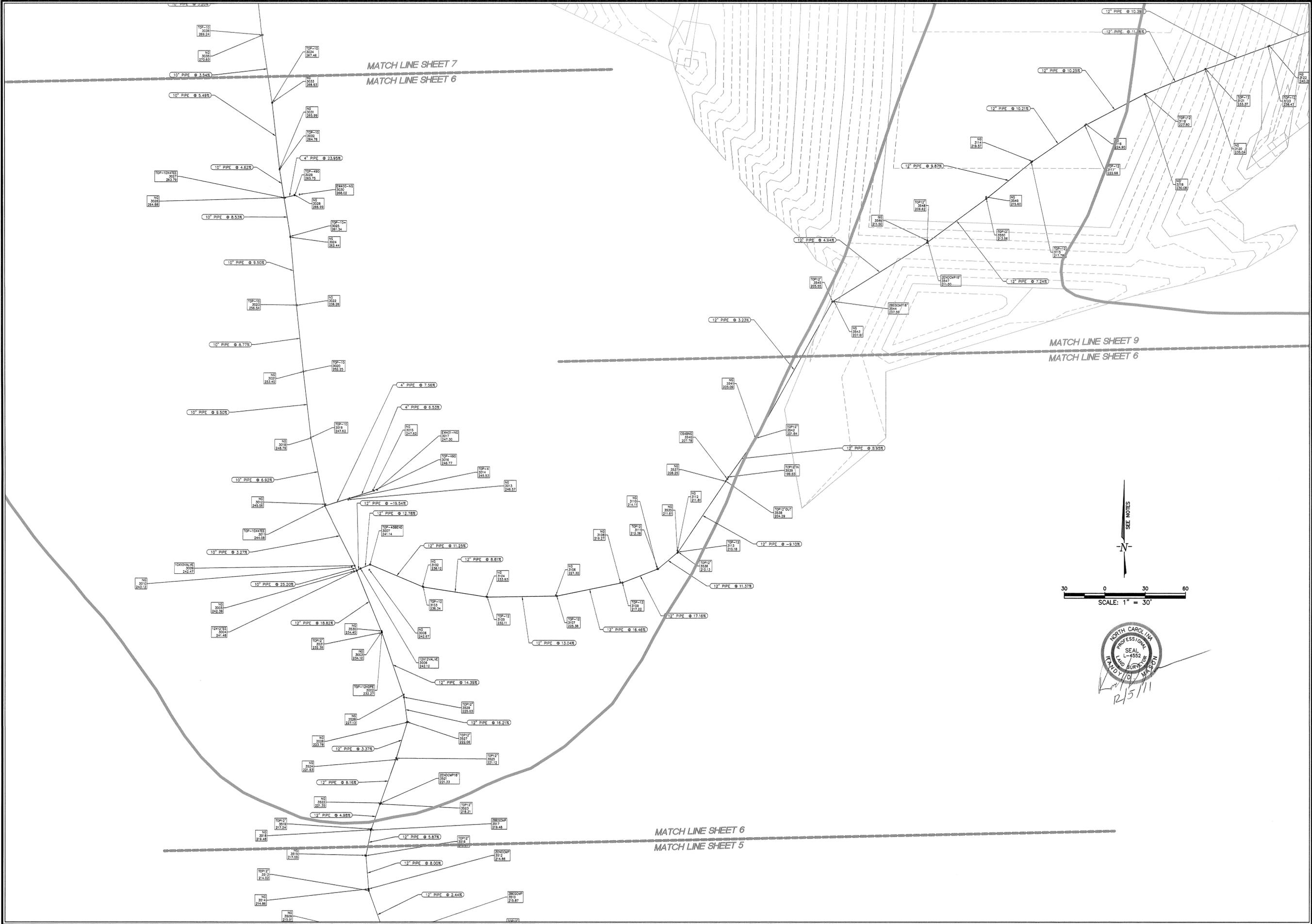
**JOHNSTON COUNTY
 LANDFILL GAS PROJECT**
 JOHNSTON COUNTY
AS-BUILTS MAP

JOHNSTON COUNTY

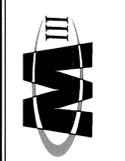
NO.	DATE	DESCRIPTION	BY

DATE: 12-2-11 SCALE: 1" = 30'
 DRAWN: RDM CHECKED: MWY
 SHEET: 5 of 12
 CAD FILE: ASBUILTS.DWG
 PROJECT NO: 110065

P:\110065 - Johnston County Landfill\Survey\AS-BULTS.dwg - Monday, December 05, 2011 10:51:48 AM - M - ENGINEERING



970 TRINITY ROAD
RALEIGH, NC 27607
TEL: 919-822-2222
WWW.M-III.COM
LICENSE # P-0661



JOHNSTON COUNTY
LANDFILL GAS PROJECT
AS-BULTS MAP

NO.	DATE	DESCRIPTION	BY

DATE: 12-2-11 SCALE: 1" = 30'
DRAWN: RDM CHECKED: MWY
SHEET: 6 of 12
CAD FILE: ASBULTS.DWG
PROJECT NO: 110065

P:\110065 - Johnston County Landfill Gas Project - as-builts.dwg - Monday, December 05, 2011 10:52:34 AM - M. J. ENGINEERING

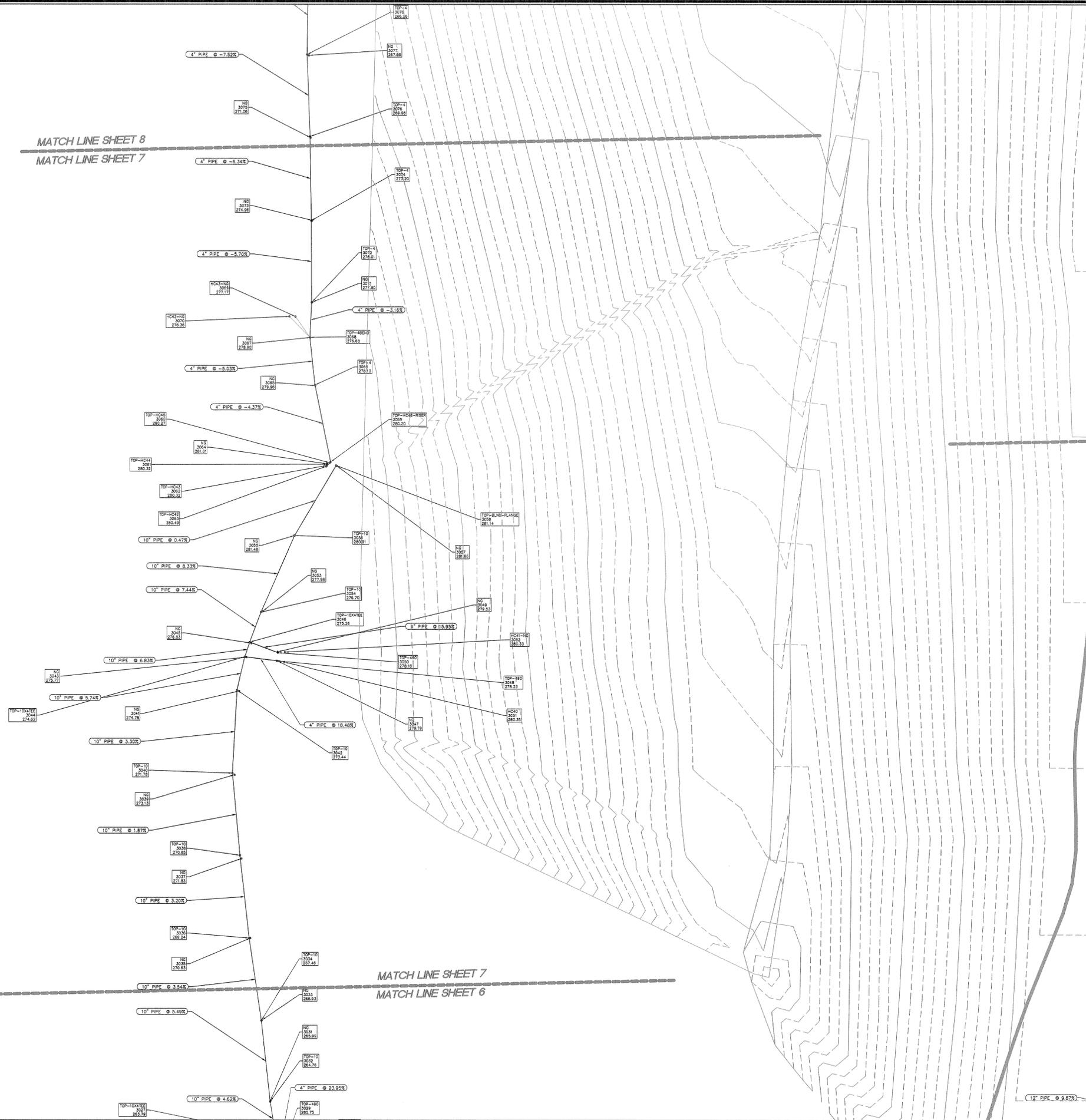
SCALE: 1" = 30'



SEE NOTES

MATCH LINE SHEET 8
MATCH LINE SHEET 7

MATCH LINE SHEET 7
MATCH LINE SHEET 6



970 TRINITY ROAD
RALEIGH, NC 27607
TEL: 919-822-2522
WWW.M-III.COM
LICENSE #: P-0661



JOHNSTON COUNTY LANDFILL GAS PROJECT

JOHNSTON COUNTY
NORTH CAROLINA

JOHNSTON COUNTY

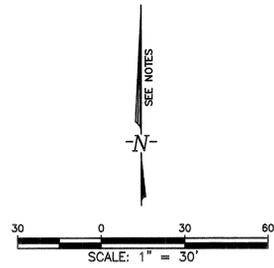
NO.	DATE	DESCRIPTION	BY

DATE: 12-2-11
DRAWN: RDM
SHEET: 7 of 12

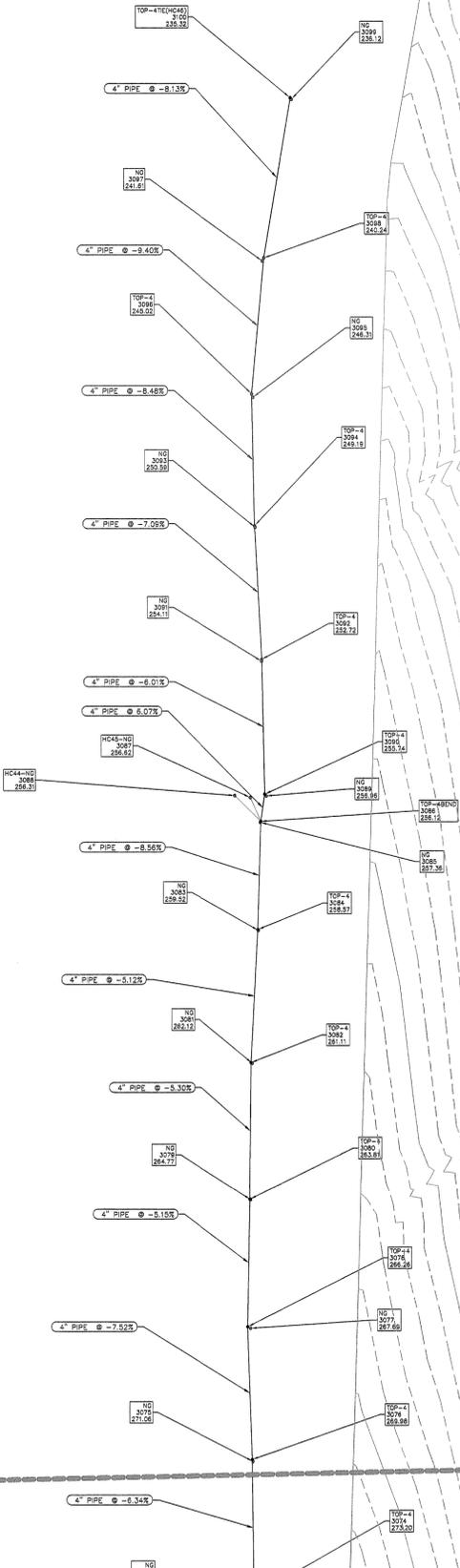
CAD FILE: ASBULTS.DWG
PROJECT NO: 110065

AS-BUILTS MAP

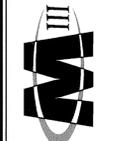
P:\110065 - Johnston County landfill\Survey\AS-Built.dwg - Monday, December 05, 2011 10:52:41 AM - M-JL ENGINEERING



MATCH LINE SHEET 8
MATCH LINE SHEET 7



970 TRINITY ROAD
RALEIGH, NC 27607
TEL: 919-822-2222
WWW.M-JL.COM
LICENSE # P-0661



JOHNSTON COUNTY LANDFILL GAS PROJECT

JOHNSTON COUNTY
NORTH CAROLINA

JOHNSTON COUNTY

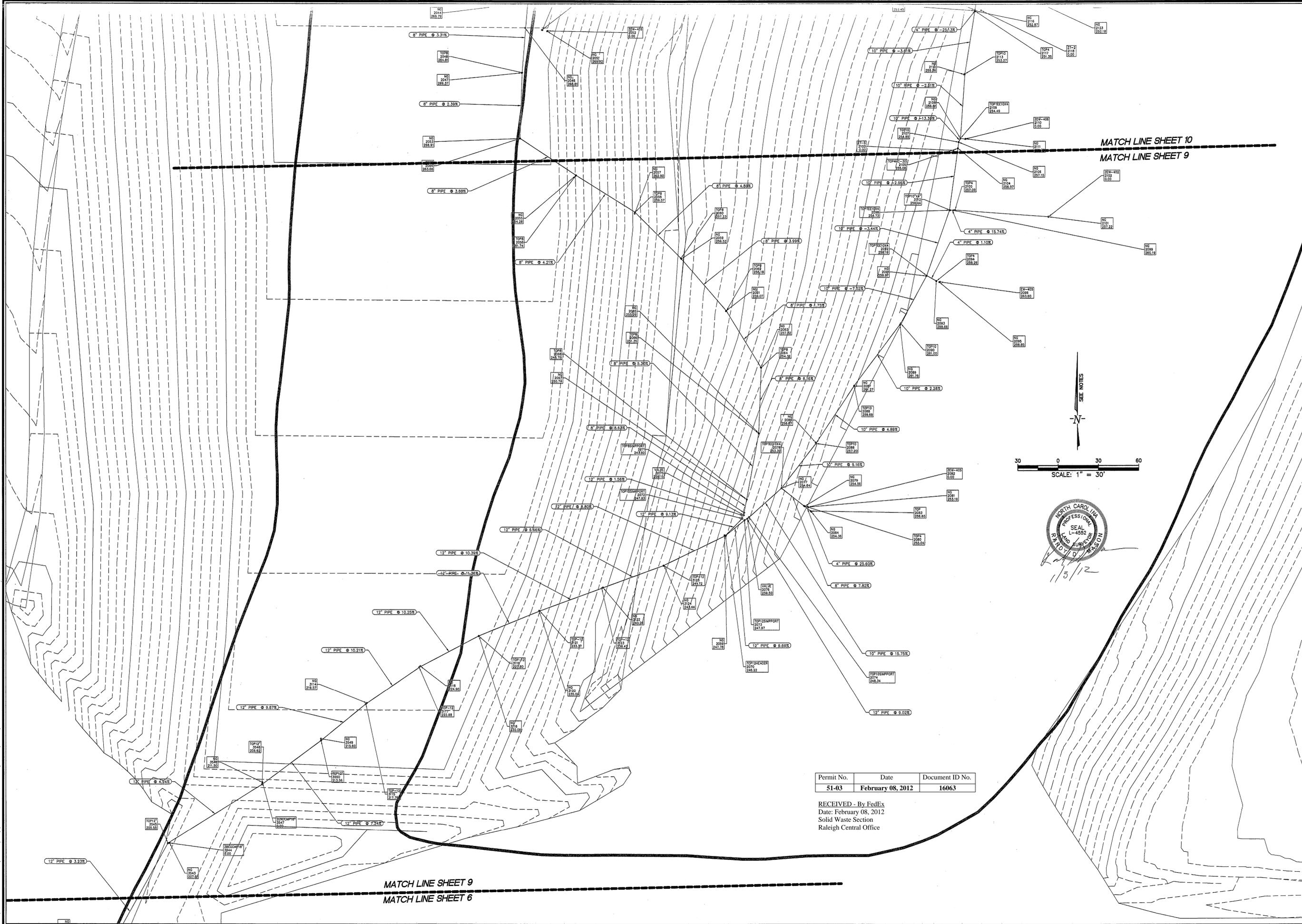
NO.	DATE	DESCRIPTION	BY

DATE: 12-2-11 SCALE: 1" = 30'
DRAWN: RDM CHECKED: MWY
SHEET: 8 of 12

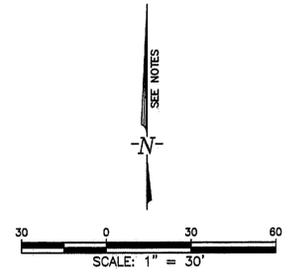
CAD FILE: ASBULTS.DWG
PROJECT NO: 110065

AS-BUILTS MAP

PA\10065 - Johnston County Landfill Survey\AC02012 - as-built-revised.dwg Tuesday, January 03, 2012 12:40:38 PM - M-III ENGINEERING



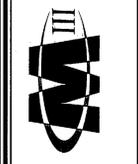
MATCH LINE SHEET 10
 MATCH LINE SHEET 9



Permit No.	Date	Document ID No.
51-03	February 08, 2012	16063

RECEIVED - By FedEx
 Date: February 08, 2012
 Solid Waste Section
 Raleigh Central Office

MATCH LINE SHEET 9
 MATCH LINE SHEET 6



970 TRINITY ROAD
 RALEIGH, NC 27607
 TEL: 919-822-2222
 WWW.M-III.COM
 LICENSE #: P-0661

**JOHNSTON COUNTY
 LANDFILL GAS PROJECT**
 AS-BUILTS MAP

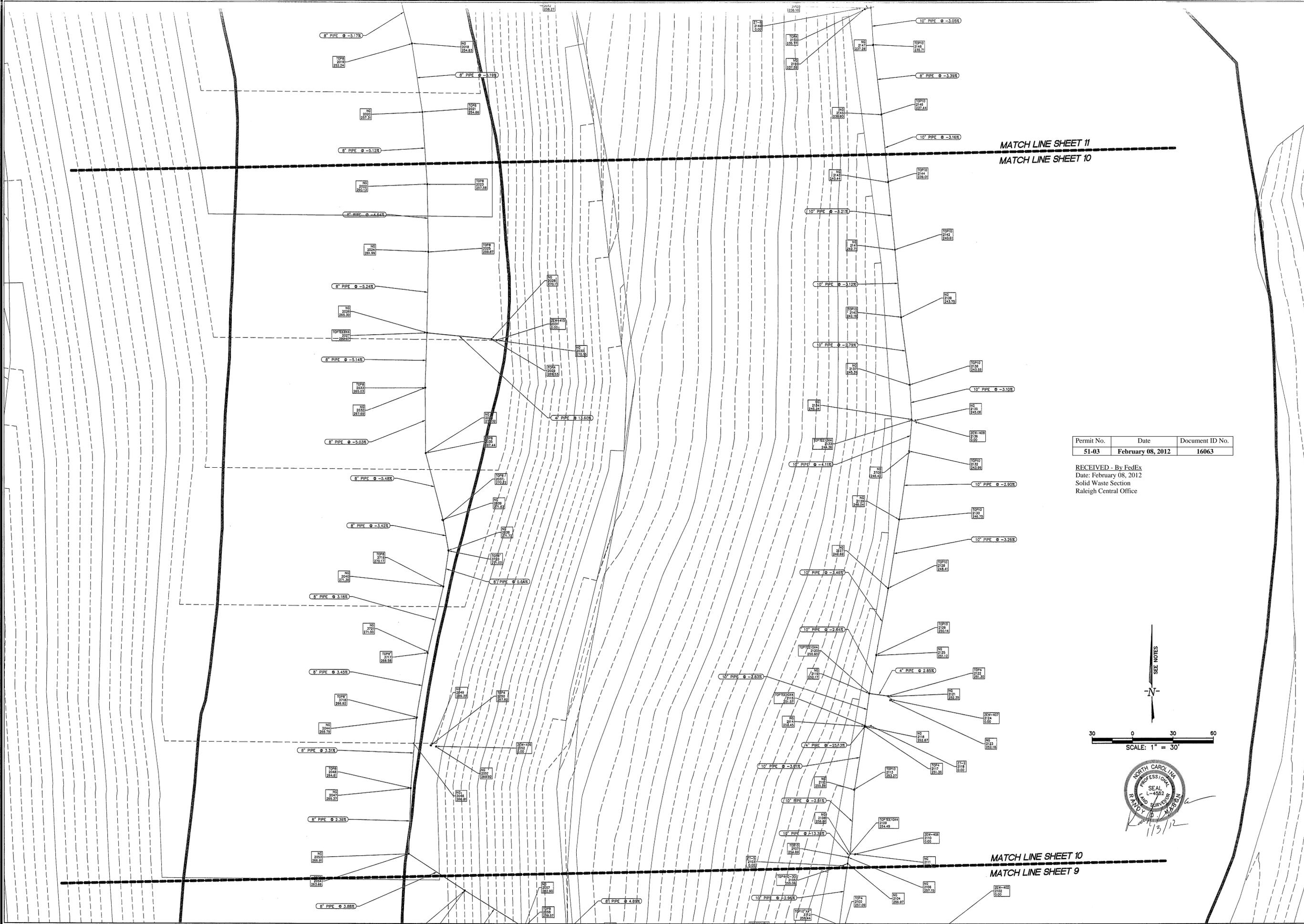
JOHNSTON COUNTY
 NORTH CAROLINA

NO.	DATE	DESCRIPTION	BY
1	12/29/11	Revised to contract and labels.	RDM

DATE: 12-2-11
 DRAWN: RDM
 SHEET: 9 OF 12

CAD FILE: ASBUILTS.DWG
 PROJECT NO: 110065

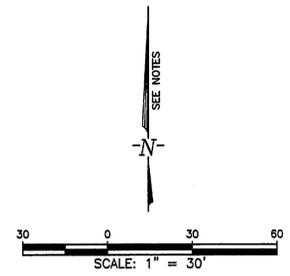
PA\110065 - Johnston County Landfill\GIS\mxd\2012-01-12\12-21-11-07 PM - M-IE ENGINEERING



MATCH LINE SHEET 11
MATCH LINE SHEET 10

Permit No.	Date	Document ID No.
51-03	February 08, 2012	16063

RECEIVED - By FedEx
Date: February 08, 2012
Solid Waste Section
Raleigh Central Office



MATCH LINE SHEET 10
MATCH LINE SHEET 9

970 TRINITY ROAD
RALEIGH, NC 27607
TEL: 919-822-2222
WWW.M-III.COM
LICENSE #: P-0661



JOHNSTON COUNTY
NORTH CAROLINA

JOHNSTON COUNTY LANDFILL GAS PROJECT

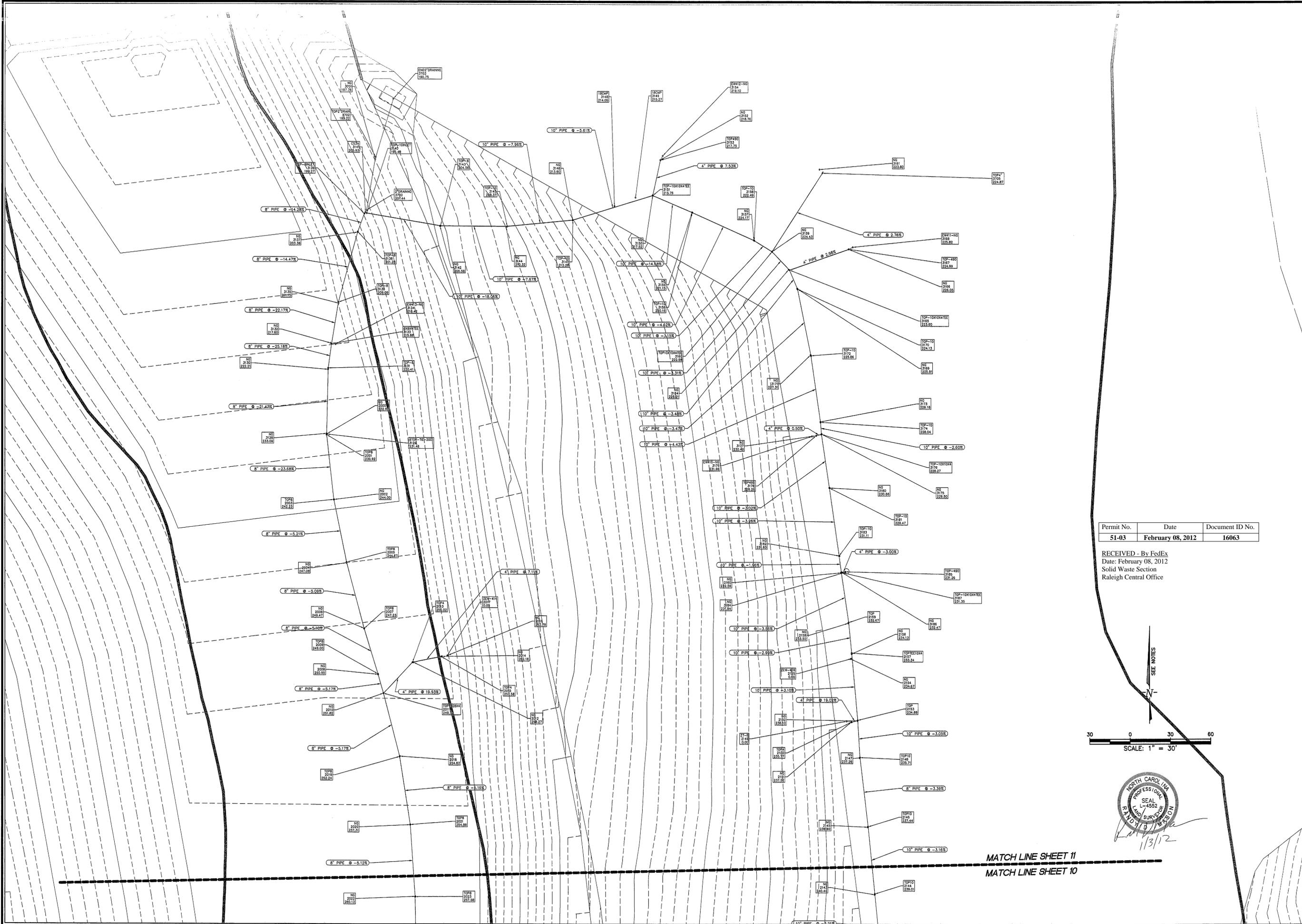
AS-BUILTS MAP

JOHNSTON COUNTY
NORTH CAROLINA

DATE	DESCRIPTION	BY	SCALE
12-2-11	Revised to correct well labels.	RDM	1" = 30'
12/29/11		RDM	

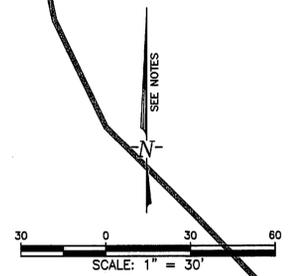
SHEET: 10 OF 12
CAD FILE: ASBUILTS.DWG
PROJECT NO: 110065

PA\10065 - Johnston County Landfill Survey\10065.dwg - Tuesday, January 03, 2012 12:52:17 PM - M-III ENGINEERING



Permit No.	Date	Document ID No.
51-03	February 08, 2012	16063

RECEIVED - By FedEx
 Date: February 08, 2012
 Solid Waste Section
 Raleigh Central Office



MATCH LINE SHEET 11
 MATCH LINE SHEET 10

970 TRINITY ROAD
 RALEIGH, NC 27607
 TEL: 919-822-2222
 WWW.M-III.COM
 LICENSE #: P-0661



**JOHNSTON COUNTY
 LANDFILL GAS PROJECT**

JOHNSTON COUNTY
 AS-BUILTS MAP

JOHNSTON COUNTY
 NORTH CAROLINA

NO.	DATE	DESCRIPTION	BY
1	12/29/11	Revised to correct well labels.	RCM

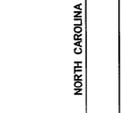
DATE:	SCALE:
12-2-11	1" = 30'

DRAWN:	CHECKED:
RCM	MWY

SHEET: **11** OF **12**

CAD FILE: **ABBLTSDWG**

PROJECT NO: **110065**



NORTH CAROLINA
JOHNSTON COUNTY

JOHNSTON COUNTY LANDFILL GAS PROJECT AS-BUILTS MAP

DATE: 12-2-11
SCALE: N.T.S.
DRAWN: RDM
CHECKED: MWY
SHEET: 12 of 12
CAD FILE: ASBUILTS.DWG
PROJECT NO: 110065



1/3/12

Permit No.	Date	Document ID No.
51-03	February 08, 2012	16063

RECEIVED - By FedEx
Date: February 08, 2012
Solid Waste Section
Raleigh Central Office

Point #	Northing	Easting	Elevation	Description
3016	64305.07	217001.91	246.77	TOP-490
3028	64295.52	217001.19	227.13	NG
3001	64487.57	217056.02	230.92	TOP8
3025	64329.39	216995.07	261.34	TOP-10
3037	64311.93	217029.57	208.25	NG
3002	643001.17	217024.80	232.27	TOP-12/DOPE
3014	64281.99	217001.85	214.86	NG
3436	64223.18	216935.55	242.03	TOP2
3445	64227.30	216945.36	237.41	TOP8"X10"REDUCER
3422	64248.76	216923.26	280.35	NG
3367	64245.01	216920.60	284.27	TOP8
3376	64261.01	216937.19	288.28	TOP4"TEE
3353	64250.44	216884.79	226.08	TOP4"TEE
3278	64289.07	216846.20	289.50	NG
3404	64208.01	216884.42	280.75	EW508
3284	64296.69	216885.03	282.52	TOP8
3261	643073.66	216882.01	256.46	NG
3208	643593.32	216876.34	239.19	TOP4"
3718	643599.62	217027.45	266.92	TOP8"
2189	64440.58	217095.83	232.67	TOP
3153	644498.18	217095.07	231.11	TOP-10
2113	643807.28	217092.25	283.27	TOP10
3137	644736.09	217092.10	203.38	NG
2080	643824.82	217090.51	281.00	TOP10
3114	643346.51	217090.07	219.57	NG
2029	643707.50	217094.86	260.19	NG
3123	643430.70	217086.97	236.47	TOP-12
2076	643461.66	217090.27	265.50	VALVE
3100	643430.32	216997.67	235.32	TOP-4TEE(HC46)
2021	643402.14	217083.37	254.86	TOP8
3045	643817.19	216993.78	276.53	NG
3022	643240.96	216982.34	258.28	NG
2007	644445.67	217028.96	247.23	NG
3031	643341.17	216994.28	265.99	NG
3543	643243.82	217036.07	207.81	NG
3421	642159.59	216980.00	227.01	TOP10"
3396	642391.94	216934.64	272.96	NG
3373	642581.51	216924.63	278.77	NG
3362	642314.27	216943.02	251.66	TOP8"X4"
3359	642509.18	216913.60	286.33	TOP8"
3304	642794.93	216906.13	274.39	NG
3313	642764.28	216902.81	275.85	NG
3290	642845.68	216920.09	267.78	TOP4"90
3235	643403.71	216987.71	237.16	TOP8"
3212	643584.23	216881.70	228.37	NG
3724	642058.99	216950.72	226.56	CONC1
3221	643581.65	216950.32	208.03	NG
3733	642051.91	216990.91	226.16	CONC3
3119	643377.27	217062.93	252.17	NG
3143	643740.71	217063.82	204.56	TOP-8
3128	643254.34	217077.31	248.41	TOP10
3152	642788.05	217081.35	216.76	NG
3164	642080.28	216995.63	222.89	TOP2"FLAREDRAN
3054	643752.76	217094.05	205.08	TOP4HC-30
3129	643588.00	217068.16	231.48	BTOP-TEE-2001
3020	643583.16	217057.47	267.60	NG
3074	643872.15	216973.62	272.20	TOP-4
3027	644140.70	217034.81	252.97	TOP8E8X4
3091	643605.81	216997.33	280.35	HC40
2036	644004.07	217068.23	271.62	NG
3080	643728.05	216994.97	280.27	TOP-HC45
2013	644421.05	217032.94	256.02	TOP4
3037	643487.22	216993.36	271.83	NG
3549	643320.37	217074.80	215.60	NG
3494	642389.25	2170129.02	213.09	CH2NG
3425	642451.09	216920.58	284.36	TOP8"
3402	642304.18	216931.99	254.92	NG
3411	642279.19	216921.97	261.12	TOP(2)X4"
3388	642391.91	216934.66	270.62	TOP8"X4"TEE/VERT
3393	643417.58	216895.91	233.98	NG
3310	642792.36	216902.63	274.81	NG
3319	642845.22	216908.43	267.58	NG
3264	643062.24	216874.49	245.16	NG
3241	643325.14	216873.13	248.80	NG
3250	643216.48	216874.33	249.64	NG
3227	643439.00	216897.63	234.50	TOP8"
3739	642056.94	216992.95	228.02	SHED1
2148	644351.45	217086.30	235.71	TOP-10
3172	644645.81	217092.61	225.86	TOP-10
3684	643235.03	217003.78	211.75	NG
2126	643905.16	217088.28	251.12	NG
3149	644761.68	217078.92	215.27	BCMP
2134	644077.60	217094.43	245.34	NG
3158	644730.14	217088.31	222.49	TOP-10
3670	642093.20	216978.62	217.58	NG
2111	643759.76	217092.85	255.77	NG
3135	644883.94	217077.73	211.15	NG
2056	643732.97	217062.80	261.74	TOP8
3080	644019.97	216992.04	263.81	TOP-4
2085	643544.26	217078.71	255.29	NG
3089	644170.25	216978.27	256.66	NG
3086	643733.01	216976.00	278.13	TOP-4
3011	643063.63	216982.41	244.08	TOP-10KATEE
3323	642875.28	217022.47	216.21	TOP12"
3500	642928.07	217009.65	208.81	TOP12"
3502	642777.33	217022.43	215.91	NG
3451	642304.59	216944.16	260.26	NG
3440	642286.41	216947.87	236.13	TOP8"
3417	642415.46	216932.40	278.27	NG
3392	642466.46	216917.13	288.01	NG
3348	642611.72	216935.01	287.91	NG
3325	643254.13	216920.44	253.22	NG
3270	643070.13	216836.37	259.52	NG
3247	643167.13	216873.76	247.32	TOP4"90
3201	643258.67	216860.69	241.33	NG
2154	644423.76	217029.36	234.67	NG
3178	644587.27	217033.53	228.29	TOP490
3090	644283.10	217011.30	208.06	TOP12"
3187	644487.08	217029.31	231.35	TOP-10X10KATEE
2140	644152.46	217086.86	242.16	TOP10

Point #	Northing	Easting	Elevation	Description
3164	644708.88	217091.33	225.21	NG
3678	642196.76	216890.82	213.51	NG
3021	643537.37	217084.15	258.87	TOP4"
3109	643037.85	217023.07	217.22	TOP-12
2002	643633.81	217074.72	258.18	TOP8
3086	644160.78	216997.20	256.12	TOP-4BEND
2071	643486.10	217078.62	247.90	TOP8BSP/PORT
3095	643814.74	216993.57	246.31	NG
2016	64428.15	217059.51	262.78	NG
3040	643538.74	216925.76	271.78	TOP-10
3017	643105.69	217021.29	247.30	EW40-10
3529	642963.63	217024.30	228.03	TOP12"
2002	644540.12	217054.37	244.00	NG
3028	643319.73	216953.24	264.89	NG
3538	643112.00	217027.58	204.29	TOP12" OUT
3003	643001.64	217024.78	234.10	NG
3437	642783.63	217012.45	217.05	NG
3448	642227.07	216850.94	240.12	NG
3423	642458.68	216923.64	278.56	TOP8"
3377	642507.58	216932.44	270.71	NG
3354	642594.76	216924.11	285.04	NG
3299	642826.71	216845.63	267.51	TOP8"
3276	643068.14	216843.11	260.59	NG
3285	642936.32	216898.66	266.05	NG
3282	643074.97	216892.04	256.49	LCR1
3207	643592.80	216899.82	242.82	NG
3719	643985.29	217084.10	270.17	TOP8
3216	643581.04	216892.56	228.27	NG
3728	642970.73	216897.95	256.58	CONC2
3705	644779.52	217093.04	224.87	TOP4"
2114	643953.35	217099.56	253.45	NG
3138	644736.48	217092.11	201.28	TOP-8
2091	643659.40	217092.46	259.97	NG
3115	643345.82	217050.23	217.78	TOP-12
2100	643707.73	217044.84	257.09	TOP4
3124	643447.11	217072.25	243.44	NG
2077	643503.64	217081.73	254.64	NG
2022	642449.34	217063.20	260.13	NG
3046	643817.86	216936.20	275.26	TOP-10KATEE
3023	643241.08	216991.59	256.54	TOP-10
3034	643098.47	217024.74	211.61	NG
2008	644412.18	217080.37	250.95	NG
3030	643440.49	216949.08	264.76	TOP-10
3444	643423.40	2170380.24	0.00	ZBEGCOMP18"
3452	643218.40	216820.80	227.04	NG
3397	643289.84	216834.40	271.19	TOP8"X4"TEE/VERT
3374	642851.42	216925.79	277.59	TOP4"
3383	643234.65	216949.33	259.04	NG
3328	643144.27	216952.68	242.66	TOP4"
3305	642793.12	216905.59	273.16	TOP8"X4"
3314	642748.45	216922.74	274.37	TOP8"
3291	642945.25	216920.47	268.32	HC56
3278	643683.71	216916.37	226.54	TOP8"X4"
3725	642058.89	216854.65	266.57	CONC1
3023	643541.84	216983.09	231.10	NG
3734	642057.42	216868.75	226.19	CONC3
2120	643877.26	217093.28	250.80	TOP12E10X4
3144	644740.01	217072.66	210.32	NG
2129	644004.70	217085.15	248.04	NG
3153	644788.98	217081.39	217.75	TOP490
3685	642067.94	216974.98	221.11	NG
2108	643757.37	217047.62	257.15	NG
3130	644635.50	2170570.01	222.21	NG
2051	643938.25	217064.37	269.92	NG
3079	643622.26	216973.18	271.06	NG
2028	644136.32	217062.85	270.11	HC4-10
3052	643611.78	216997.69	280.33	TOP-10
3061	643003.65	217054.91	270.22	TOP8
3063	643726.20	216993.72	260.32	TOP-HC44
3044	64424.26	217055.01	261.16	NG
3038	643496.16	216920.48	270.85	TOP-10
3550	643619.05	217047.91	213.59	TOP12"
3680	642274.40	216950.47	212.97	NG
2121	643874.08	2170120.85	207.22	TOP12"
3504	642627.47	217001.45	210.51	TOP12"
3403	643003.16	216937.15	292.71	TOP4"X10KATEE
3412	642333.51	216922.50	269.55	NG
3389	642988.02	216934.46	271.82	NG
3334	643417.62	216897.85	224.53	TOP4"X10KATEE
3311	642791.94	216901.62	274.84	HC54
3320	642848.96	216908.52	266.17	TOP4"
3265	643082.21	216874.87	241.73	TOP4"
3242	643325.17	216873.48	248.15	TOP4"90
3251	643216.39	216874.33	248.13	TOP8"X8"
3228	643432.35	216875.13	237.76	NG
3740	642060.76	216970		

APPENDIX G

Flare Documentation and DAQ Information

Utility Flare Dimensions

Gas Flow:

1250 scfm
1339.6 acfm
22.33 cf/sec

Methane Conc. 50%

Maximum Exit Velocity:

60.0 f/s
0.3721 sq ft

Heat Rate: 34 mmBtu/hr LHV

Required Stack Area:

0.69 ft
8.26 inches

Lower Heating Value: @ 14.696 psia and 60 deg.F

Stack Diameter:

10" SCH 40

Actual Velocity 40.77 ft/s

Flare Tip Size:

334.89 cfm

Gas Temperature: 100 deg F

Stack Size:

4 :1

Minimum Gas Flow:

Maximum Turndown
Operating at lower flow rates and higher turndowns will require flare tip size reduction.

Flare Stack Height:

25 ft

Wind Screen Dimensions

Diameter

Length

Length above flare tip:

Length below flare tip:

18" SCH 40

36 inches

25 inches

11 inches

Blower - Flare Interconnect :

Pipe Diameter:

Orifice Plate Size:

See blower arrangement

6 inches

Knockout Vessel Sizing:

Diameter:

Vertical distance

between gas inlet

and outlet:

28" SDR 21 PE

24 inches



North Carolina Department of Environment and Natural Resources

Division of Air Quality

Beverly Eaves Perdue
Governor

Sheila C. Holman
Director

Dee Freeman
Secretary

October 18, 2010

Mr. Rick Hester
County Manager
Johnston County MSW Landfill
P.O. Box 1049
Smithfield, NC 27577

Subject: Air Permit No. 08844R05
Johnston County MSW Landfill
Smithfield, Johnston County, North Carolina
Permit Class: Small
Facility ID# 5100188

Dear Mr. Hester:

In accordance with your completed application received August 19, 2010, we are forwarding herewith Permit No. 08844R05 to Johnston County MSW Landfill, Smithfield, Johnston County, North Carolina for the construction and operation of air emissions sources or air cleaning devices and appurtenances. Additionally, any emissions activities determined from your air permit application as meeting the exemption requirements contained in 15A NCAC 2Q .0102 have been listed for information purposes as an "ATTACHMENT" to the enclosed air permit. Please note the records retention requirements are contained in General Condition 2 of the General Conditions and Limitations.

If any parts, requirements, or limitations contained in this permit are unacceptable to you, you have the right to request a formal adjudicatory hearing within 30 days following receipt of this permit, identifying the specific issues to be contested. Such a request will stay the effectiveness of the entire permit. This hearing request must be in the form of a written petition, conforming to G.S. 150B-23 of the North Carolina General Statutes, and filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, NC 27699-6714. The form for requesting a formal adjudicatory hearing may be obtained upon request from the Office of Administrative Hearings. Unless a request for a hearing is made pursuant to G.S. 150B-23, this air permit shall be final and binding.

You may request modification of your air permit through informal means pursuant to G.S. 150B-22. This request must be submitted in writing to the Director and must identify the specific

Raleigh Regional Office - Division of Air Quality
3800 Barrett Drive, Raleigh, North Carolina 27609
Phone: (919) 791-4200 \ FAX: (919) 571-4718 \ Internet: www.ncair.org

An Equal Opportunity \ Affirmative Action Employer

One
North Carolina
Naturally

Rick Hester
October 18, 2010
Page 2

provisions or issues for which the modification is sought. Please note that the permit will become final and binding regardless of a request for informal modification unless a request for a hearing is also made under G.S. 150B-23.

Unless exempted by a condition of this permit or the regulations, construction of new air pollution sources or air cleaning devices, or modifications to the sources or air cleaning devices described in this permit must be covered under a permit issued by the Division of Air Quality prior to construction. Failure to do so is a violation of G.S. 143-215.108 and may subject the Permittee to civil or criminal penalties as described in G.S. 143-215.114A and 143-215.114B.

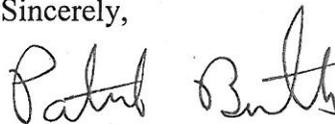
This permit shall be effective from October 18, 2010 until November 30, 2014, is nontransferable to future owners and operators, and shall be subject to the conditions and limitations as specified therein.

Changes have been made to the permit stipulations. The Permittee is responsible for carefully reading the entire permit and evaluating the requirements of each permit stipulation. The Permittee shall comply with all terms, conditions, requirements, limitations and restrictions set forth in this permit. Noncompliance with any permit condition is grounds for enforcement action, for permit termination, revocation and reissuance, or modification, or for denial of a permit renewal application. Specific changes and additions are summarized below (note: this list may not include all changes and additions):

- Removed Emission Sources ES-1 through ES-15 from the permit.
- Added Control Device CD-1 – landfill gas-fired flare - to the permit.
- Added IES-1 – Leachate Storage – to the insignificant/exempt equipment list.
- Added a stipulation for NSPS Subpart WWW to the permit.
- Revised 2Q .0711 to reflect the most current list of HAPs/TAPs for the facility.
- Added the stipulation for 2D .1100, Toxic Air Pollutant Emissions Limitation, to the permit.

Should you have any questions concerning this matter, please contact Lori Ann Phillips at (919) 791-4200.

Sincerely,



Patrick Butler, P.E.
Regional Air Quality Supervisor

LAP
Enclosures

c: Central Files
Raleigh Regional Office

NORTH CAROLINA ENVIRONMENTAL MANAGEMENT COMMISSION
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

DIVISION OF AIR QUALITY

AIR PERMIT NO. 08844R05

Issue Date: October 18, 2010
Expiration Date: November 30, 2014

Effective Date: October 18, 2010
Replaces Permit: 08844R04

To construct and operate air emission source(s) and/or air cleaning device(s), and for the discharge of the associated air contaminants into the atmosphere in accordance with the provisions of Article 21B of Chapter 143, General Statutes of North Carolina (NCGS) as amended, and other applicable Laws, Rules and Regulations,

Johnston County MSW Landfill
680 County Home Road
Smithfield, Johnston County, North Carolina
Permit Class: Small
Facility ID# 5100188

(the Permittee) is hereby authorized to construct and operate the air emissions sources and/or air cleaning devices and appurtenances described below:

Emission Source ID	Emission Source Description	Control System ID	Control System Description
ES-01 (NSPS)	Municipal Solid Waste Landfill	CD-1	landfill gas-fired flare (38 million Btu per hour maximum heat input)

in accordance with the completed application 5100188.10A received August 19, 2010 including any plans, specifications, previous applications, and other supporting data, all of which are filed with the Department of Environment and Natural Resources, Division of Air Quality (DAQ) and are incorporated as part of this permit.

This permit is subject to the following specified conditions and limitations including any **TESTING, REPORTING, OR MONITORING REQUIREMENTS:**

A. SPECIFIC CONDITIONS AND LIMITATIONS

1. Any air emission sources or control devices authorized to construct and operate above must be operated and maintained in accordance with the provisions contained herein. The Permittee shall comply with applicable Environmental Management Commission Regulations, including Title 15A North Carolina Administrative Code (NCAC), Subchapter 2D .0202, 2D .0516, 2D .0521, 2D .0524 (NSPS Subpart WWW), 2D .0535, 2D .0540, 2D .1100, 2D .1806 and 2Q .0711.
2. PERMIT RENEWAL AND EMISSION INVENTORY REQUIREMENT - The Permittee, at least 90 days prior to the expiration date of this permit, shall request permit renewal by letter in accordance with 15A NCAC 2Q .0304(d) and (f). Pursuant to 15A NCAC 2Q .0203(i), no permit application fee is required for renewal of an existing air permit (without a modification request). The renewal request (with AA application form) should be submitted to the Regional Supervisor, DAQ. Also, at least 90 days prior to the expiration date of this permit, the Permittee shall submit the air pollution emission inventory report (with Certification Sheet) in accordance with 15A NCAC 2D .0202, pursuant to N.C. General Statute 143 215.65. The report shall be submitted to the Regional Supervisor, DAQ and shall document air pollutants emitted for the 2013 calendar year.
3. SULFUR DIOXIDE CONTROL REQUIREMENT - As required by 15A NCAC 2D .0516 "Sulfur Dioxide Emissions from Combustion Sources," sulfur dioxide emissions from the combustion sources shall not exceed 2.3 pounds per million Btu heat input.
4. VISIBLE EMISSIONS CONTROL REQUIREMENT - As required by 15A NCAC 2D .0521 "Control of Visible Emissions," visible emissions from the emission sources, manufactured after July 1, 1971, shall not be more than 20 percent opacity when averaged over a six-minute period, except that six-minute periods averaging not more than 87 percent opacity may occur not more than once in any hour nor more than four times in any 24-hour period. However, sources which must comply with 15A NCAC 2D .0524 "New Source Performance Standards" or .1110 "National Emission Standards for Hazardous Air Pollutants" must comply with applicable visible emissions requirements contained therein.
5. 15A NCAC 2D .0524 "NEW SOURCE PERFORMANCE STANDARDS" - For the municipal solid waste landfill (ID No. ES-1), the Permittee shall comply with all applicable provisions, including the notification, testing, reporting, recordkeeping, and monitoring requirements contained in Environmental Management Commission Standard 15A NCAC 2D .0524 "New Source Performance Standards" (NSPS) as promulgated in 40 CFR 60, Subpart WWW and including Subpart A "General Provisions."
 - a. When an increase in the maximum design capacity of the landfill results in a revised maximum design capacity equal to or greater than 2.5 million megagrams and 2.5 million cubic meters, the owner or operator shall comply with the provision of paragraph 60.752(b) of Subpart WWW. The facility must also submit a Title V permit application within 90 days of receiving the permit to increase the maximum design capacity.

6. NOTIFICATION REQUIREMENT - As required by 15A NCAC 2D .0535, the Permittee of a source of excess emissions that last for more than four hours and that results from a malfunction, a breakdown of process or control equipment or any other abnormal conditions, shall:
- a. Notify the Director or his designee of any such occurrence by 9:00 a.m. Eastern time of the Division's next business day of becoming aware of the occurrence and describe:
 - i. the name and location of the facility,
 - ii. the nature and cause of the malfunction or breakdown,
 - iii. the time when the malfunction or breakdown is first observed,
 - iv. the expected duration, and
 - v. an estimated rate of emissions.
 - b. Notify the Director or his designee immediately when the corrective measures have been accomplished.

This reporting requirement does not allow the operation of the facility in excess of Environmental Management Commission Regulations.

7. FUGITIVE DUST CONTROL REQUIREMENT - As required by 15A NCAC 2D .0540 "Particulates from Fugitive Dust Emission Sources," the Permittee shall not cause or allow fugitive dust emissions to cause or contribute to substantive complaints or excess visible emissions beyond the property boundary. If substantive complaints or excessive fugitive dust emissions from the facility are observed beyond the property boundaries for six minutes in any one hour (using Reference Method 22 in 40 CFR, Appendix A), the owner or operator may be required to submit a fugitive dust plan as described in 2D .0540(f).

"Fugitive dust emissions" means particulate matter from process operations that does not pass through a process stack or vent and that is generated within plant property boundaries from activities such as: unloading and loading areas, process areas stockpiles, stock pile working, plant parking lots, and plant roads (including access roads and haul roads).

8. TOXIC AIR POLLUTANT EMISSIONS LIMITATION AND REPORTING REQUIREMENT - Pursuant to 15A NCAC 2D .1100 "Control of Toxic Air Pollutants," and in accordance with the approved application for an air toxic compliance demonstration, the following permit limits shall not be exceeded:

Affected Source(s)	Toxic Air Pollutant	Emission Limit
Municipal Solid Waste Landfill (ES-01)	Hydrogen chloride (hydrochloric acid) (7647-01-0)	0.294 pounds per hour

9. CONTROL AND PROHIBITION OF ODOROUS EMISSIONS - As required by 15A NCAC 2D .1806 "Control and Prohibition of Odorous Emissions" the Permittee shall not operate the facility without implementing management practices or installing and operating odor control equipment sufficient to prevent odorous emissions from the facility from causing or contributing to objectionable odors beyond the facility's boundary.

10. TOXIC AIR POLLUTANT EMISSIONS LIMITATION REQUIREMENT - Pursuant to 15A NCAC 2Q .0711 "Emission Rates Requiring a Permit," for each of the below listed toxic air pollutants (TAPs), the Permittee has made a demonstration that facility-wide actual emissions do not exceed the Toxic Permit Emission Rates (TPERs) listed in 15A NCAC 2Q .0711. The facility shall be operated and maintained in such a manner that emissions of any listed TAPs from the facility, including fugitive emissions, will not exceed TPERs listed in 15A NCAC 2Q .0711.
 - a. A permit to emit any of the below listed TAPs shall be required for this facility if actual emissions from all sources will become greater than the corresponding TPERs.

 - b. PRIOR to exceeding any of these listed TPERs, the Permittee shall be responsible for obtaining a permit to emit TAPs and for demonstrating compliance with the requirements of 15A NCAC 2D .1100 "Control of Toxic Air Pollutants".

 - c. In accordance with the approved application, the Permittee shall maintain records of operational information demonstrating that the TAP emissions do not exceed the TPERs as listed below:

Pollutant	Carcinogens (lb/yr)	Chronic Toxicants (lb/day)	Acute Systemic Toxicants (lb/hr)	Acute Irritants (lb/hr)
Acrylonitrile (107-13-1)	10			
Benzene (71-43-2)	8.1			
CFC-12 (Dichlorodifluoromethane) (75-71-8)		5200		
Carbon disulfide (75-15-0)		3.9		
Carbon tetrachloride (56-23-5)	460			
Chlorobenzene (108-90-7)		46		
Chloroform (67-66-3)	290			
Dichlorobenzene(p), 1,4- (106-46-7)				16.8
Ethyl mercaptan (75-08-1)			0.025	
Ethylene dibromide (dibromoethane) (106-93-4)	27			

Ethylene dichloride (1,2-dichloroethane) (107-06-2)	260			
Hexane, n- (110-54-3)		23		
Hydrogen chloride (hydrochloric acid) (7647-01-0)				0.18
Hydrogen sulfide (7783-06-4)		1.7		
MEK (methyl ethyl ketone, 2-butanone) (78-93-3)		78		22.4
MIBK (methyl isobutyl ketone) (108-10-1)		52		7.6
Mercury, aryl and inorganic compounds (Component of HGC) (MERCARYL)		0.013		
Methyl mercaptan (74-93-1)			0.013	
Methylene chloride (75-09-2)	1600		0.39	
Perchloroethylene (tetrachloroethylene) (127-18-4)	13000			
TCE (trichloroethylene) (79-01-6)	4000			
Tetrachloroethane, 1,1,2,2- (79-34-5)	430			
Toluene (108-88-3)		98		14.4
Vinyl chloride (75-01-4)	26			
Xylene (mixed isomers) (1330-20-7)		57		16.4

B. GENERAL CONDITIONS AND LIMITATIONS

1. TWO COPIES OF ALL DOCUMENTS, REPORTS, TEST DATA, MONITORING DATA, NOTIFICATIONS, REQUESTS FOR RENEWAL, AND ANY OTHER INFORMATION REQUIRED BY THIS PERMIT shall be submitted to the:

Regional Air Quality Supervisor
North Carolina Division of Air Quality
Raleigh Regional Office
3800 Barrett Drive
Raleigh, NC 27609
(919) 791-4200

For identification purposes, each submittal should include the facility name as listed on the permit, the facility identification number, and the permit number.

2. RECORDS RETENTION REQUIREMENT - Any records required by the conditions of this permit shall be kept on site and made available to DAQ personnel for inspection upon request. These records shall be maintained in a form suitable and readily available for expeditious inspection and review. These records must be kept on site for a minimum of 2 years, unless another time period is otherwise specified.
3. ANNUAL FEE PAYMENT - Pursuant to 15A NCAC 2Q .0203(a), the Permittee shall pay the annual permit fee within 30 days of being billed by the DAQ. Failure to pay the fee in a timely manner will cause the DAQ to initiate action to revoke the permit.
4. EQUIPMENT RELOCATION - A new air permit shall be obtained by the Permittee prior to establishing, building, erecting, using, or operating the emission sources or air cleaning equipment at a site or location not specified in this permit.
5. REPORTING REQUIREMENT - Any of the following that would result in previously unpermitted, new, or increased emissions must be reported to the Regional Supervisor, DAQ:
 - a. changes in the information submitted in the application regarding facility emissions;
 - b. changes that modify equipment or processes of existing permitted facilities; or
 - c. changes in the quantity or quality of materials processed.

If appropriate, modifications to the permit may then be made by the DAQ to reflect any necessary changes in the permit conditions. In no case are any new or increased emissions allowed that will cause a violation of the emission limitations specified herein.

6. This permit is subject to revocation or modification by the DAQ upon a determination that information contained in the application or presented in the support thereof is incorrect, conditions under which this permit was granted have changed, or violations of conditions contained in this permit have occurred. The facility shall be properly operated and maintained at all times in a manner that will effect an overall reduction in air pollution.

Unless otherwise specified by this permit, no emission source may be operated without the concurrent operation of its associated air cleaning device(s) and appurtenances.

7. This permit is nontransferable by the Permittee. Future owners and operators must obtain a new air permit from the DAQ.
8. This issuance of this permit in no way absolves the Permittee of liability for any potential civil penalties which may be assessed for violations of State law which have occurred prior to the effective date of this permit.
9. This permit does not relieve the Permittee of the responsibility of complying with all applicable requirements of any Federal, State, or Local water quality or land quality control authority.
10. Reports on the operation and maintenance of the facility shall be submitted by the Permittee to the Regional Supervisor, DAQ at such intervals and in such form and detail as may be required by the DAQ. Information required in such reports may include, but is not limited to, process weight rates, firing rates, hours of operation, and preventive maintenance schedules.
11. A violation of any term or condition of this permit shall subject the Permittee to enforcement pursuant to G.S. 143-215.114A, 143-215.114B, and 143-215.114C, including assessment of civil and/or criminal penalties.
12. Pursuant to North Carolina General Statute 143-215.3(a)(2), no person shall refuse entry or access to any authorized representative of the DAQ who requests entry or access for purposes of inspection, and who presents appropriate credentials, nor shall any person obstruct, hamper, or interfere with any such representative while in the process of carrying out his official duties. Refusal of entry or access may constitute grounds for permit revocation and assessment of civil penalties.
13. The Permittee must comply with any applicable Federal, State, or Local requirements governing the handling, disposal, or incineration of hazardous, solid, or medical wastes, including the Resource Conservation and Recovery Act (RCRA) administered by the Division of Waste Management.
14. PERMIT RETENTION REQUIREMENT - The Permittee shall retain a current copy of the air permit at the site. The Permittee must make available to personnel of the DAQ, upon request, the current copy of the air permit for the site.
15. CLEAN AIR ACT SECTION 112(r) REQUIREMENTS - Pursuant to 40 CFR Part 68 "Accidental Release Prevention Requirements: Risk Management Programs Under the Clean Air Act, Section 112(r)," if the Permittee is required to develop and register a risk management plan pursuant to Section 112(r) of the Federal Clean Air Act, then the Permittee is required to register this plan in accordance with 40 CFR Part 68.
16. PREVENTION OF ACCIDENTAL RELEASES - GENERAL DUTY - Pursuant to Title I Part A Section 112(r)(1) of the Clean Air Act "Hazardous Air Pollutants - Prevention of Accidental Releases - Purpose and General Duty," although a risk management plan may not

be required, if the Permittee produces, processes, handles, or stores any amount of a listed hazardous substance, the Permittee has a general duty to take such steps as are necessary to prevent the accidental release of such substance and to minimize the consequences of any release. **This condition is federally-enforceable only.**

17. GENERAL EMISSIONS TESTING AND REPORTING REQUIREMENTS - If emissions testing is required by this permit, or the DAQ, or if the Permittee submits emissions testing to the DAQ in support of a permit application or to demonstrate compliance, the Permittee shall perform such testing in accordance with 15A NCAC 2D .2600 and follow all DAQ procedures including protocol approval, regional notification, report submittal, and test results approval.

Permit issued this the 18th of October, 2010.

NORTH CAROLINA ENVIRONMENTAL MANAGEMENT COMMISSION



Patrick Butler, P.E.

Regional Air Quality Supervisor

By Authority of the Environmental Management Commission

Air Permit No. 08844R05

Insignificant / Exempt Activities

Source	Exemption Regulation	Source of TAPs?	Source of Title V Pollutants?
IES-1 - Leachate Storage (maximum capacity 5.7 million gallons)	2Q .0102 (c)(2)(E)(i)	Yes	Yes

1. Because an activity is exempted from being required to have a permit or permit modification does not mean that the activity is exempted from an applicable requirement or that the owner or operator of the source is exempted from demonstrating compliance with any applicable requirement.
2. When applicable, emissions from stationary source activities identified above shall be included in determining compliance with the permit requirements for toxic air pollutants under 15A NCAC 2D .1100 "Control of Toxic Air Pollutants" or 2Q .0711 "Emission Rates Requiring a Permit."

APPENDIX H
Leak Test Results

SCS FIELD SERVICES

Air Testing Log

Job Number: 12211010.00
Location: Johnston CO LF
Date: 6/25/11

Type of Test Air
 Hydrostatic

PSI Required 1075i

Time Required 4HR

Time Test Started 1230

Time Test Stopped 1730 Test Passed

Air Loss 0 Test Failed

Location of Test all header piping including valves
laterals and sump on this job
tested from inspection port at
toe of phase 5

Testing Technician Teddy Blevins
Superintendent Teddy Blevins

SCS FIELD SERVICES

Air Testing Log

Job Number: 1221010.00
Location: Johnston CO LF
Date: 6/25/10

Type of Test Air
 Hydrostatic

PSI Required

100 PSI

Time Required

4HR

Time Test Started

0730

Time Test Stopped

1130

Test Passed

Air Loss

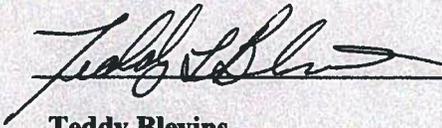
0

Test Failed

Location of Test

all 2" air line installed on job
including valves

Testing Technician



Superintendent

Teddy Blevins

SCS FIELD SERVICES

Air Testing Log

Job Number: 12211010.00
Location: Johnston CO LF
Date: 6/25/11

Type of Test Air
 Hydrostatic

PSI Required

10 PSI

Time Required

4HR

Time Test Started

1400 6/25

Time Test Stopped

0700 6/26

Test Passed

Air Loss

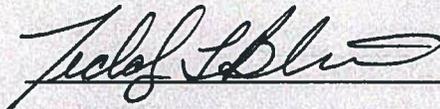
1 lb

Test Failed

Location of Test

Tested all 2" FM and 2x4 DC
for entire job from valve
station at toe of phase 5
including all valves

Testing Technician



Superintendent

Teddy Blevins

APPENDIX I
Correspondence

SCS ENGINEERS, PC

November 30, 2010

Revised: January 26, 2011

File No. 02210301.00

Mr. Ming Chao

North Carolina Department of Environment and Natural Resources

Division of Solid Waste

410 Oberlin Rd

Raleigh, North Carolina 27605

Subject: Solid Waste Permit Modification
Landfill Gas Collection and Control System
Johnston County MSW and C&D Landfill Facility
SW Permit #51-03
Smithfield, North Carolina

Dear Mr. Chao:

On behalf of Johnston County MSW and C&D Landfill Facility (Landfill), SCS Engineers, PC (SCS) is submitting an application for a permit modification to SW Permit #51-03. The application has been revised to reflect items contained in a comments letter from the SWS dated December 9, 2010 and a response letter from SCS dated January 14, 2011. The permit modification is for the installation of a voluntary landfill gas collection and control system (GCCS) at the Landfill. The primary purpose of the voluntary GCCS is to collect and control landfill gas (LFG). Johnston County has entered into an agreement with Blue Source to sell the greenhouse gas credits and to produce electricity from the LFG.

INTRODUCTION AND BACKGROUND

The Johnston County MSW and C&D Landfill Facility (Landfill) is located near Smithfield, North Carolina. A Request for Proposal for a Landfill Gas to Energy Project at the Johnston County Landfill was issued by the Johnston County Department of Utilities. The Development Team of Blue Source and SCS Engineers proposes to develop a landfill gas collection and control system and a beneficial use project for the LFG at the Landfill. The Development Team will finance, design, permit, build, commission, own, operate, and maintain the GCCS and plans to implement a Landfill Gas Energy system

The Landfill includes several waste disposal areas designated as Phase 1, 2, 3, 4, 4A, and 5. No GCCS construction activities are planned in Phase 1 and 2. Drilling and pipe installation will take place in Phase 3, 4A and 5. For Phase 4, no drilling is planned and pipe installation will only occur within the existing soil cover.

LANDFILL GAS COLLECTION AND CONTROL SYSTEM

The primary components of the GCCS include the following:

- Landfill gas extraction wells
- Landfill gas header and lateral piping
- Landfill gas condensate controls (sumps, air line, and force main)
- Connecting to existing passive LFG trenches and vents
- Blower flare station (blower and utility flare)
- Air compressor
- Landfill gas-fueled generator and associated landfill gas treatment and compression systems (in future)

The GCCS will be installed in portions of Phase 3, Phase 4A, Phase 4, and Phase 5. Construction Drawings for the GCCS are provided Attachment A. The remainder of this permit application describes the GCCS in more detail.

LFG Extraction Wells

LFG extraction wells will be drilled into the existing waste mass at the depths depicted on the Well Completion Schedule, Sheet 4 of 6 (Attachment A). The well depths were established following industry standards and based on our engineering judgment and experience. The bottom of the wells was set at least 15 feet above the landfill's base liner system.

To insure the wells do not penetrate the bottom liner system, as-built drawings were obtained from Johnston County and reviewed by SCS. All lined areas (Phases 4A and 5) have survey records that include the northing, easting, and elevation of the base liner system. This survey information was used to maintain a minimum distance of 15 feet above the base liner system when drilling. In areas where there is less than 30 feet of waste the minimum distance above the base liner may be shortened to 10 feet. The base of the landfill phases that do not have a synthetic base liner (Phase 3) will also be avoided by finding available survey information or assuming that the base grades are equal to the native topography outside the limit of waste. The design for a soil base liner system will again include a minimum of 15 feet from the assumed base liner.

Proposed wells have been overlaid on the surveyed baseliner system to insure that at the specific point a well will be installed the minimum buffer is present. The well locations will be surveyed by a professional surveyor prior to drilling. The survey results will be reviewed by a professional engineer and the well schedule revised if necessary.

Refer to Attachment B for SCS's CQA Guidelines for drilling LFG extraction wells. These CQA guidelines are part of a larger SCS program related to standard procedures and quality assurance.

SCS will submit the required information to the Health Hazards Control Unit (HHCU) of the Division of Public Health that addresses disturbing asbestos containing materials (ACMs). No

drilling will occur until an approval letter has been received. A copy of the notification from SCS and approval from the HHCUC will be provided in the Construction Documentation Report.

All LFG extraction wells will be surveyed.

LFG Header and Lateral Piping

The GCCS will have various pipes that connect the gas wells to the flare. There will be lateral lines 4-in in diameter connected to main header pipes 8-in, 10-in, and 12-in in diameter. All piping will be HDPE SDR 17 pipe. These pipes are sized using industry standards to carry existing and projected LFG flow. A LFG projection model prepared by SCS was used to estimate expected current and future LFG collection. A pipe sizing calculation is provided in Attachment C. LFG header/lateral piping will be installed with a typical slope of 3% and a minimum slope at 1%.

Piping will be installed according to details in the attached set of construction plans. These plans illustrate the network of pipes to be installed. The details also illustrate how the piping, and other associated aspects of the GCCS will be constructed. An excavator with a two foot wide bucket will be used to dig the trenches two to three feet deep for installation of the various pipes. In areas that are closed with a synthetic liner, the trench depth will be approximately 12" to avoid damaging the synthetic liner. Also as seen in the details, the HDPE GCCS pipe will be run through corrugated metal pipe at all road crossings to protect the pipe from crushing. Refer to the drawings for additional information.

All GCCS piping will be leak tested. A copy of the leak testing protocol is provided in Attachment D.

The maximum length of trench open at one time will be limited to 1,000 feet. All trenches within the waste mass footprint will be backfilled at the end of the day.

Condensate Management

Condensate is formed within the GCCS piping network as LFG cools. Condensate is collected at the low points of the piping network in condensate sumps. Multiple condensate sumps are incorporated into the GCCS. Each condensate sump is equipped with a pneumatic pump which transfers the condensate into a force main. The locations of the sumps and force mains are illustrated on the Construction Drawings (Attachment A). Condensate is eventually transferred into the Landfill's leachate management system where it is properly disposed. Force mains not located within the waste limits will be dual-contained.

Blower/Flare Station

The blower/flare station will utilize a candlestick flare to combust the collected LFG. The Landfill has already received an Air Permit from the NC Department of Environment and Natural Resources' Division of Air Quality for the construction and operation of this system. The blowers located at the blower/flare station will be used to pull the gas from the Landfill and send it through the candlestick flare or to the planned Landfill Gas Energy Project.

The blower/flare station planned for this landfill will have a safety interlock system that will automatically shutdown the blower if no flame is present in the flare. Providing the complete system design and emergency shutdown procedures in this response would be extensive. When the blower/flare station is installed, a copy of the operation and maintenance manual, which includes emergency shut-down procedures, will be kept on-site.

The construction and operation of the flare is permitted through the NCDENR, Division of Air Quality. A copy of the Permit-to-Construct application and DAQ approvals will be included in the Construction Documentation Report.

Landfill Gas Energy Project

After the GCCS is installed and becomes operational, the Project Team plans to install a Cummins C2000 N6C Engine, or equivalent, to convert LFG into electricity. The electricity produced will then be placed on the grid. This specific engine has the capability to produce up to 2 MW of electricity. Electricity will depend on the amount of LFG that is recovered from the Landfill and collected by the GCCS.

Disposal of Excavated Waste

During drilling and pipe trenching, MSW will be generated. All MSW generated during the installation of the GCCS will be hauled to the Landfill's working face in accordance with the Landfill's operating permit.

No MSW will be left on top of the Landfill or exposed overnight. During normal operations the construction crew and the site will communicate so excavation and drilling cease for the day prior to closing the active disposal area. This will allow for proper disposal and daily cover of excavated waste.

Existing Permitted Cap

Phase 4 is the only area with a permitted cap and no drilling will take place in Phase 4. Some excavation will be required to install piping to existing LFG horizontal collectors. In areas with a synthetic cap, the LFG collection pipes will be installed above the synthetic liner within the vegetative soil layer. Excavated soils will be placed back around the installed pipe and used as backfill for the trench.

Construction Documentation Report

A construction documentation report will be prepared at the completion of the project to document the installation of the primary GCCS components. In general the report will include the following information:

- Brief descriptions of the project activities, scheduled and all involved parties.
- Descriptions of variances or deviations from the proposed plan
- Copies of approval letters and/or permit documents
- As-built drawings including survey coordinates of gas wells, valves, sumps and piping gradient.

Mr. Ming-tai Chao
January 26, 2011

- Well completion logs and final well completion schedule.
- Leak test results.
- QA/QC testing report for the cover restoration, if required.
- A series of color photographs to document the major project features.

The final construction documentation report will be submitted to the SWS within 30 days of system construction.

CLOSING

The installation of the GCCS will be conducted by SCS Field Services under a design-build contract between Blue Source and SCS. We anticipate the start of construction in February 2010. Following the installation of the GCCS, Johnston County will revise or update (if needed) the landfill's Operations Plan, Closure Plan, Post-Closure Plan, and financial assurance documents in accordance with the solid waste regulations.

The GCCS installation will facilitate the collection of LFG for the Green Energy Project and Carbon Credit Project. Please do not hesitate to contact either of the undersigned if you have any questions or comments at (704) 504-3107.

Sincerely,



J Morgan, PE
Senior Project Professional
SCS ENGINEERS, PC



Steven C. Lamb, PE
Vice President
SCS ENGINEERS, PC

jm/scl

cc: Rick Proctor, Johnston County Solid Waste Manager
Annika Colston, Blue Source
Matt Wells, Blue Source
Guy Lewis, SCS Field Services

Attachment A – Construction Drawings
Attachment B – SCS CQA Guidelines
Attachment C – Pipe Sizing Calculation
Attachment D – Leak Testing Guidelines

ATTACHMENT A
Construction Drawings



NO.	REVISION	DATE

SHEET TITLE
EXISTING CONDITIONS

PROJECT TITLE
**JOHNSTON COUNTY LANDFILL
 LANDFILL GAS PROJECT**

CLIENT
BLUE SOURCE LLC
 26 W 17TH STREET, SUITE 604
 NEW YORK, NY 10011

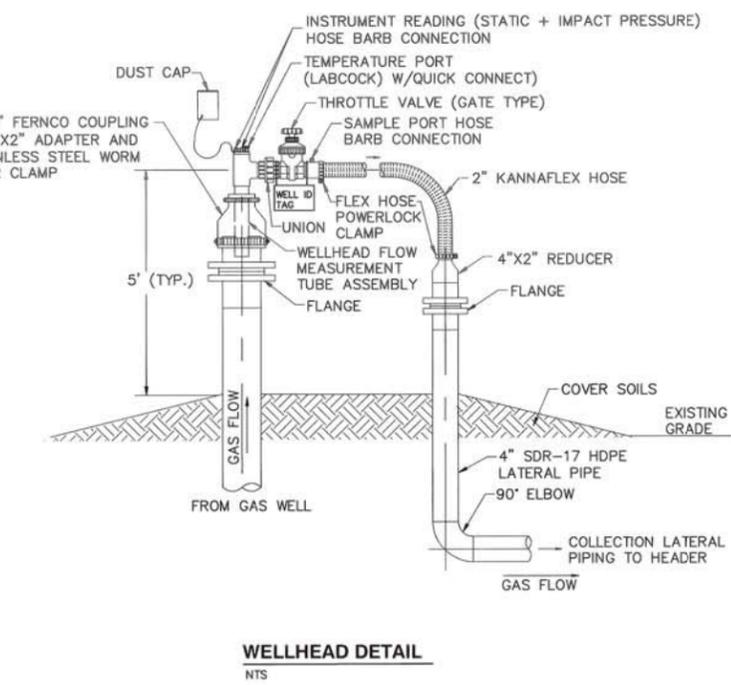
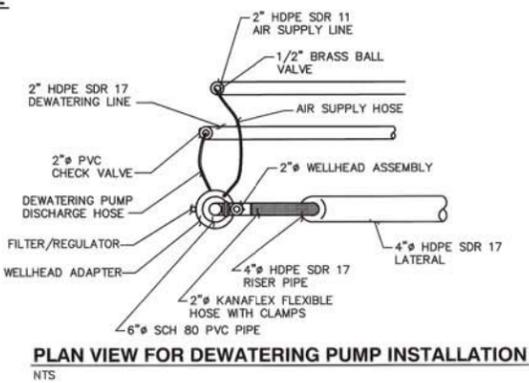
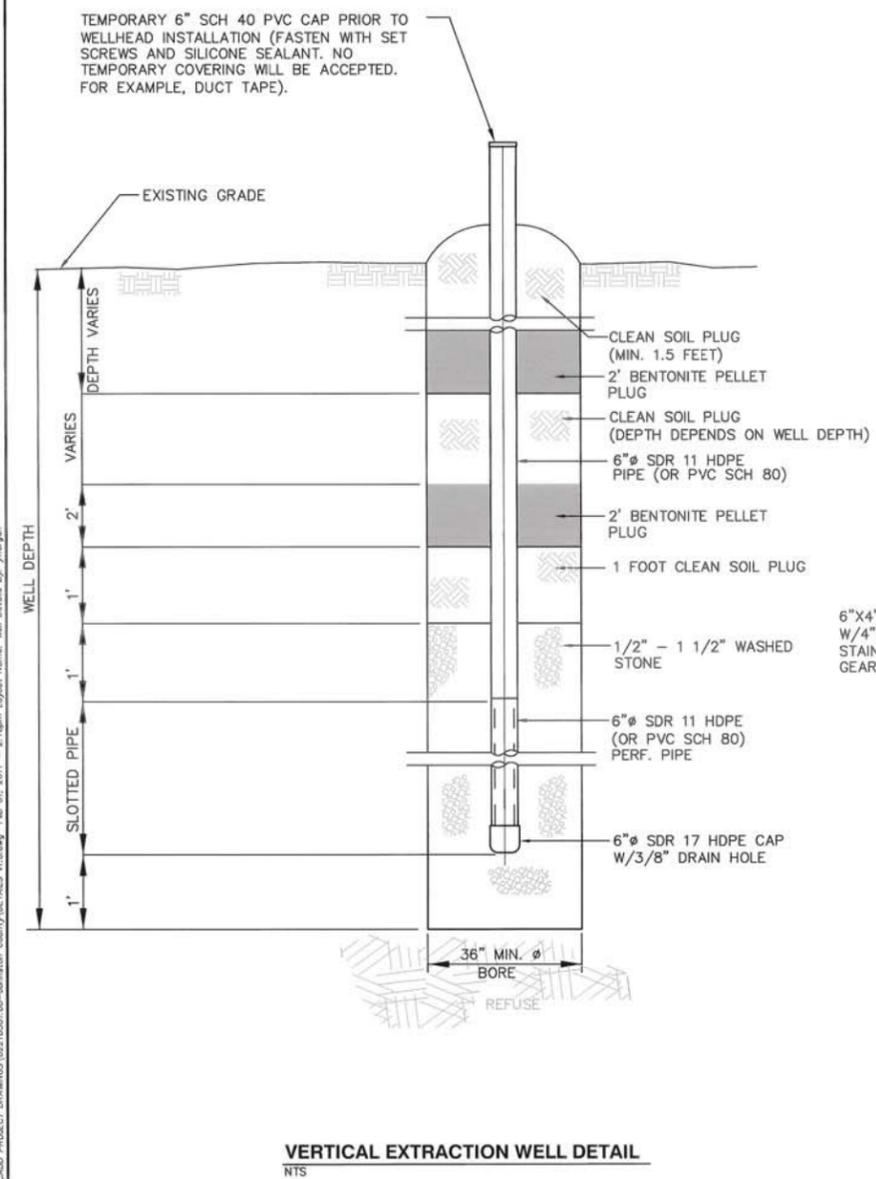
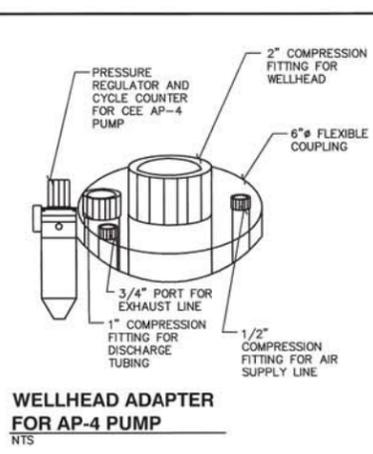
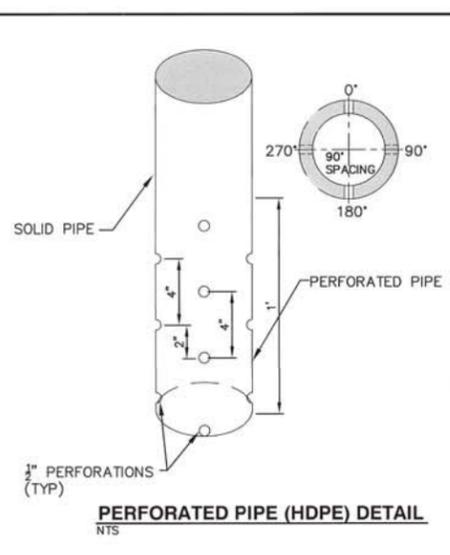
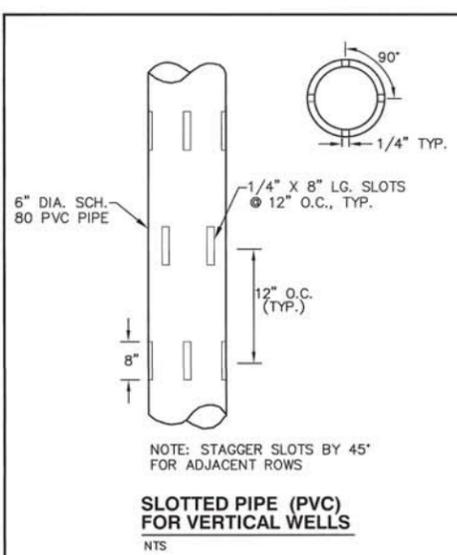
SCS ENGINEERS, PC
 2520 WHITEHALL PARK DRIVE, SUITE 450
 CHARLOTTE, NORTH CAROLINA 28273
 PHONE: (704) 504-3107 FAX: (704) 504-3174

PROJ. NO. 02210301.00
 DWN. BY: JLM
 T.A.S.
 CHK. BY: JLM
 SCL

DATE: NOVEMBER 2010
 SCALE: AS SHOWN
 DRAWING NO. 2

PERMIT DRAWINGS
DO NOT USE FOR CONSTRUCTION
 DATE: 11/30/10

W:\LOAD PROJECT DRAWINGS\02210301.00-Johnston County, NC - Existing Conditions.dwg Nov 30, 2010 - 12:50pm Layout Name: Layout1 By: jmorgan



WELL SCHEDULE

WELL ID	NORTHING	EASTING	ANTICIPATED GROUND SURFACE ELEVATION	FINAL GROUND SURFACE ELEVATION	BASELINER ELEVATION (Note 2)	LANDFILL DEPTH	WELL DEPTH	6" SOLID PIPE LENGTH (Note 8)	6" PERFORATED PIPE LENGTH	
EW-405	643,653	2,170,938	260				41	20	25	
EW-406	643,750	2,170,951	256				41	20	25	
EW-407	643,872	2,170,977	250				41	20	25	
EW-408	644,077	2,170,983	250				41	20	25	
EW-409	644,422	2,170,956	238				41	20	25	
EW-410	644,585	2,170,926	238				41	20	25	
EW-411	644,725	2,170,991	220				41	20	25	
EW-412	644,792	2,170,817	218				41	20	25	
EW-413	644,655	2,170,580	220	164	56	56	41	18	27	
EW-414	644,428	2,170,659	260	185	75	75	60	24	40	
EW-415	644,136	2,170,686	262	192	70	70	55	22	37	
EW-416	643,841	2,170,640	263	193	70	70	55	22	37	
EW-417	643,586	2,170,647	245	194	51	51	36	15	25	
EW-501	642,388	2,169,341	272		232	40	25	14	15	
EW-502	642,509	2,169,373	270		224	46	31	14	21	
EW-503	642,458	2,169,138	280		224	56	41	20	25	
EW-504	642,640	2,169,219	284		224	60	45	19	30	
EW-505	642,610	2,169,060	276		228	48	33	15	22	
EW-506	642,784	2,168,995	272		227	45	30	14	20	
EW-507	642,941	2,168,929	270		224	46	31	15	20	
EW-508	643,078	2,168,859	262		224	38	23	15	12	
EW-509	643,324	2,168,757	250		223	27	17	14	7	
EW-510	643,443	2,168,722	246		221	25	15	14	5	
EW-511	643,603	2,168,670	246		221	25	15	14	5	
TOTAL								881	430	547

- NOTES:**
- THIS DRAFT WELL COMPLETION SCHEDULE IS NOT INTENDED FOR CONSTRUCTION UNTIL ACTUAL SURVEY DATA IS OBTAINED BY CONTRACTOR AND THE WELL COMPLETION SCHEDULE IS REVISED BY THE DESIGN ENGINEER.
 - BASE GRADE DATA BY RSG.
 - EXISTING LANDFILL SURFACE TOPOGRAPHY SHOWN ON SITE PLANS IS FROM 2009 AERIAL FLYOVER.
 - CONTRACTOR AND ENGINEER SHALL VERIFY ALL FIELD CONDITIONS INCLUDING PRE-CONSTRUCTION WELL SURVEY STAKES AND NOTIFY ENGINEER OF ANY DISCREPANCIES BETWEEN ACTUAL CONDITIONS AND CONDITIONS DEPICTED IN THESE PLANS PRIOR TO DRILLING.
 - FOLLOWING REVIEW OF SURVEY DATA, CONTRACTOR SHALL GET AUTHORIZATION FROM OWNER AND ENGINEER PRIOR TO DRILLING.
 - NO DRILLING SHALL PROCEED WITHOUT AUTHORIZATION AND ACCEPTANCE INDICATED BY SIGNATURE BELOW.
 - WELLS DEPTHS WILL VARY ACCORDING TO CONDITIONS ENCOUNTERED.
 - SOLID PIPE LENGTHS INCLUDE A 5 FEET OF SOLID PIPE ABOVE GRADE.
 - BASED ON NATURAL GRADE SURROUNDING THE LANDFILL AND ANTICIPATED GROUND SURFACE ELEVATION, A WELL DEPTH OF 41' IS SHOWN FOR WELLS IN PHASE 3. IT IS ASSUMED THIS DEPTH WILL NOT PENETRATE THE SOIL BASE OF THE LANDFILL.
 - GRAIN SIZE ANALYSIS WILL BE PERFORMED ON GRAVEL BACKFILL AT A FREQUENCY OF 1 PER 250 CUBIC YARDS, OR AS DIRECTED BY ENGINEER (ASTM D421).

CQA CONSULTANT _____ CONTRACTOR _____ OWNER _____

PERMIT DRAWINGS
DO NOT USE FOR CONSTRUCTION
DATE: 11/30/10

NO. COMP. LICENSE NO. C-1837

DATE: 11/30/10

REVISION: ADDED NOTES 9 and 10

NO. 1 2 3 4 5 6 7 8 9 10

SHEET TITLE: **WELL DETAILS**

PROJECT TITLE: **JOHNSTON COUNTY LANDFILL LANDFILL GAS PROJECT**

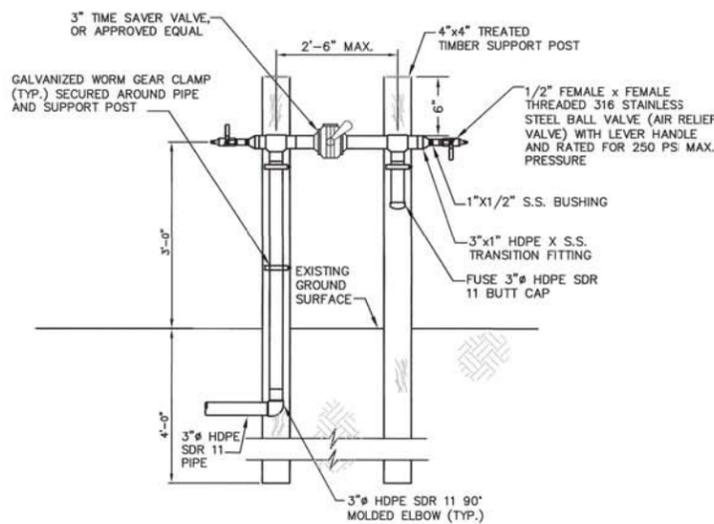
CLIENT: **BLUE SOURCE LLC**
26 W 17TH STREET, SUITE 504
NEW YORK, NY 10011

SCS ENGINEERS, PC
2520 WHITEHALL PARK DRIVE, SUITE 450
CHARLOTTE, NORTH CAROLINA 28273
PHONE: (704) 504-3107 FAX: (704) 504-3174

DATE: JANUARY 2011

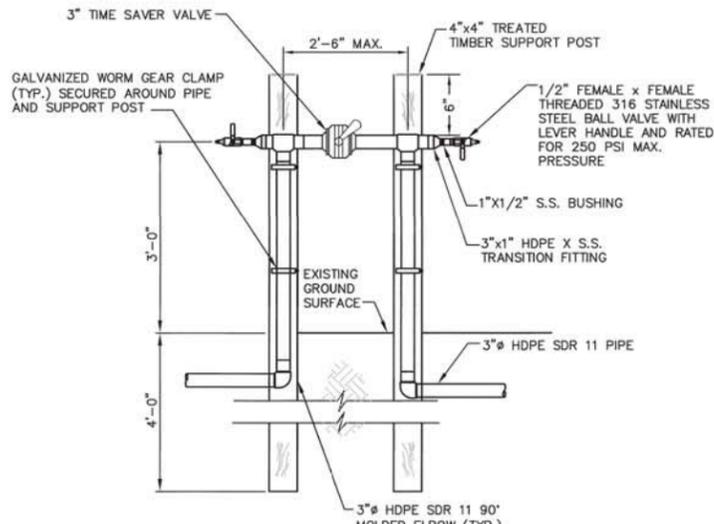
SCALE: AS SHOWN

DRAWING NO. **4** of 6

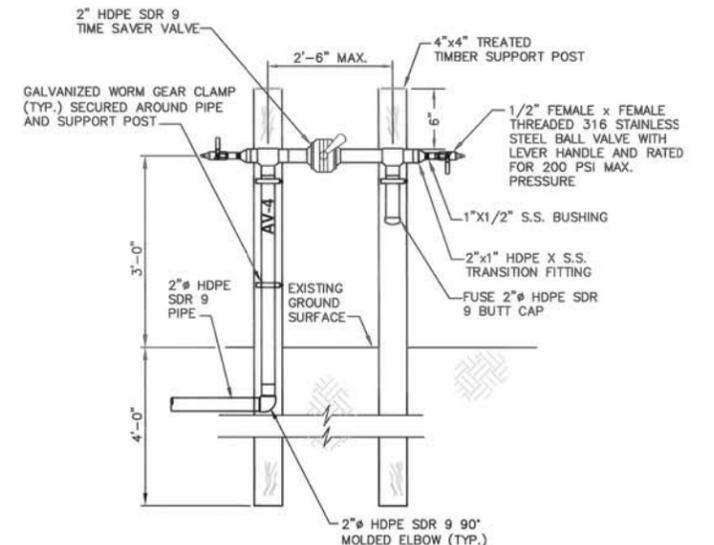


NOTE: CAN BE USED FOR FUTURE CONNECTION

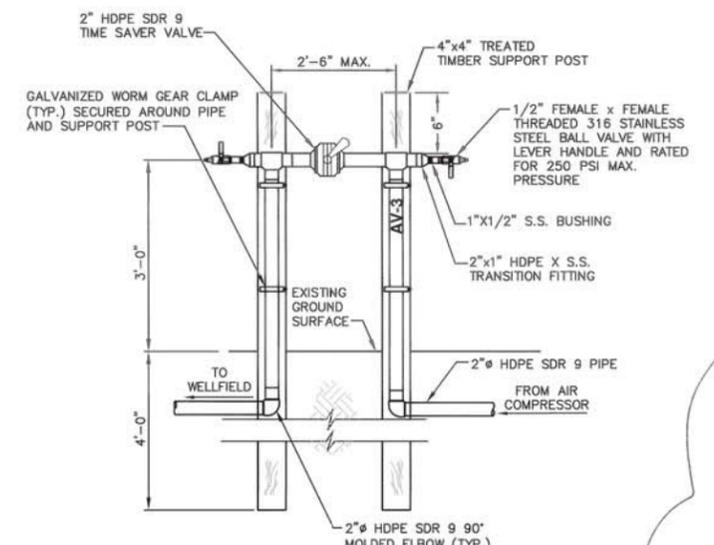
FORCEMAIN ISOLATION VALVE AND TERMINATION DETAIL
NTS



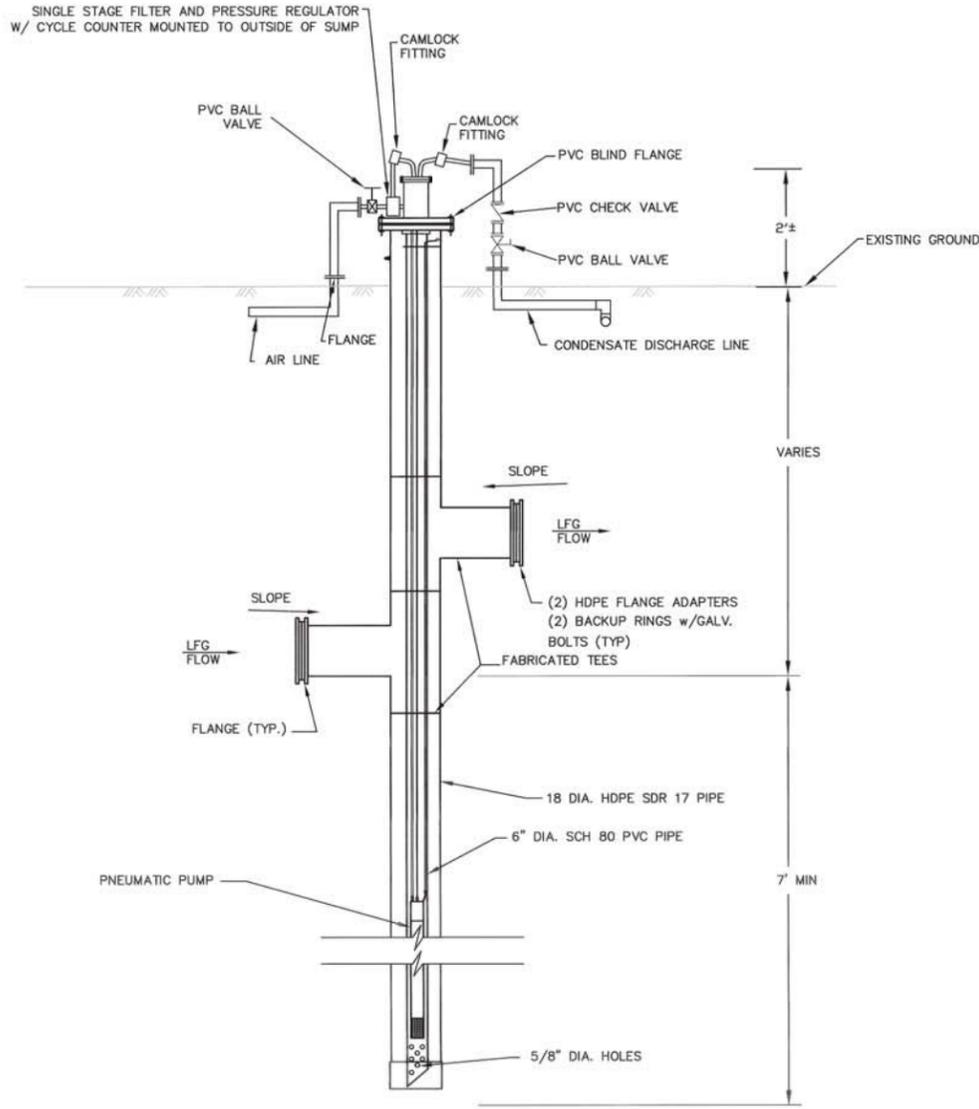
FORCEMAIN ISOLATION AND BLOWOFF VALVES DETAIL
NTS



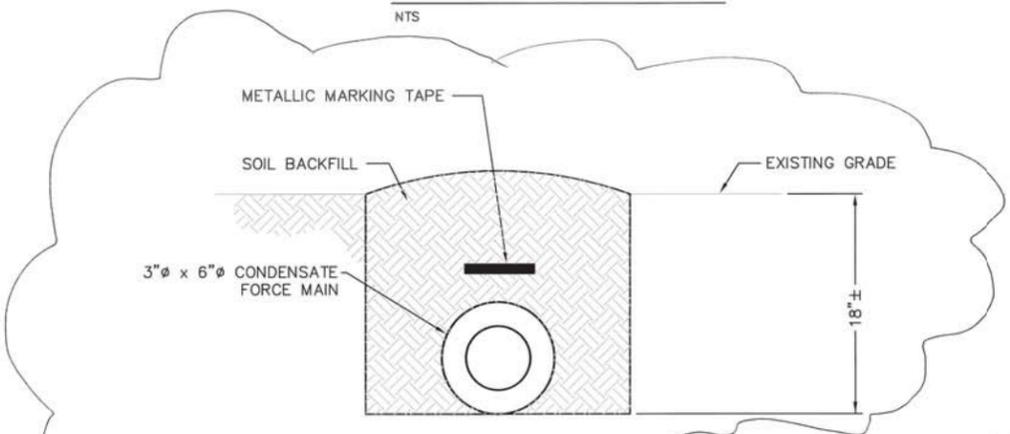
AIR LINE ISOLATION VALVE AND TERMINATION DETAIL
NTS



AIR LINE ISOLATION AND BLOWOFF VALVES DETAIL
NTS



CONDENSATE SUMP DETAIL
NTS



DUAL-CONTAINED PIPE IN TRENCH DETAIL
NTS

PERMIT DRAWINGS
DO NOT USE FOR CONSTRUCTION

DATE: 11/30/10



NO.	REVISION	DATE
1	ADDED DUAL-CONTAINED DETAIL	2/10

GENERAL DETAILS
PROJECT TITLE
**JOHNSTON COUNTY LANDFILL
LANDFILL GAS PROJECT**

CLIENT
BLUE SOURCE LLC
26 W 17TH STREET, SUITE 604
NEW YORK, NY 10011

SCS ENGINEERS, PC
2520 WHITEHALL PARK DRIVE, SUITE 450
CHARLOTTE, NORTH CAROLINA 28273
PHONE: (704) 504-3107 FAX: (704) 504-3174
PROJECT NO.: 001.00
DATE: 11/30/10
DRAWN BY: JLM
CHECKED BY: JLM
SCALE: SCL

DATE: **JANUARY 2011**
SCALE: **AS SHOWN**
DRAWING NO.

I:\CAD\PROJECT DRAWINGS\021030100- Johnston County\DETAILS.vf.dwg Feb 01, 2011 - 11:50am Layout Name: General Details By: jpergent

ATTACHMENT B

SCS CQA Guidelines

Standard Procedure Construction Quality Assurance for Installation of LFG Extraction Wells

PURPOSE

The purpose of this Standard is to describe the procedures and activities to be performed by SCS personnel in the field and office in support of drilling and installation of LFG extraction wells. This Standard supplements SCS's Quality Assurance Program, which also should be reviewed with respect to review and approval procedures for engineering drawings and documents.

This Standard addresses the following:

- Procedures used by SCS designers and engineers during the development of Construction Drawings and the Well Completion Schedule.
- Procedures used by SCS CQA personnel, both field and project engineer.

DESIGN ACTIVITIES

1. Obtain the most recent topographic map for the area where construction will occur.
2. Obtain the As-Built drawings for the bottom liner system. If As-Built drawings of the bottom liner system are not available, use the permit drawings. However, when using permit drawings, SCS should note this on the Construction Drawings or Well Completion Schedule. The Client should also be made aware that the As-Built drawings could not be located.
3. Establish the "depth of waste" for a given well, then calculate the well depth accordingly (e.g., 75% of waste depth, 15 feet off the bottom, maximum depth approx. 90 to 100 feet).
4. The Draft Well Completion Schedule provided on the Construction Drawings should be used for estimating drilling depths and pipe quantities only. Include a note under the Draft Well Completion Schedule.

This draft well completion schedule is not intended for construction, until actual survey data is obtained and the well completion schedule is revised by the design engineer.

5. Have second person review the well completion schedule, including checking coordinates, elevations, and calculations.
6. Never plan to drill through a landfill bottom into soil below (with or without a liner).

CONSTRUCTION QUALITY ASSURANCE ACTIVITIES

1. Obtain the services of a professional land surveyor to stake the well field and to obtain the actual ground elevation at each well location. [Note: The surveyor may be hired by SCS during the design-phase or as part of our CQA services. In some cases, the Contractor or Owner may procure the services of the surveyor.]. Do not rely on GPS survey information.
2. The surveyed elevations should be written on the stakes in the field by the surveyor along with the well ID. The surveyor should provide the survey data (northing, easting, and elevation) to the Design Engineer and CQA Consultant.
3. The surveyed ground elevations should be reviewed by the Design Engineer and the Well Completion Schedule should be revised and re-issued to the Contractor. The Final Well Completion Schedule should be “signed off” by the Design Engineer.
4. The CQA Monitor should walk the site and verify the well stakes and elevations.
5. The CQA Monitor should “sign off” on the Final Well Completion Schedule” indicating that the actual ground elevations have been incorporated into the Schedule, and the drilling depths have been reviewed.
6. The CQA Monitor should verify the math on the Well Completion Schedule to make sure it makes sense!
7. The CQA Monitor must review the Final Well Completion Schedule with the Driller and General Contractor. The Driller and General Contractor should “sign off” on the Final Well Completion Schedule” indicating that the actual ground elevations have been incorporated into the Schedule, and the drilling depths have been reviewed. If there is any question or confusion regarding the information on the Well Completion Schedule, sequencing of well construction, or any other construction details, the Design Engineer should be contacted immediately for clarification. In no case should drilling proceed until all parties are in concurrence regarding the well drilling details.
8. Once the drill rig is set up on the well, the CQA Monitor must again verify the elevation on the stake is the same as on the Final Well Completion Schedule.
9. The CQA Monitor and Driller should verify the drill depth before drilling begins.
10. If drilling accidentally goes through the bottom of a landfill (with or without a liner), the boring hole should be grouted back to at least to the refuse bottom. The SCS Client Manager should be immediately contacted in order to coordinate with the Client and regulatory agencies if necessary regarding any further remedial measures.

ATTACHMENT C

Pipe sizing Calculations

SCS ENGINEERS

SHEET 1 of 1

CLIENT Blue Source	PROJECT Johnston County Landfill	JOB NO. 02210301.00
SUBJECT Pipe Sizing	BY J Morgan	DATE 1/31/2011
	CHECKED S Lamb	DATE 2/1/2011

OBJECTIVE: Calculate the appropriate pipe size for various sections of header pipe

APPROACH: Pipe sizing guideline: less than one inch of pressure drop per 100 linear feet.
The piping network is divided into four sections of pipe for pipe sizing as seen below.
The current or maximum Landfill Gas Recovery Estimate Tables (attached) were used to estimate the flow that would travel through each section and Table 1 was constructed to illustrate the results. Each section has been illustrated on the map with the letters shown below.

SOLUTION:

(Section 1) Phase 3/4A to EW-400 (A to B)

Using a distance of 900 linear feet and the flow from the recovery model for these sections, the pressure drop is calculated using the Spitzglass equation as seen in Table 1. Only the 12 inch pipe has less than one inch of pressure drop per 100 ft.

12 in pipe

(Section 2) Phase 4 to EW-400 (C to B)

Using a distance of 800 linear feet and the flow from the recovery model from Phase 4, the pressure drop is calculated using the Spitzglass equation as seen in Table 1. The 8, 10, and 12 inch pipe sizes all have a pressure drop of less than one inch. However to provide future capacity for flow from phase 4A and a more structurally robust pipe a 10 inch pipe was chosen.

10 in pipe

(Section 3) EW-400 to the Flare (B to D)

Using a distance of 1,250 linear feet and the combined flow for sections 1 and 2, the pressure drop is calculated using the Spitzglass equation as seen in Table 1. Only the 12 inch pipe has less than one inch of pressure drop per 100 ft.

12 in pipe

(Section 4) Phase 5 to the Flare (E to D)

Using a distance of 900 linear feet and the flow from the recovery model for Phase 5 the pressure drop is calculated using the Spitzglass equation as seen in Table 1. The 10 inch pipe has less than one inch of pressure drop per 100 ft.

10 in pipe

TABLE 1
LANDFILL GAS COLLECTION SYSTEM
HEADER LINE SIZING
 Johnston County Landfill Pipeline

Assumptions:

Pipe sizing guideline - pressure drop/100 feet should be less than 1 inch of water column (wc)

	Flow Points		Design Flow (cfm)	Factor of Safety	Adjusted Design Flow (cfm)	Pipe Inside Diameter (in.) [2]	Nominal Pipe Size (in.) [2]	Total L (ft)	Delta P (in. wc)	Cumulative Delta P (in. wc)	Pressure Drop per 100 ft (in. wc)
	From	To									
A to B	Phase 3/4A	EW-400	1,093	1.5	1,640	7.55	8	900	35.02	35.02	3.89
	Phase 3/4A	EW-400	1,093	1.5	1,640	9.41	10	900	11.38	11.38	1.26
	Phase 3/4A	EW-400	1,093	1.5	1,640	11.16	12	900	4.83	4.83	0.54
C to B	Phase 4	EW-400	63	3	189	7.55	8	800	0.41	0.41	0.05
	Phase 4	EW-400	63	3	189	9.41	10	800	0.13	0.13	0.02
	Phase 4	EW-400	63	3	189	11.16	12	800	0.06	0.06	0.01
B to D	EW-400	Flare	1,156	1.5	1,734	7.55	8	1250	54.41	54.41	4.35
	EW-400	Flare	1,156	1.5	1,734	9.41	10	1250	17.68	17.68	1.41
	EW-400	Flare	1,156	1.5	1,734	11.16	12	1250	7.50	7.50	0.60
E to D	Phase 5	Flare	226	1.5	339	7.55	8	300	0.50	0.50	0.17
	Phase 5	Flare	226	1.5	339	9.41	10	300	0.16	0.16	0.05
	Phase 5	Flare	226	1.5	339	11.16	12	300	0.07	0.07	0.02

[2]

SDR 17

IPS Pipe Size (in.)	ID (in.)
4	4
6	6
8	7.550
10	9.410
12	11.160
14	12
16	14
18	16
20	18
22	19
24	21

ID Measurements are Plexco Piping Standard ID's
 From Plexco Piping Systems Manual

Specific

Gravity LFG

0.65

Spitzglass Equation

$$Q_h = \frac{3350}{S_g^{0.5}} \left(\frac{h_1 - h_2}{L} \right)^{0.5} \left(\frac{d^5}{1 + \frac{3.6}{d} + 0.03 d} \right)^{0.5} \quad (4-44)$$

where terms are as defined above, and

- h_1 = inlet pressure, in H₂O
- h_2 = outlet pressure, in H₂O
- Q_h = flow, standard ft³/hour
- S_g = gas specific gravity
- p_1 = inlet pressure, lb/in² absolute
- p_2 = outlet pressure, lb/in² absolute
- L = length, ft
- d = pipe bore, in

LEACHATE SURFACE IMPOUNDMENT (NOT TO SCALE)

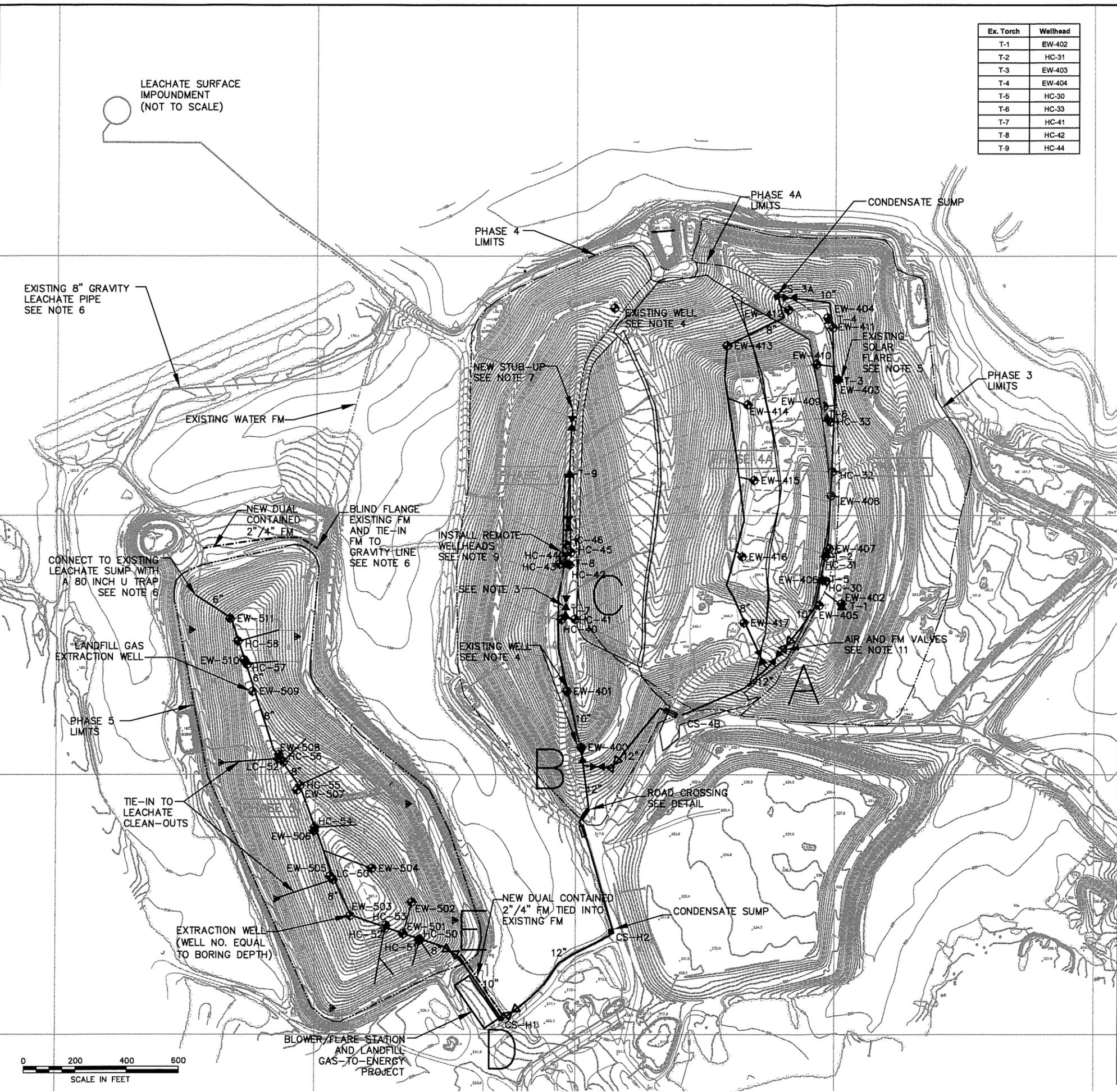
Ex. Torch	Wellhead
T-1	EW-402
T-2	HC-31
T-3	EW-403
T-4	EW-404
T-5	HC-30
T-6	HC-33
T-7	HC-41
T-8	HC-42
T-9	HC-44



LEGEND

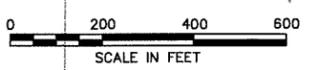
- EXISTING CONTOUR
- PHASE LIMITS
- - - LFG HORIZONTAL COLLECTOR
- LFG HEADER PIPE
- ◆ EW LFG EXTRACTION WELL
- ▲ T-1 EXISTING PASSIVE SOLAR FLARE (TORCH)
- ◆ HC WELL HEAD ON EXISTING HORIZONTAL COLLECTOR
- CS-H1 CONDENSATE SUMP
- ▲ LEACHATE CLEANOUT
- ✕ LFG HEADER VALVE
- ✕ AIRLINE/FORCEMAIN VALVES

EXISTING 8" GRAVITY LEACHATE PIPE SEE NOTE 6



NOTES:

1. INCLUDE 2-IN AIR AND 2-IN FM IN TRENCH WITH ALL PIPING IN PHASE 5.
2. AIR COMPRESSOR SHALL BE AN INGERSOLL RAND UP5 15-8. CONTRACTOR SHALL ALSO PROVIDE ENCLOSURE FOR AIR COMPRESSOR.
3. INSTALL 8-IN VALVE IN EXISTING 8-IN HEADER AND ONE ADDITIONAL STUB-UP FROM THE 8-IN HEADER IN ORDER TO ISOLATE EXISTING HORIZONTAL COLLECTORS IN PHASE 4 (SEPARATE COST).
4. THERE ARE 3 EXISTING LFG TEST WELLS IN PHASE 4. CONTRACTOR SHALL INSTALL WELLHEAD ON TWO OF THESE. (EW-400 and EW-401)
5. EXISTING TORCHES ARE MARKED AS T-X. CONTRACTOR SHALL INSTALL WELLHEAD ON ALL OF THESE. DRAWING DEPICTS SOME AS HC WELLS THAT ARE CONNECTED TO A HORIZONTAL NETWORK
6. THERE IS AN EXISTING LEACHATE SUMP IN THE NORTH CORNER OF PHASE 5. LEACHATE FLOWS BY GRAVITY FROM THE SUMP TO THE SURFACE IMPOUNDMENT
7. REMOTE WELLS ARE CONNECTED TO THE NEW STUB-UP, THE EXISTING TORCH (T-9), AND THE NORTH BANK OF NEW HORIZONTAL COLLECTORS IN PHASE 4
8. WELL NUMBERS ARE GROUPED ACCORDING TO PHASE
9. CONTRACTOR WILL RUN 4-IN LATERALS TO THE NEW STUB-UP, THE EXISTING TORCH (T-9), AND THE NORTH BANK OF NEW HORIZONTAL COLLECTORS IN PHASE 4 FOR A TOTAL OF THREE REMOTE WELLHEADS
10. INCLUDE 2-IN AIR AND FORCEMAIN IN THE 12-IN PIPING FROM THE FLARE TO PHASE 3 AND ALSO ALONG THE 10-IN PIPING TO CS-3A
11. CONTRACTOR TO INSTALL AIR AND FORCEMAIN VALVES AS SHOWN ON DRAWING AND IN DETAILS 1-4 ON SHEET 6
12. ALL PIPING WILL BE PRESSURE TESTED TO 5 PSI FOR 4 HOURS
13. ALL FORCEMAINS THAT ARE NOT ON LINED AREAS OF THE LANDFILL WILL BE DUAL-CONTAINED



BLOWER/FLARE STATION AND LANDFILL GAS-TO-ENERGY PROJECT

NORTH CAROLINA LICENSE NO. C-1837	
DATE	REVISION

SITE PLAN
JOHNSTON COUNTY LANDFILL LANDFILL GAS PROJECT

CLIENT
BLUE SOURCE LLC
 26 W 17TH STREET, SUITE 504
 NEW YORK, NY 10011

SCS ENGINEERS, PC
 2520 WHITEHALL PARK DRIVE, SUITE 450
 CHARLOTTE, NORTH CAROLINA 28273
 PHONE: (704) 504-3107 FAX: (704) 504-3174

DATE: JANUARY 2011
 SCALE: AS SHOWN
 DRAWING NO. 0210301.00

PERMIT DRAWINGS
DO NOT USE FOR CONSTRUCTION
 DATE: 11/30/10

C:\GDD PROJECT DRAWINGS\0210301.00-Johnston County\JCL - SITE PLAN v2.2.dwg File 01, 2011 - 10:49am Layout Name: Layout1 By: jprogen

**Johnston County, NC Phase III
Preliminary Gas Recovery Estimates**

Year	Disposal Rate (tons/yr)	Refuse In-Place (tons)	LFG Recovery Potential			LFG System Coverage (%)	LFG Recovery from Existing and Planned System			
			(scfm)	(mmcf/day)	(mmBtu/yr)		(scfm)	(MMBtu/hr)	(MW)	(MTCO2e/yr)
1979	47,800	47,800	0	0.00	0	0%	0	0	0	0
1980	52,000	99,800	48	0.07	12,840	0%	0	0	0	0
1981	55,000	154,800	97	0.14	25,679	0%	0	0	0	0
1982	58,000	212,800	144	0.21	38,196	0%	0	0	0	0
1983	61,000	273,800	190	0.27	50,419	0%	0	0	0	0
1984	64,000	337,800	235	0.34	62,373	0%	0	0	0	0
1985	0	337,800	279	0.40	74,082	0%	0	0	0	0
1986	0	337,800	254	0.37	67,571	0%	0	0	0	0
1987	0	337,800	232	0.33	61,632	0%	0	0	0	0
1988	0	337,800	211	0.30	56,214	0%	0	0	0	0
1989	0	337,800	193	0.28	51,274	0%	0	0	0	0
1990	0	337,800	176	0.25	46,767	0%	0	0	0	0
1991	0	337,800	160	0.23	42,656	0%	0	0	0	0
1992	68,578	406,378	146	0.21	38,907	0%	0	0	0	0
1993	74,151	480,529	203	0.29	53,908	0%	0	0	0	0
1994	72,961	553,490	260	0.37	69,088	0%	0	0	0	0
1995	78,095	631,585	311	0.45	82,614	0%	0	0	0	0
1996	95,004	726,589	362	0.52	96,331	0%	0	0	0	0
1997	91,004	817,593	426	0.61	113,383	0%	0	0	0	0
1998	0	817,593	481	0.69	127,863	0%	0	0	0	0
1999	0	817,593	439	0.63	116,624	0%	0	0	0	0
2000	0	817,593	400	0.58	106,374	0%	0	0	0	0
2001	0	817,593	365	0.53	97,024	0%	0	0	0	0
2002	0	817,593	333	0.48	88,496	0%	0	0	0	0
2003	0	817,593	304	0.44	80,718	0%	0	0	0	0
2004	0	817,593	277	0.40	73,623	0%	0	0.0	0.0	0
2005	0	817,593	252	0.36	67,152	0%	0	0.0	0.0	0
2006	0	817,593	230	0.33	61,250	0%	0	0.0	0.0	0
2007	0	817,593	210	0.30	55,866	0%	0	0.0	0.0	0
2008	0	817,593	192	0.28	50,956	0%	0	0.0	0.0	0
2009	0	817,593	175	0.25	46,477	0%	0	0.0	0.0	0
2010	0	817,593	159	0.23	42,392	0%	0	0.0	0.0	0
2011	0	817,593	145	0.21	38,666	85%	124	3.8	0.4	11,316
2012	0	817,593	133	0.19	35,267	85%	113	3.4	0.3	10,321
2013	0	817,593	121	0.17	32,168	85%	103	3.1	0.3	9,414
2014	0	817,593	110	0.16	29,340	85%	94	2.8	0.3	8,587
2015	0	817,593	101	0.14	26,761	85%	86	2.6	0.3	7,832
2016	0	817,593	92	0.13	24,409	85%	78	2.4	0.2	7,144

**Johnston County, NC Phase IVA
Preliminary Gas Recovery Estimates**

Year	Disposal Rate (tons/yr)	Refuse In-Place (tons)	LFG Recovery Potential			LFG System Coverage (%)	LFG Recovery from Existing and Planned System			
			(scfm)	mmcf/day	(mmBtu/yr)		(scfm)	MMBtu/hr	(MW)	(MTCO ₂ e/yr)
2003	50,274	50,274	0	0.00	0	0%	0	0.0	0.0	0
2004	106,126	156,400	51	0.07	13,504	0%	0	0.0	0.0	0
2005	109,287	265,686	154	0.22	40,825	0%	0	0.0	0.0	0
2006	111,753	377,439	250	0.36	66,593	0%	0	0.0	0.0	0
2007	113,489	490,928	341	0.49	90,758	0%	0	0.0	0.0	0
2008	103,501	594,429	426	0.61	113,266	0%	0	0.0	0.0	0
2009	108,759	703,188	493	0.71	131,113	0%	0	0.0	0.0	0
2010	108,760	811,948	560	0.81	148,803	0%	0	0.0	0.0	0
2011	108,760	920,708	620	0.89	164,939	75%	465	14.1	1.4	42,592
2012	108,760	1,029,468	676	0.97	179,656	63%	424	12.9	1.3	38,849
2013	108,760	1,138,228	726	1.05	193,080	53%	387	11.7	1.2	35,434
2014	108,760	1,246,988	772	1.11	205,324	75%	579	17.6	1.7	53,021
2015	108,760	1,355,748	814	1.17	216,492	65%	528	16.0	1.6	48,361
2016	108,760	1,464,508	852	1.23	226,678	57%	482	14.6	1.4	44,110
2017	108,760	1,573,268	887	1.28	235,969	75%	665	20.2	2.0	60,935
2018	108,760	1,682,028	919	1.32	244,444	66%	607	18.4	1.8	55,579
2019	11,070	1,693,098	948	1.37	252,173	58%	554	16.8	1.6	50,693
2020	0	1,693,098	876	1.26	232,982	85%	745	22.6	2.2	68,185
2021	0	1,693,098	799	1.15	212,504	85%	679	20.6	2.0	62,192
2022	0	1,693,098	729	1.05	193,826	85%	619	18.8	1.8	56,726
2023	0	1,693,098	665	0.96	176,790	85%	565	17.2	1.7	51,740
2024	0	1,693,098	606	0.87	161,251	85%	515	15.6	1.5	47,192
2025	0	1,693,098	553	0.80	147,078	85%	470	14.3	1.4	43,044
2026	0	1,693,098	504	0.73	134,150	85%	429	13.0	1.3	39,261
2027	0	1,693,098	460	0.66	122,359	85%	391	11.9	1.2	35,810
2028	0	1,693,098	420	0.60	111,604	85%	357	10.8	1.1	32,662
2029	0	1,693,098	383	0.55	101,795	85%	325	9.9	1.0	29,792
2030	0	1,693,098	349	0.50	92,848	85%	297	9.0	0.9	27,173

$948 + 145 = 1093 \text{ cfm}$
 A to B

For C-13

**Johnston County, NC Phase IV
Preliminary Gas Recovery Estimates**

Year	Disposal Rate (tons/yr)	Refuse In-Place (tons)	LFG Recovery Potential			LFG System Coverage (%)	LFG Recovery from Existing and Planned System			
			(scfm)	mmcf/day	mmBtu/yr		(scfm)	MMBtu/hr	(MW)	MTCO2e/yr
1985	33,000	33,000	0	0.00	0	0%	0	0	0	0
1986	68,000	101,000	33	0.05	8,864	0%	0	0	0	0
1987	69,000	170,000	99	0.14	26,351	0%	0	0	0	0
1988	70,000	240,000	160	0.23	42,570	0%	0	0	0	0
1989	70,940	310,940	217	0.31	57,631	0%	0	0	0	0
1990	72,050	382,990	269	0.39	71,621	0%	0	0	0	0
1991	70,050	453,040	318	0.46	84,680	0%	0	0	0	0
1992	0	453,040	361	0.52	96,054	0%	0	0	0	0
1993	0	453,040	329	0.47	87,611	0%	0	0	0	0
1994	0	453,040	300	0.43	79,911	0%	0	0	0	0
1995	0	453,040	274	0.39	72,887	0%	0	0	0	0
1996	0	453,040	250	0.36	66,480	0%	0	0	0	0
1997	0	453,040	228	0.33	60,637	0%	0	0	0	0
1998	0	453,040	208	0.30	55,307	0%	0	0	0	0
1999	0	453,040	190	0.27	50,446	0%	0	0	0	0
2000	0	453,040	173	0.25	46,012	0%	0	0	0	0
2001	0	453,040	158	0.23	41,968	0%	0	0	0	0
2002	0	453,040	144	0.21	38,279	0%	0	0	0	0
2003	0	453,040	131	0.19	34,915	0%	0	0	0	0
2004	0	453,040	120	0.17	31,846	0%	0	0	0	0
2005	0	453,040	109	0.16	29,047	0%	0	0	0	0
2006	0	453,040	100	0.14	26,494	0%	0	0	0	0
2007	0	453,040	91	0.13	24,165	0%	0	0	0	0
2008	0	453,040	83	0.12	22,041	0%	0	0	0	0
2009	0	453,040	76	0.11	20,104	0%	0	0	0	0
2010	0	453,040	69	0.10	18,337	70%	48	1.5	0.1	0
2011	0	453,040	63	0.09	16,725	70%	44	1.3	0.1	4,031
2012	0	453,040	57	0.08	15,255	70%	40	1.2	0.1	3,677
2013	0	453,040	52	0.08	13,914	70%	37	1.1	0.1	3,354
2014	0	453,040	48	0.07	12,691	70%	33	1.0	0.1	3,059
2015	0	453,040	44	0.06	11,576	70%	30	0.9	0.1	2,790
2016	0	453,040	40	0.06	10,558	70%	28	0.8	0.1	2,545
2017	0	453,040	36	0.05	9,630	70%	25	0.8	0.1	2,321
2018	0	453,040	33	0.05	8,784	70%	23	0.7	0.1	2,117
2019	0	453,040	30	0.04	8,012	70%	21	0.6	0.1	1,931
2020	0	453,040	27	0.04	7,308	70%	19	0.6	0.1	1,761
2021	0	453,040	25	0.04	6,665	70%	18	0.5	0.1	1,606
2022	0	453,040	23	0.03	6,079	70%	16	0.5	0.0	1,465
2023	0	453,040	21	0.03	5,545	70%	15	0.4	0.0	1,336
2024	0	453,040	19	0.03	5,058	70%	13	0.4	0.0	1,219
2025	0	453,040	17	0.02	4,613	70%	12	0.4	0.0	1,112
2026	0	453,040	16	0.02	4,208	70%	11	0.3	0.0	1,014
2027	0	453,040	14	0.02	3,838	70%	10	0.3	0.0	925
2028	0	453,040	13	0.02	3,501	70%	9	0.3	0.0	844
2029	0	453,040	12	0.02	3,193	70%	8	0.3	0.0	770
2030	0	453,040	11	0.02	2,912	70%	8	0.2	0.0	702

For E to D

**Johnston County, NC Phase V
Preliminary Gas Recovery Estimates**

Year	Disposal Rate (tons/yr)	Refuse In-Place (tons)	LFG Recovery Potential			LFG System Coverage (%)	LFG Recovery from Existing and Planned System			
			(scfm)	(mmcf/day)	(mmBtu/yr)		(scfm)	(MMBtu/hr)	(MW)	(MTCO2e/yr)
1997	45,502	45,502	0	0.00	0	0%	0	0	0	0
1998	79,428	124,930	46	0.07	12,223	0%	0	0	0	0
1999	95,761	220,691	122	0.18	32,484	0%	0	0	0	0
2000	92,141	312,832	208	0.30	55,352	0%	0	0	0	0
2001	91,475	404,307	283	0.41	75,237	0%	0	0	0	0
2002	95,430	499,737	350	0.50	93,196	0%	0	0	0	0
2003	50,274	550,010	416	0.60	110,639	0%	0	0	0	0
2004	0	550,010	430	0.62	114,418	0%	0	0	0	0
2005	0	550,010	392	0.57	104,362	0%	0	0	0	0
2006	0	550,010	358	0.52	95,189	0%	0	0	0	0
2007	0	550,010	326	0.47	86,822	0%	0	0	0	0
2008	0	550,010	298	0.43	79,191	0%	0	0	0	0
2009	0	550,010	272	0.39	72,230	0%	0	0	0	0
2010	0	550,010	248	0.36	65,882	0%	0	0	0	0
2011	0	550,010	226	0.33	60,091	85%	192	6	0.6	17,586
2012	0	550,010	206	0.30	54,809	85%	175	5	0.5	16,041
2013	0	550,010	188	0.27	49,992	85%	160	5	0.5	14,631
2014	0	550,010	171	0.25	45,598	85%	146	4	0.4	13,345
2015	0	550,010	156	0.23	41,590	85%	133	4	0.4	12,172
2016	0	550,010	143	0.21	37,935	85%	121	4	0.4	11,102
2017	0	550,010	130	0.19	34,600	85%	111	3	0.3	10,126
2018	0	550,010	119	0.17	31,559	85%	101	3	0.3	9,236
2019	0	550,010	108	0.16	28,785	85%	92	3	0.3	8,424
2020	0	550,010	99	0.14	26,255	85%	84	3	0.2	7,684
2021	0	550,010	90	0.13	23,947	85%	77	2	0.2	7,009
2022	0	550,010	82	0.12	21,843	85%	70	2.1	0.2	6,393
2023	0	550,010	75	0.11	19,923	85%	64	1.9	0.2	5,831
2024	0	550,010	68	0.10	18,172	85%	58	1.8	0.2	5,318
2025	0	550,010	62	0.09	16,574	85%	53	1.6	0.2	4,851
2026	0	550,010	57	0.08	15,118	85%	48	1.5	0.1	4,424
2027	0	550,010	52	0.07	13,789	85%	44	1.3	0.1	4,035
2028	0	550,010	47	0.07	12,577	85%	40	1.2	0.1	3,681
2029	0	550,010	43	0.06	11,471	85%	37	1.1	0.1	3,357
2030	0	550,010	39	0.06	10,463	85%	33	1.0	0.1	3,062

ATTACHMENT D

Leak Testing Guidelines

PIPE LEAK TESTING GUIDELINES

PIPE TESTING

- A. All PE pipes shall be subjected to an air test as described herein to detect any leaks in the piping. Testing shall be performed below grade (inside the trench). The CONTRACTOR shall be responsible for locating, uncovering (if previously backfilled), and repairing any leaks detected during testing.
- B. The pipe segment to be tested shall be allowed time to reach constant and/or ambient temperature before initiating the test.
- C. Tests shall be performed during periods when the pipe segments will be out of direct sunlight when possible; i.e., early morning, late evening, or cloudy days. This will reduce the pressure changes that will occur due to temperature fluctuations.
- D. The test pressure shall be 4 psig (110.8 inches, w.c.) and the CONTRACTOR shall use a digital gauge.
- E. Pressure drop during the test shall not exceed one percent of the testing gauge pressure over a period of one hour. This pressure drop shall be corrected for temperature changes before determining pass or failure. (See Section 3.10 for test failures). The ENGINEER shall sign off on the test form to indicate test compliance.
- F. The ENGINEER shall be notified prior to commencement of the testing procedure and shall be present during the test.
- G. Equipment for this testing procedure shall be furnished by the CONTRACTOR. This shall consist of a polyethylene flange adapter with a blind flange. Tapped and threaded into the blind flange will be a temperature gauge 0 to 100 degrees C; a Schraeder tire valve to facilitate pressurization with an air compressor hose; a ball valve to release pipe pressure upon completion of the test; and a pressure measuring device. The pressure measuring device shall be a digital manometer capable of measuring positive or differential pressures of air and other non-corrosive gasses over a range of 0 to 199.9 in-w.c., Model No. 475-3 (manufactured by Dwyer Instruments, Inc., 219-879-8000), or approved equal.

TEST FAILURE

- A. The following steps shall be performed when a pipe segment fails the one percent - one-hour test described in Section 3.9 F above.

1. The pipe and all fusions shall be inspected for cracks, pinholes, or perforations.
 2. All blocked risers and capped ends shall be inspected for leaks.
 3. Leaks shall be located and/or verified by applying a soapy water solution and observing soap bubble formation.
- A. All pipe and fused joint leaks shall be repaired by cutting out the leaking area and re-fusing the pipe.
- B. After all leaks are repaired, a retest shall be performed in accordance with Section 3.9.

END OF SECTION

From: [Mussler, Ed](#)
To: [Lamb, Steve;](#)
Subject: RE: LFGCCS project, Johnston County Landfill, Permit # 51-03
Date: Monday, February 28, 2011 11:11:50 AM

That is acceptable. Interim operation of the landfill gas system and flare has never been a question, and you have been the first to raise the issue. In the future we will make it clear that interim operation is acceptable pending submittal of the final documentation. Let us know if we can be of further assistance.

Ed Mussler

From: Lamb, Steve [mailto:SLamb@scsengineers.com]
Sent: Wednesday, February 23, 2011 5:45 PM
To: Mussler, Ed
Subject: LFGCCS project, Johnston County Landfill, Permit # 51-03

Ed:

Thanks for talking to me yesterday about the GCCS at Johnston County. As I mentioned on the phone, we take exception to some of the items in Ming's letter (attached).

As stated in Ming's letter..."Upon completion of the construction of LFGCCs, the SWS may grant the Landfill a final authorization to operate the constructed LFGCC system. This operating authorization will be issued pending receipt and approval of the following"

Although we are in agreement that all 6 of the items in his letter are important and will be submitted to the SWS, we feel the timely of said submittals is too restrictive, will add undue cost, and should not be required before operations. The primary concern with any GCCS is the operation of the flare, and the flare has a permit from the BAQ. For several reason, including safety, it is critical to operate the flare as soon as possible following completion of the GCCS.

What we propose is to submit items 1-6 within 4 weeks after system start up. We propose to operate the flare in accordance with its air permit as soon as construction is complete.

The project parties (Blue Source, Johnston County and SCS) are eager to begin construction on this voluntary GCCS. We hope you will consider our approach presented herein as reasonable and grant approval soon.

Thanks,

Steven C. Lamb, PE
Vice President
SCS Engineers
2520 Whitehall Park Drive, Suite 450
Charlotte, NC 28273

704-504-3107 - office
704-576-4731 - mobile

From: Morgan, J
Sent: Friday, February 18, 2011 11:16 AM
To: Lamb, Steve
Subject: Fw: approval of constructing LFGCCS project, Johnston County Landfill, Permit # 51-03

From: Chao, Ming-tai
To: Morgan, J
Cc: Whaley, Mary
Sent: Fri Feb 18 08:06:20 2011
Subject: approval of constructing LFGCCS project, Johnston County Landfill, Permit # 51-03
Dear Mr. Morgan:

Attached is the approval letter to permit Johnston County to construct the proposed landfill gas collection and control system (LFGCCs) at Johnston County Landfill Facility. The hard copy of the letter will be mailed to Mr. Broome today.

By the way, I am still waiting to receive the hard copy of revised permit modification application and full-size drawings of this LFGCCs project, which you planned to send to me two weeks ago. Have you sent them out yet?

Should have any questions of the permitting processes, please feel free to contact me.

Best regards,

Ming-Tai Chao, P.E.
Environmental Engineer II
Permitting Branch, Solid Waste Section
Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646
401 Oberlin Road, Suite 150, NC 27605
Tel: 919.508.8507, Fax 919.733.4810
ming.chao@ncdenr.gov
<http://portal.ncdenr.org/web/wm/sw>

E-mail correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties.

SCS ENGINEERS, PC

January 14, 2011
File No. 02210304.00

Mr. Ming-Tai Chao
NCDENR, Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699

Subject: Response to comments, Permit Modification
Johnson County Landfill Gas Collection and Control System Project

Dear Ming-Tai Chao:

A solid waste permit modification for the installation of a voluntary landfill gas collection and control system (GCCS) was submitted to the Division of Waste Management (DWM), Solid Waste Section (SWS) on behalf of the Johnson County MSW and C&D Landfill Facility (Landfill). The parties involved in the voluntary GCCS project include Blue Source and SCS Engineers (the "Development Team"). The Development Team will finance, design, permit, build, commission, own, operate, and maintain the voluntary GCCS. This project is a "design-build" project.

Previously in North Carolina similar voluntary GCCS projects have been developed with minimal comments from the SWS. Past projects only required the applicable air permit for the construction and operation of the flare in accordance with the Division of Air Quality (DAQ), and a straight forward notification to the SWS. Based on our experience with the previous similar projects, the response letter from the SWS for the Johnston County project indicates a more active and enhanced role by the SWS for voluntary GCCS projects. Several comments in your letter we take exception with and do not know the regulatory basis for such comments.

This is a voluntary greenhouse gas emission reduction project and the proper operation of the gas collection system is needed for it to be successful. Therefore, the County and the Development Team have an inherent interest in keeping the system operating properly.

This response letter has been reviewed and approved by Johnston County. We are planning to begin construction in January and trust our responses herein will allow this project to move forward in a timely manner.

Your comments (contained in a letter dated December 9, 2010) are provided below in *italics* followed by our responses in **bold**.

1. *(LFG Extraction Wells, on page 2) Please address the following comments:*

- i. *Provide the construction project specifications as appendices of the permit application. The specifications include, but not limited to, gas well installation (safety, provisions to handle obstruction while drilling, etc.) and completion (well logs and decontamination), the gas well abandonment/capping.*

As stated above this project is a design-build project and as such, written specifications were not prepared. SCS will construct this system in accordance with their internal safety procedures that have been developed through SCS's experience in the design and construction of these systems at hundreds of landfills nationwide.

- ii. *The wells located in the active filling area are expected to encounter leachate due to the vertical expansions at the existing phases in the future. Therefore, the coarse aggregates backfilled between the borehole and well casing must be tested of the calcium carbonate content and the grain size analysis to confirm the aggregate gradations. The maximum amount of the calcium carbonate content must be specified in the specification. The specification shall also include test methods and frequencies of the grain size analysis and measurement of calcium content.*

A grain size analysis is routinely performed by SCS on design-build projects. Grain-size testing may be performed as deemed necessary by the Certifying Engineer. A note that addresses grain size testing will be added to Drawing No. 4.

SCS is unaware of any LFG extraction well that was properly designed, installed, and maintained that has been impacted by leachate reacting with the well aggregate backfill. Based on review of the local aggregate supply, there is no concern with calcium carbonate content in the well backfill materials planned to be used. In our professional opinion, we do not feel testing the aggregate backfill for calcium carbonate content is needed.

This project is voluntary and only benefits the parties involved if it maximizes the safe recovery of LFG.

- iii. *Prior to installing extraction wells, if JCL is accepting and has accepted asbestos containing materials....report.*

The Health Hazards Control Unit of the Division of Public Health has been contacted and provided the required documentation. A copy of the documentation and approval will be included in the construction documentation report.

- iv. *In addition to the extraction gas wells, the coordinates of the other LFGCCs components including the alignment of the header pipe, buried control valves, and sumps must be surveyed by a surveyor licensed in the State of North Carolina; and the final locations must be presented in the as-built drawings. Please add these requirements to this section.*

Although we are unaware of any solid waste regulation that requires this survey, SCS will survey pertinent components of the GCCS. The components will be shown on the as-built drawings. GCCS components may be field located using GPS and/or the services of a licensed surveyor.

2. *(LFG Header and Lateral Piping on Page 3) Please address the following concerns:*

- i. *Please describe the estimated gas flow rates and capacities of the current and future LFGCCs based on the described SCS model.*

A calculation for sizing the proposed current primary header pipes has been added to the permit modification submittal. Calculations for future pipes are not available.

- ii. *Please describe the existing closure cover system at Phase 3 and 4 –clay liner, synthetic composite liner, or two-foot thick soil layer.*

Phase 3 was closed in accordance with the pre-1998 regulations with a 2-ft thick soil cover and a small top portion which includes a GCL.

Phase 4 does have a final cover system which consists of a flexible membrane liner (FML) covered by 18” of vegetative soil. No drilling will be performed in Phase 4. Pipe installation will only occur within the 18” soil layer.

- iii. *If the prescribed cover system (clay liner or synthetic composite liner) should be damaged while excavation of trench, what provisions (repair approaches, QC testing methods and frequencies, etc.) are there to ensure the final cover system can be properly restored? Please clarify.*

In the unlikely event the prescribed cover system is damaged in Phase 4, the final cover will be prepared in like and kind in accordance with the original design plans and CQA plans.

- iv. *Will the condensate flow by gravity in the header/lateral piping? If so, please specify the minimum pipe slope/gradient (post settlement).*

Yes, condensate will flow by gravity within the header/lateral piping. The typical slope is 3 percent. The minimum slope is 1 percent. A note has been added to Drawing 3 to clarify slope/gradient requirements.

Calculating potential settlement for purposes of LFG header/lateral design is cumbersome, burdensome, and does not guarantee future settlement will not impact condensate movement. If future settlement impacts the operation of the header/lateral pipe, the watered-in pipes will be repaired or replaced.

- v. *Please provide the specification for testing leakage and air-tightness of the solid piping (header and leachate/condensate piping).*

As previously stated technical specifications were not prepared for this project since it was structured to be a design/build project. The standard pressure testing guideline we use at SCS (and will use on this project also) is pressurizing gas and leachate piping to 5 psi for 4 hour. This procedure will be added as a note to Drawing 3.

- vi. *To mitigate nuisances (such as vector, odor, etc..) and maintain dry condition of the open trench, please specify (a) the maximum length of trench (such as 200 feet) may be opened in advance of pipe installation in the landfill units and (b) the open trench shall be backfilled at the end of each workday.*

The maximum length of trench open at one time will be limited to 1,000 feet. All trenches must be backfilled at the end of the day. Both of these guidelines are standards in the industry and will be followed by SCS during construction.

3. *(Condensate Management, on Page 3) Please address the following concerns:*

- i. *Does the sump pump have overflow alarm/prevention and auto shut off devices, which can't be found in the Condensate Sump Detail on Drawing No. 6 of 6?*

No.

- ii. *If the answer in the comment i in the subparagraph is "No". Please describe the spill prevention plan. The Phases 3 & 4 are unlined landfills; therefore, the condensate can't be drained back to the wastes in these two areas in compliance the requirement stated in Rule .1626(9)(a)(2).*

There is no spill prevention plan and in our professional opinion a spill prevention plan is not necessary because of the design of the sump. If the pump should fail, condensate will collect in the sump and eventually cause a "blockage" in the header pipe. The blockage will essentially prohibit landfill gas from moving through the sump; thereby stopping the production of condensate. The sump is deep enough to prevent the possibility to over flow with condensate.

- iii. *Pursuant to Rule .1626(9)(a)(2), the force mains inside the unlined landfill footprint must be dual contained. Please revise the context accordingly.*

We agree. A note was added to Drawing No. 3.

- iv. *Will there be scheduled or routine inspection of the condensate sump? This inspection plan can be incorporated into the existing Operations Plan.*

Prior to operating the GCCS, Johnston County will modify their existing Operations Plan to cover routine inspection activities for components of the GCCS in accordance with the solid waste regulations.

4. *(Blower/Flare Station, on page 3) Please describe the LFG control system and emergency shutdown of the system.*

SCS is not aware of this request from SWS on any previous GCCS installed in North Carolina. The flare manufacturer provides a comprehensive Operations and Maintenance Manual that contains information of the control systems, emergency shutdowns, and maintenance requirements. These manuals are extensive and specific to the system installed at the landfill.

The blower/flare station planned for this landfill will have a safety interlock system that will automatically shutdown the blower if no flame is present in the flare. Providing the complete system design and emergency shutdown procedures in this response would be extensive. When the blower/flare station is installed, a copy of the operation and maintenance manual, which includes emergency shut-down procedures, will be kept on-site.

The construction and operation of the flare is permitted through the NCDENR, Division of Air Quality. A copy of the Permit-to-Construct application and DAQ approvals will be included in the Construction Documentation Report.

5. *(Existing Permitted Cap, on page 4) The DWM records show the Phases 3 and 4 were originally proposed to close by constructed two-foot-thick soil. On August 4, 1998 DWM approved the alternative final cap design for Phases 3 and 4 which included for Phase 4, on top portions of the landfill, a geomembrane will be installed; for Phase 3, on the top portion, a GCL will be installed. Soil will be used on the side slopes. In 1999 the construction completed; and the deck portion of the Phase 3 cover system consisted of a GCL and drainage composite layer overlain by 18-inch thick top soil. Phase 4 cap consisted of 12-mil geomembrane overlain by 18-inch thick top soil. Based on the findings the SWS requests County address the following concerns:*

- i. *The plan proposes that the header pipe trench will be 2 to 3 feet deep and installed above the synthetic liner with the vegetative soil layer as described in this section, LFG Header and Lateral Piping” and on the “Pipe Trench Detail” – Drawing no. 5 of 6. Since the vegetation layer is approximately 18-inch thick, please explain how the proposal can be implemented in the field without damaging the liners?*

Where header pipe is installed over areas with final cover, the pipe will be installed above the FML or GCL, regardless of soil depth. Additional grading may be necessary in areas where the soil layer is approximately 18 inches to ensure proper storm water runoff and management.

- ii. *Since gas extraction wells will be installed in the Phase 3 & 4 areas, the synthetic cover systems (FML and GCL) will likely be penetrated, if wells are not located on side slope areas. Therefore, please provide details of the connections (boots) and seals around the well casing and liners on Drawing 4 of 6.*

No extraction wells are proposed in Phase 4. There are existing wells in this phase that will be used for LFG extraction. In addition, there are existing horizontal collectors installed underneath the Phase 4A bottom liner system that will be used for LFG extraction.

All wells installed in 3 will be located outside the final cover limits and no GCL will be penetrated.

- iii. If the portions of the liners are expected to be damaged or removed during the trench excavation, please provide specifications for restoration of cap (final cover) including material, construction procedures, & QA/QC testing (methods and frequency) which are consistent with the previously approved closure plans.*

No portion of the liners is expected to be damaged or removed during any activities associated with this project. If damage does occur, the liners will be repaired according to the design plans provided by RSG Engineers.

- 6. Please provide a section that describes how the operating LFGCCs and LFGTE project will properly be coordinated with the active fill operations. The section needs to include, but not limited to the following information:*

We do not feel adding a “section” to the permit modification submittal to address this comment should be required. We offer the following responses to provide clarity to the SWS:

- i. Restricted access and security to the blower/flare station, engines, and apparatus.*

The landfill is restricted to the public; therefore the GCCS will be restricted to the public.

A fence will be installed around the blower/flare station.

- ii. A detailed emergency response plan for a landfill fire and/or natural disaster. The plan should include provisions to train landfill employees in the proper response to a fire or inclement weather, specifically step to be taken concerning the LFGCCs and LFGTE.*

The blower/flare station is designed with an automatic safety interlock system that will shut the system down in case of irregular operation. Additionally, the blower/flare station will incorporate a system to alert the County, SCS field personnel, and BlueSource if a malfunction occurs. County Management personnel are trained in emergency response and crisis management.

- iii. Descriptions of how the presence of the gas collection system will be coordinated with the operation of the landfill units. For example, will gas well be vertical extended in the active cell in coordination with the fill operation in the future vertical expansion? Protection measures to be implemented to protect the wells from filing operation.*

The wells proposed for this project are at or near final grade. In the event a well needs to be raised, the well will be raised in accordance with industry standards and future well expansions will be coordinated with landfill operations.

- iv. *Descriptions of the routine maintenance requirements of the LFGCCs and LFGTE project.*

SCS is not aware of any regulation that requires the County to provide this information. Routine maintenance requirements are not available at this time.

The LFGTE project is still in the planning process, therefore no information is available at this time.

- v. *Descriptions of the party (County or the contractor) will be in charge of the operations of the LFGCCs and LFGTE and operator's credentials. If County will contact third party to operate & manage the LFGCCs and LFGTE, please describe the contractor responsibilities and contact information. it is advised that the SWS will hold the County responsible, as permittee of the landfill, for any problems or violations at the landfill, even if the problems or violations are performed by a contractor on the property.*

This information is not available at this time. Once the systems are constructed and operational, they will be operated by a qualified company. The County is aware of their responsibility as the permit holder for the Landfill.

- vi. *Record keeping requirements pertain to LFGCCs and LFGTE; records and reports must be placed in the facility operating records ready for agencies' audit.*

Record keeping requirements for the flare are stipulated in the Permit to Construct provided by NCDENR Division of Air Quality and will also be provided in the facility's Title V Air Operating Permit. All record keeping requirements contained in these documents will be maintained in accordance with the regulations.

SCS is not aware of any other regulation that requires record keeping for voluntary GCCS. Once the facility is under the jurisdiction of the NSPS, the NSPS record keeping requirements will be followed.

It should be noted that a sophisticated system control and data acquisition system is planned for this system to record numerous data in order to qualify for a greenhouse gas emission reduction project and for the Federal greenhouse gas monitoring requirements.

7. *Provide a section describe how the installation and presence of the LFGCCS will be coordinated with the closure of the existing units. Or, should the operating of LFGCCs be extended to the post-closure period of the landfill, the existing Post Closure Plan for JCL must be modified by adding a new plan defining the steps necessary to*

decommissioning the wells, piping (.), sumps, and the blower/flare station at the end of their useful life. The costs associated with the decommissioning activities must be added to the cost estimates for either closure or the post-closure cares. JC must rectify the final cost amounts in the annual financial assurance.

We do not feel adding a “section” to the permit modification submittal to address this comment should be required. We offer the following responses to provide clarity to the SWS:

When portions of the landfill are closed, the presence of the wells will be considered and proper engineering performed. At this time, it is not practical to address landfill closures for a GCCS installation.

Costs associated with the gas system will be added to the closure and the post closure financial assurance estimates by Johnston County, as needed, and in accordance with the solid waste regulations.

8. *Please describe the construction completion report which will be signed, sealed, and certified by a professional engineer registered in the State of North Carolina and submitted to the DWM after the project is completed. In a minimum the report must include:*
 - i. *Brief descriptions of the project activities, scheduled and all involved parties.*
 - ii. *Descriptions of variances or deviations from the proposed plan*
 - iii. *Copies of approval letters (including the one described in Comment No. 1.iii) and/or permit documents*
 - iv. *As-built drawings including survey coordinates of gas wells, valves, sumps and piping gradient.*
 - v. *Well completion logs and final well completion schedule.*
 - vi. *Certified pipe test results.*
 - vii. *QA/QC testing report for the cover restoration, if required.*
 - viii. *A series of color photographs to document the major project features.*
 - ix. *Operation, Maintenance, and Inspection Plan for LFGCCs and LFGTE.*
 - x. *Provide a schedule for submitting the construction completion report. The SWS suggests a 30-day after the construction is complete.*

A Construction Documentation Report will be prepared to include the above referenced items with the exception of comment ix. A Plan will be kept on site that includes information related to operation, maintenance, and inspection of the GCCS. As stated previously, nothing is available for the LFGTE yet.

Upon approval of the construction completion report, the SWS will grant County an authorization to operate LFGCCs and/or LFGTE.

The blower/flare station will be installed, constructed, and operated in accordance with the DAQ regulations and the facility's Title V Permit. We are not aware of any specific solid waste regulation that requires authorization by the SWS for operation of a voluntary GCCS.

From a practical standpoint, as soon as the GCCS is completed, it needs to be operated. The SWS cannot expect all of the contractors (electrical, flare, general) to leave the site, wait on approval from SWS to operate, and then re-mobilize back to the site weeks later to turn the system on.

It is our position that the flare can operated as soon as it is installed in accordance with the terms and conditions contained in the Permit to Construct issued by the NCDENR DAQ and waiting for "approval" of the Construction Documentation Report by the SWS is not needed.

9. *During the course of the project, what provision are there to prevent the disturbed soil cover from erosion due to stormwater runoff and to restore vegetation covers? Please clarify.*

SCS will prepare an Erosion & Sediment Control Plan prior to the construction of the project in accordance with local and State requirements. Standard E&S practices such as silt fencing will be used where needed. The Landfill has an E&S plan and has already implemented this plan for the entire Landfill facility.

10. *(Drawing No. 4 of 6) Please address the following concerns:*

- i. *Provide the proposed gas extraction wells – EW402, EW403, and EW404 data to the "Well Schedule" Table.*

EW402, EW403, and EW404 are existing wells, so adding data to the Well Schedule is not needed.

- ii. *In the "Well Schedule" Table, the data of "baseliner elevation" for the gas extraction wells – EW405 through EW412 are not provided (or not available) but the well depth of 41 feet is pre-selected for each above –mentioned well. It is advised that the assumption for selection the proposed well depth is noted on the drawing.*

Noted.

Mr. Ming-Tai Chao
January 14, 2011
Page 10

A revised permit modification submittal with the permit drawings will be submitted following your review on our responses. If additional information is still needed by the SWS, maybe a meeting to discuss these items would be more efficient. If there are any questions, please contact either of the undersigned at 704-504-3107.

Sincerely,



Steven C. Lamb, PE
Vice President
SCS ENGINEERS, PC



J Morgan, PE
Senior Project Professional
SCS ENGINEERS, PC

scl/jm

cc: Ed Mussler, DWM, SWS
Tim Broome, Johnston County
Rick Proctor, Johnston County
Annika Colston, Blue Source
Matt Wells, Blue Source
Guy Lewis, SCS Field Services

M:\PROJECT FILES\02210301.00 - BlueSource Johnston County\response to comments ver3 1.doc



MATRIX

Health & Safety Consultants, L.L.C.

April 27, 2011

Pierce Wu
SCS Field Services
11260 Roger Bacon Drive, Suite 300
Reston, VA 20190

RE: Johnston County Landfill

Dear Mr. Wu,

Please find enclosed, the laboratory results for the asbestos air samples collected for analysis. Samples were analyzed in accordance with NIOSH method 7400, Fourth Edition, Issue 2. A visual inspection of the work area was performed prior to the collection of clearance samples.

Sample concentrations at or below 0.01 fibers per cubic centimeter are considered to be "clean air" according to current EPA standards. The current OSHA permissible exposure limit is 0.1 fibers per cubic centimeter for an eight-hour time weighted exposure.

Matrix Health & Safety Consultants, L.L.C. is pleased to have provided our services for this project. If you have any questions, please do not hesitate to call (919) 833-2520.

Sincerely,

C. Britt Wester, CIH
Principal

Enclosures

Matrix Health & Safety Consultants, L.L.C.

2900 Yonkers Road, Raleigh, NC 27604

Phone - (919) 833-2520 Fax - (919) 882-9926

AIHA Proficiency Analytical Testing (PAT) Laboratory ID #164217.

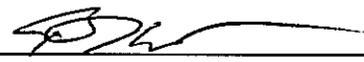
LABORATORY REPORT**ASBESTOS AIR SAMPLING DATA**SAMPLES ANALYZED IN ACCORDANCE WITH NIOSH
METHOD 7400, FOURTH EDITION.**Client:** SCS Field Services
11260 Roger Bacon Drive, Suite 300
Reston, VA 20190**Date Collected:** 4-26-2011**Date Analyzed:** 4-26-2011**Collected By:** John Pearson (#80735)**Lab Code:** A11180**Project Code:** 110459**Project:** Johnston County Landfill

FIELD ID.:	LAB. ID.:	VOLUME (liters)	COUNT (Fibers/Field)	DETECTION LIMIT	CONCENTRATION (Fibers/cc)
A-1 Drill Operator Ambient	111252	1386	9.0/ 100	0.002	0.003
A-2 Skid Steer Ambient	111253	1398	11.5/ 100	0.002	0.004
A-3 Downwind of Drill Sites Ambient	111254	1386	6.0/ 100	0.002	0.002
B-1 Field Blank	111255	BLANK	0.0/ 100		



John Pearson (#80735)

Analyst



C. Britt Wester, CIH (#90131)

Supervising Air Monitor

Matrix Health & Safety Consultants, L.L.C.

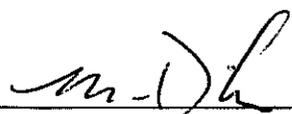
2900 Yonkers Road, Raleigh, NC 27604

Phone - (919) 833-2520 Fax - (919) 882-9926

AIHA Proficiency Analytical Testing (PAT) Laboratory ID #164217.

LABORATORY REPORT**ASBESTOS AIR SAMPLING DATA**SAMPLES ANALYZED IN ACCORDANCE WITH NIOSH
METHOD 7400, FOURTH EDITION.**Client:** SCS Field Services
11260 Roger Bacon Drive, Suite 300
Reston, VA 20190**Date Collected:** 4-27-2011**Date Analyzed:** 4-27-2011**Collected By:** Matt Dickens (#80695)**Lab Code:** A11179**Project Code:** 110459**Project :** Johnston County Landfill

FIELD ID.:	LAB. ID.:	VOLUME (liters)	COUNT (Fibers/Field)	DETECTION LIMIT	CONCENTRATION (Fibers/cc)
CL-01 Drill Operator Ambient	111248	876	4.5/ 100	0.003	< 0.003
CL-02 Downwind of Drill Sites Ambient	111249	876	6.0/ 100	0.003	0.003
CL-03 Skid Steer Ambient	111250	870	5.0/ 100	0.003	< 0.003
CL-04 Field Blank	1112501	BLANK	0.0/ 100		



Matt Dickens (#80695)

Analyst



C. Britt Wester, CIH (#90131)

Supervising Air Monitor

APPENDIX J
NESHAP Documentation

SCS ENGINEERS, PC

File No. 02210301.00
November 30, 2010

Mr. Jeff Dellinger
Industrial Hygiene Consultant
Health Hazards Control Unit
Division of Public Health – NCDHHS
1912 Mail Service Center
Raleigh, NC 27699

Re: Notification of Waste Disturbance
Johnson County Landfill
Air Permit No. 08844R04

Dear Mr. Dellinger:

Johnson County Landfill (Landfill) will be constructing a landfill gas collection and control system (GCCS) which will include the installation of up to 24 extraction wells, associated piping and a blower flare station. The Landfill is a MSW landfill located near Smithfield, NC.

The Landfill includes several waste disposal areas designated as Phase 1, 2, 3, 4, 4A, and 5. No activities are planned in Phases 1 and 2. Work in Phase 3 (drilling) may potentially encounter ACMs; therefore this notification. Work activities in Phase 4, 4A, and 5 will not encounter ACMs. For Phase 4 only pipe installation will occur within the existing soil cover. No waste will be encountered. In Phase 5 ACMs were only landfilled in the initial 10 feet of waste and the proposed wells will not encounter this waste (wells stop 15-feet from the bottom).

Therefore based on the above and in accordance with 40 CFR 61.154(j), Johnson County Landfill is providing this notification that waste disturbance which may encounter asbestos-containing material (ACM) will occur in Phase 3 at the Johnson County Landfill.

40CFR 61.154(j)(1) - *We anticipate drilling to start the week of January 17, 2011 and be completed by the week of January 31, 2011.*

40CFR 61.154(j)(2) - *The disturbance is a result of the upcoming drilling of boreholes associated with the installation of landfill gas extraction wells in Phase 3 of the landfill which is the only area where potential ASMs could be encountered.*

Each gas extraction well borehole will consist of a minimum 36-inch diameter well bore, each drilled to varying depths depending on the placement of refuse at that location. The well depths will range from 15 feet to 65 feet deep. These wells are needed facilitate the voluntary collection of landfill gas for a green energy project

40CFR 61.154(j)(3) - *Emissions will be controlled by keeping any suspected ACMs wet and moist during the excavation, storage, transport, and disposal.*

40CFR 61.154(j)(4) - *If ACMs are encountered in the drill cuttings, they will be loaded into a dump truck by the Contractor and hauled to the designated area about 100 feet away from the working face*



in accordance with the landfill's solid waste permit and operating plan. There will be no temporary storage areas for ACM used during drilling activities. The disposal location will be recorded by the County using a GPS, consistent with their current ACM tracking procedures.

The above items satisfy the requirements of 40 CFR 61.154(j). In addition to these items, the North Carolina Department of Health and Human Services (NCDHHS), Health Hazards Control unit has requested the following additional information:

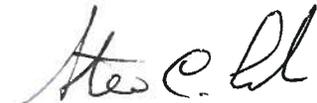
- The delegated authority will be the Health Hazards Control Unit, 1912 Mail Service Center, Raleigh, NC 27699. Attention: Jeff Dellinger (919) 707-5950.
- No ACMs will be removed from the site.
- There will also be some trenching on the landfill surface for the installation of landfill gas piping. Based on site records, regulated ACMs will not be encountered during pipe installation activities. Approximately 4,000 linear feet of pipe installation will occur in areas where there is no potential to encounter regulated ACMs. The approximate depth and width for trenching for pipe installation is 3 feet and 2 feet, respectively.
- This Plan will be kept on site throughout the duration of the project.
- Any regulated ACMs identified should be treated as if it was new regulated ACMs entering the landfill and existing procedures for handling, transporting, and disposal should be followed, as required by the following.
 - NESHAP – 40CFR 61
 - OSHA – 29CFR 1926.1101 and 29CFR 1910.1101
 - NC General Statutes – NC GS 130A, Article 19
 - NC Solid Waste Rules 15A NCAC 13B .1626 1(d)
- Both non-asbestos containing waste and suspect or known asbestos-containing waste will be disposed of at the landfill, at the direction of landfill personnel. The disposal locations will be decided during the pre-construction meeting with the contractor, owner and engineer.
- A Trained Asbestos Supervisor (TAS) will be onsite in the immediate vicinity of the drilling to oversee the work setup and maintenance. The TAS will setup the work area such that the Contractor and technicians are protected. The public does not have access to the work areas.
- The TAS will be a North Carolina accredited asbestos supervisor and will have completed the contractor/supervisor training course as outlined in EPA's Asbestos Model Accreditation Plan (40 CFR 763)
- An Accredited Asbestos Inspector (AAI) will be observing/inspecting excavated drill cuttings (i.e., waste) during drilling activities. If suspect material is observed, it will be placed adjacent to the borehole. The suspect waste will be loaded into a dump truck and properly landfilled as stated above.

- The AAI is a person who, at a minimum, is a NC Accredited Asbestos Inspector as outlined in the EPA's Asbestos Model Accreditation Plan.
- The following definitions contained in 40 CFR 61 were requested by NCDHHS to be included in this notification:
 - *Friable asbestos materials* means any material containing more than 1 percent asbestos as determined using the method specified in appendix E, subpart E, 40 CFR part 763, section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10 percent as determined by a method other than point counting by polarized light microscopy (PLM), verify the asbestos content by point counting using PLM.
 - *Regulated asbestos-containing material (RACM)* means (a) Friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations regulated by the subpart.
 - *Adequately wet* means sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions are observed coming from asbestos-containing material, then the materials has not been adequately wetted. However, the absence of visible emissions in not sufficient of being adequately wet.

If you have questions, please do not hesitate to contact either of the undersigned at (704) 504-3107.

Sincerely,


J. Morgan, PE
Senior Project Engineer
SCS ENGINEERS, PC

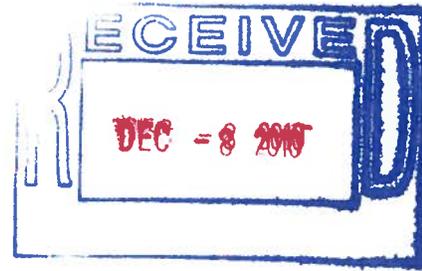

Steven C. Lamb, PE
Vice President
SCS ENGINEERS, PC

Enclosures

cc: Steven Vozzo, NCDENR (Fayetteville Regional Office)
Rick Proctor, Johnson County



North Carolina Department of Health and Human Services
Division of Public Health • Epidemiology Section
Occupational and Environmental Epidemiology Branch
1912 Mail Service Center • Raleigh, North Carolina 27699-1912
Tel 919-707-5950 • Fax 919-870-4808



Beverly Eaves Perdue, Governor
Lanier M. Cansler, Secretary

Jeffrey P. Engel, M.D.
State Health Director

December 6, 2010

Mr. J. Morgan, PE
SCS Engineers, PC
2520 Whitehall Park Drive
Suite 450
Charlotte, NC 28273-3557

Subject: Landfill Gas Collection at Johnson County Landfill

Dear Mr. Morgan:

We have reviewed your asbestos plan dated December 1, 2010, regarding the subject landfill. It is our understanding that the scope of work for this project is to expand the existing gas collection system by drilling in Phase 3. After reviewing your asbestos plan, we have the following comments that will need clarification before completing our review of the plan.

1. Provide the point of contact, company name, physical mailing address and telephone number for the actual landfill and landfill owner, general contractor, drilling contractor and other associated parties involved with this project.
2. Explain how the public will be protected from potential exposure during the activities which may disturb asbestos waste.
3. Clarify the need for barrier tape or signs needed in the regulated work area, where asbestos waste may be disturbed, to keep individuals who are not asbestos trained out of the regulated work area.
4. Clarify what level of asbestos training individuals inside the regulated work area will have.



North Carolina Public Health
Working for a healthier and safer North Carolina
Everywhere. Everyday. Everybody.



Location: 5505 Six Forks Road, 2nd Floor, Room D-1 • Raleigh, N.C. 27609

SCS Engineers, PC
Johnson County Landfill
Page 2
December 6, 2010

In closing, we look forward to working with your industry regarding the recycling of landfill gas while at the same time protecting the environment and the public from potential exposure to asbestos. If you have any questions about our comments, feel free to contact myself or Pat Wylie at (919) 707-5950.

Sincerely,



Jeffery W. Dellinger
Industrial Hygiene Consultant
Health Hazards Control Unit

Ed Mussler, NC DSWM
David Lipton, CIH, Interim Manager
Pat Wylie, IH Consultant

SCS ENGINEERS, P.C

File No. 02210301.00
February 1, 2011

Mr. Jeff Dellinger
Industrial Hygiene Consultant
Health Hazards Control Unit
Division of Public Health – NCDHHS
1912 Mail Service Center
Raleigh, NC 27699

Re: Notification of Waste Disturbance - Response to Comments
Johnston County Landfill
Air Permit No. 08844R04

Dear Mr. Dellinger:

Johnston County Landfill (Landfill) will be constructing a landfill gas collection and control system (GCCS) which will include the installation of up to 24 extraction wells, associated piping and a blower flare station. The Landfill is a MSW landfill located near Smithfield, NC.

In accordance with 40 CFR 61.154(j), Johnson County Landfill provided notification that waste disturbance which may encounter asbestos-containing material (ACM) will occur in Phase 3 at the Johnston County Landfill (SCS Letter to NCDHHS dated December 1, 2010). The NCDHHS had the following comments listed in italics below. The response to these comments is provided below in bold.

- 1. Provide the point of contact, company name, physical mailing address and telephone number for the actual landfill and landfill owner, general contractor, drilling contractor and other associated parties involved with this project.*

Site - Johnston County Landfill, Landfill Manger
Rick Proctor - (919) 938-4750
680 County Home Road, Smithfield, NC 27577

Landfill Owner - Johnston County, Director of Utilities and Engineering
Timothy G. Broome, P.E. - (919) 209-8333
309 E. Market Street, Smithfield, NC 27577

General Contractor – SCS Field Services, Project Manager
Guy Lewis - (703) 517-5594
11260 Roger Bacon Drive Suite 300, Reston VA, 20190

Driller - B&H Drilling Services, Project Manager
Bill Barter - (954) 614.0492
7180 SW 18th St., Plantation, FL 33317



2. *Explain how the public will be protected from potential exposure during the activities which may disturb asbestos waste.*

The landfill is a restricted access area which prevents the public access to the landfill and working area within the landfill. Further emissions will be controlled by keeping any suspected ACMs wet and moist during the excavation, storage, transport, and disposal.

3. *Clarify the need for barrier tape or signs needed in the regulated work area, where asbestos waste may be disturbed, to keep individuals who are not asbestos trained out of the regulated work area.*

A Trained Asbestos Supervisor (TAS) will be onsite in the immediate vicinity of the drilling to oversee the work setup and maintenance. The TAS will setup the work area such that the Contractor and technicians are protected. Individuals who are not asbestos trained will not be allowed within 50-feet of the drilling activities.

4. *Clarify what level of asbestos training individuals inside the regulated work area will have.*

The Contractor's onsite personnel will have OSHA class III asbestos training. The Contractor's supervisor onsite will have 40 hour asbestos supervisor training. Further a Trained Asbestos Supervisor (TAS) will be onsite in the immediate vicinity of the drilling to oversee the work setup and maintenance. The TAS will setup the work area such that the Contractor and technicians are protected

If you have questions, please do not hesitate to contact either of the undersigned at (704) 504-3107.

Sincerely,



J Morgan, PE
Senior Project Engineer
SCS ENGINEERS, PC



Steven C. Lamb, PE
Vice President
SCS ENGINEERS, PC

Enclosures

cc: Steven Vozzo, NCDENR (Fayetteville Regional Office)
Rick Proctor, Johnston County
Guy Lewis, SCS Field Services

From: Dellinger, Jeff [jeff.dellinger@dhhs.nc.gov]
Sent: Wednesday, April 13, 2011 9:41 AM
To: Morgan, J
Subject: Johnson County Landfill Gas Collection
Hey Jay:

After looking at your revision dated February 4, 2011, for the subject landfill, I have no other comments.

Please proceed with this subject project.

Thanks
Jeff

Please note my new email address. It has changed to jeff.dellinger@dhhs.nc.gov

Jeffery W. Dellinger
Industrial Hygiene Consultant
Health Hazards Control Unit
Division of Public Health, NC DHHS
1912 Mail Service Center
Raleigh, NC 27699-1912
Phone: (919) 707-5972 Fax (919) 870-4808

Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties by an authorized State official. Unauthorized disclosure of juvenile, health, legally privileged, or otherwise confidential information, including confidential information relating to an ongoing State procurement effort, is prohibited by law. If you have received this e-mail in error, please notify the sender immediately and delete all records of this e-mail.