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April 13, 2016

Mr. Eric Syftestad
Wisconsin Department of Natural Resources
Waste Management Engineer
3911 Fish Hatchery Road
Fitchburg, WI 53711

Re: Marathon County Landfill – Area A Landfill (License No. 2892)
2015 Annual Solid Waste Report

Dear Mr. Syftestad:

On behalf of the Marathon County Solid Waste Department (Marathon County) Cornerstone Environmental Group, LLC (Cornerstone) is hereby submitting four (4) copies (three paper and one electronic) of the 2015 Annual Solid Waste Report for the Area A Landfill (Area A) of the Marathon County Landfill. This Annual Solid Waste Report is being submitted in accordance with the approved plan of operation for Area A.

If you have any questions or comments regarding this Annual Solid Waste Report do not hesitate to contact Mr. Mike Melan at (630) 633-5841 or Ms. Meleesa Johnson at (715) 466-3101 ext 104.

Sincerely,

Cornerstone Environmental Group, LLC

Benjamin Hintz
Project Scientist

Enclosure: As Noted

cc: Marathon County Landfill (File Copies)
Michael Melan – Cornerstone Environmental Group, LLC

Marathon County Solid Waste Department
Area A Landfill
2015 ANNUAL REPORT

WDNR License No. 2892
FID 737092730

Marathon County Solid Waste Management Department
R18500 Highway 29
Ringle, WI 54471
Phone 715-446-3101
Director: X104
Operations Manager: 715-551-5864
Business Office: X100
Environmental Technician: X101
Scale: X103

Solid Waste & Recycling Information Line: 877-270-3989

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marathoncountysolidwaste

Staff, Consultants & Contractors

Marathon County Solid Waste Department Staff:

- Meleesa Johnson-Director
- David Hagenbucher-Operations Manager
- Diane Borchardt-Scale Operator
- Ron Smith-Environmental Technician
- Julie Groshek-Accounting Specialist
- Chris Wickman-Equipment Maintenance Specialist
- Kevin Steinke-Equipment Operator
- Eric Olson-Eqiupment Operator
- Alex Thomas-Intern
- Carson Pethan-Intern
- Dave Vitt-Intern
- Chris Wood-Seasonal Field Assistant

Engineering Consultants:

- Mike Michels
  Cornerstone Environmental Group, LLC
  8413 Excelsior Drive, Suite 160
  Madison, WI 53717
- Michael Melan
  Cornerstone Environmental Group, LLC
  435 E Mill Street, Suite 15
  Plymouth, WI 53073
- Cyndi Neitzel
  Cornerstone Environmental Group, LLC
  435 E Mill Street, Suite 15
  Plymouth, WI 53073

Contractors:

- Northern Lakes Service, Inc.
  400 North Lake Avenue
  Crandon, WI 54520
- Northern Pipe Equipment, Inc.
  1722 County Road QQ
  Green Bay, WI 54311
- Walt's Petroleum Services, Inc.
  5207 E. Jelinek Avenue
  Schofield, WI 54476

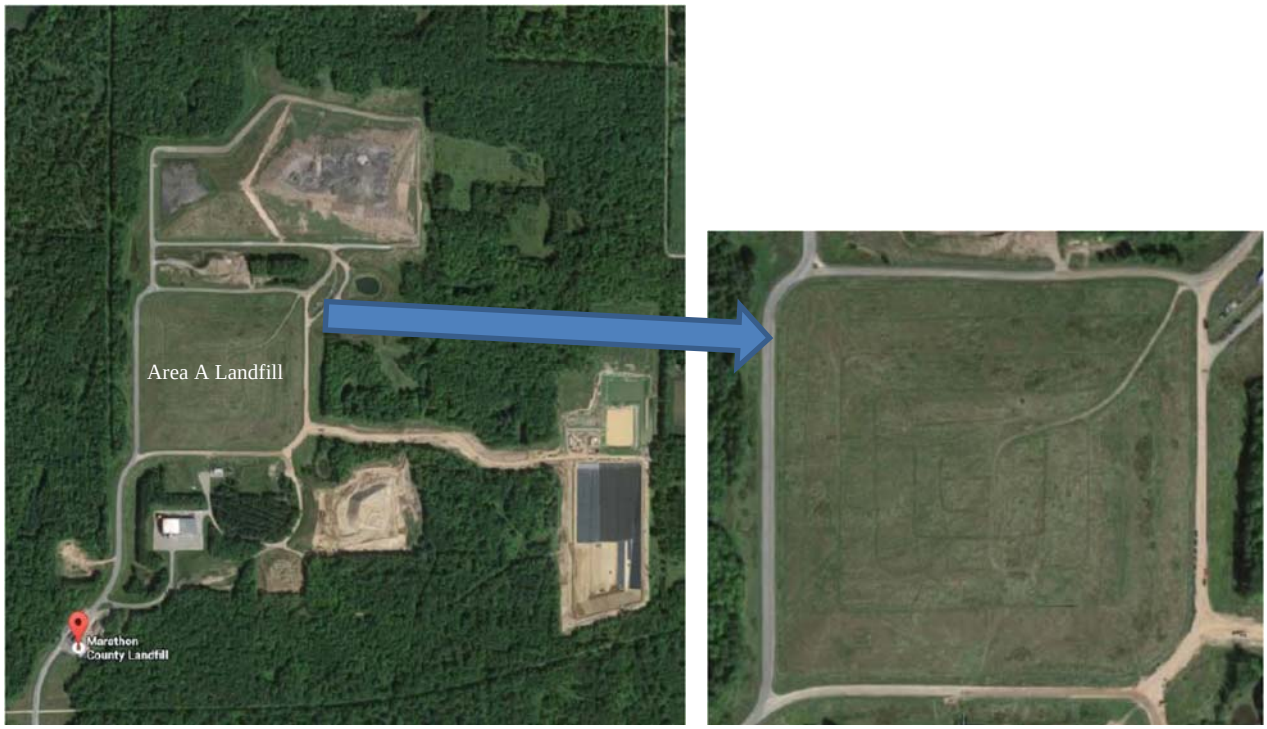
Introduction

This report provides information about site conditions on, work conducted at and other activities related to, the closed Area A Landfill (Area A). This report is intended to meet the intent and spirit of the annual reporting requirements found in approval documents for Area A.

Area A Historical Information

Area A is a 27.3-acre closed landfill. It is owned and operated by Marathon County Solid Waste Department (MCSWD). This facility accepted and disposed of waste from December 1980 until December 1993. In 1994 closure was conducted according to approved methods. During active fill operations a variety of waste materials were accepted including residential and commercial waste, high-volume industrial wastes and other miscellaneous materials.

MCSWD staff and various contracted firms have in the past and will continue to work collaboratively to ensure post-operations/post-closure activities are conducted in accordance with all required long-term care approvals. This includes, but is not limited to, operation of and maintenance of the following systems: final cover, storm water, gas and condensate, leachate collection, and groundwater monitoring.



Site Activities

The Area A is a closed landfill and, as such, did not accept waste during 2015. However, as is required by their permit or law, general maintenance and management of the post-closure facility was conducted. This included:

- Monthly visual inspections of the final cap surface
- Inspections of storm water management pathways
- Removal of obstructions or repair to storm water pathways
- Mowing pathways for surface emission monitoring work
- General mowing to control for woody herbaceous growth
- Snow plowing of access roads
- Grading and dust management of access roads
- Preventative maintenance on gas system and leachate pumping system

The condition of the surface area and final cover are good. There is no damage or compromising of the final cover. There are no slumps or subsidence, other than the normal gradual undulations. No leachate seeps exist. Vegetation consists of dense mixed grasses including rye, fescues and sedges. Some wildflowers, both native and invasive, are evident, but not abundant. The plant growth continues to look acceptable and no bare spots or other problems were noted. Wildlife species such as deer, fox, coyote, rabbits and many types of birds use the ecosystem of Area A for cover and as a source of food. The cover is inspected regularly for damage caused by wildlife and corrected, if needed.

Gas Collection System

Area A is situated near the center of the 532 acre facility boundaries. The landfill is located north of the facility's gas recovery building. An active gas system, consisting of blowers and other equipment, has been extracting landfill gas from this landfill since 1989.

Most of the Area A gas piping was installed during a ten-year period from 1984 through 1993, with additions made in 2003, 2004 and 2009. Gas, once extracted from the landfill, is funneled to the gas recovery building by way of a large header pipe. Vacuum to the wellfield is regulated by the variable frequency drive (VFD) at the blower station that controls the gas collection and control system (GCCS).

Landfill gas emissions from Area A are regulated under and in accordance with Air Pollution Control Operation Permit 737092730-P11 (expired December 30, 2015) and renewed Air Pollution Control Operation Permit 737092730-P20 (issued November 2, 2015 as a renewal for Permit No. 737092730-P11).

Sensing devices at the facility gas plant measure gas flow rates, pressures and vacuums, as well as methane and oxygen concentrations. Data is recorded and stored on a computerized system. This data is used for reporting and operating purposes.

Data indicates that the gas collection system operated ninety-nine point five percent (99.5%) of the year, or 8720 hours of operation. The average aggregated flow rate, for both Area A and Area B, was 667.31 standard cubic feet per minute (scfm), of this Area A contributed an average of 60 scfm. Methane and oxygen concentrations of landfill gas averaged, by volume, 50.28% for methane and 0.34% oxygen. Total gas collected for 2015 was 349,137,218.69 standard cubic feet (scf), of this total Area A contributed 31,391,757.33 scf. Of the facility total 335,438,192.99scf was used for production of electricity and 13,699,025.70 scf was sent to the flare.

Marathon County Landfill 2015 Gas Collection Summary (Includes Area A and Area B)

2015	Average flow (SCFM)	Monthly total flow (SCFM)	To Electrical Production (SCFM)	To Flare (SCFM)	Average Vacuum to Wellfield (Inches SC)
Jan	700.9	31,288,466.74	28,461,003.05	2,827,463.69	26.44
Feb	709.8	28,617,199.44	28,021,147.90	596,051.54	27.50
March	725.0	32,362,397.17	32,163,827.77	198,569.40	27.97
April	699.5	30,216,401.22	29,977,338.88	239,062.34	28.92
May	647.9	28,920,842.88	26,820,199.36	2,100,643.52	28.80
June	621.1	26,829,800.57	26,441,175.67	388,624.90	28.55
July	638.3	28,493,232.64	28,041,088.16	452,144.48	28.34
August	630.6	28,151,543.19	27,926,015.65	225,527.54	28.06
Sept	608.2	26,273,019.00	25,968,724.64	304,294.36	28.53
Oct	686.6	30,648,553.62	28,990,252.13	1,658,301.49	27.26
Nov	677.8	29,280,542.58	26,603,030.92	2,677,511.66	28.61
Dec	628.5	28,055,219.64	26,024,388.86	2,030,830.78	29.77

Below is a chart listing average monthly and annual methane (CH4), oxygen (O2) and hydrogen sulfide (H2S) concentrations.

2015	CH4 %	O2 %
Jan	51.97	0.21
Feb	50.35	0.29
March	49.33	0.5
April	49.28	0.51
May	50.23	0.38
June	51.48	0.25
July	48.35	0.48
August	48.64	0.44
Sept	50.89	0.19
Oct	48.08	0.39
Nov	52.36	0.14
Dec	52.37	0.35
Averages	50.28	0.34

As indicated previously, the gas system operated nearly continuously. Any shutdowns, whether for planned maintenance or unplanned events, resulted in proper and lawful notification to the Wisconsin Department of Natural Resources (WDNR) Air Management staff. The January to June Semiannual Report and July to December Semiannual Report for Area A include descriptions of GCCS and control device shutdown events, GCCS and control device malfunctions, and continuous monitoring device malfunctions.

Surface Emission Monitoring

Surface emission monitoring (SEM) of Area A was conducted on June 17, 2015. No exceedances were detected. Permit compliance condition I.A.9.e allows for annual SEM once "any closed landfill…has no monitored exceedances of the operational standard in three consecutive quarterly monitoring

periods…" Since Area A did not experience a SEM exceedance over the past three consecutive quarters, MCSWD is allowed to conduct annual SEM monitoring on Area A.

For all SEM events, a photoionization detector (PID) is used, with MCSWD's environmental technician walking a serpentine pattern across the surface of the landfill.

Soil Gas Monitoring

During 2015 the soil gas probes were monitored quarterly for relative pressure, methane (CH4), oxygen (02), and soil gas pressure. In 2015, these monitoring results indicated no gas migration.

First Quarter Probe Data (February 20, 2015):

Gas Probe [Depth in feet]	Location	Methane (%CH4 by Vol.)	Oxygen (%O2 by Vol.)	Pressure (inch W.C.)	Notes:
WDNR Param #		85547	85550	46389	WDNR ID No.
Area A Probes	Lic. 2892				
G-1R [10']	E Area A	0	20.1	0	700
G-3R [15']	W Area A	0	22	0	704
G-4R [5']	W Area A	0	22.5	0	709
G-9 [9']	W Area A	0	22.7	0	720
G-11 [10']	S Area A	0	20	0	724
G-12 [10']	S Area A	0	19.1	0	726

Second Quarter Probe Data (May 29, 2015):

Gas Probe [Depth in feet]	Location	Methane (%CH4 by Vol.)	Oxygen (%O2 by Vol.)	Pressure (inch W.C.)	Notes:
WDNR Param #		85547	85550	46389	WDNR ID No.
Area A Probes	Lic. 2892				
G-1R [10']	E Area A	0.0	18.5	0.0	700
G-3R [15']	W Area A	0.0	18.5	0.0	704
G-4R [5']	W Area A	0.0	17.6	0.0	709
G-9 [9']	W Area A	0.0	17.4	0.0	720
G-11 [10']	S Area A	0.0	16.8	0.0	724
G-12 [10']	S Area A	0.0	16.2	0.0	726

Third Quarter Probe Data (August 26, 2015):

Gas Probe [Depth in feet]	Location	Methane (%CH4 by Vol.)	Oxygen (%O2 by Vol.)	Pressure (inch W.C.)	Notes:
WDNR Param #		85547	85550	46389	WDNR ID No.
Area A Probes	Lic. 2892				
G-1R [10']	E Area A	0.0	21.0	-0.04	700
G-3R [15']	W Area A	0.0	21.0	-0.02	704
G-4R [5']	W Area A	0.0	19.9	0.06	709
G-9 [9']	W Area A	0.0	20.5	0.03	720
G-11 [10']	S Area A	0.0	20.6	-0.04	724
G-12 [10']	S Area A	0.0	20.8	-0.05	726

Fourth Quarter Probe Data (November 3, 2015):

Gas Probe [Depth in feet]	Location	Methane (%CH4 by Vol.)	Oxygen (%O2 by Vol.)	Pressure (inch W.C.)	Notes:
WDNR Param #		85547	85550	46389	WDNR ID No.
Area A Probes	Lic. 2892				
G-1R [10']	E Area A	0.0	20.9	0.0	700
G-3R [15']	W Area A	0.0	21.0	0.0	704
G-4R [5']	W Area A	0.1	20.4	0.0	709
G-9 [9']	W Area A	0.1	19.8	0.0	720
G-11 [10']	S Area A	0.0	20.8	0.0	724
G-12 [10']	S Area A	0.0	20.8	0.0	726

Gas Sampling Data

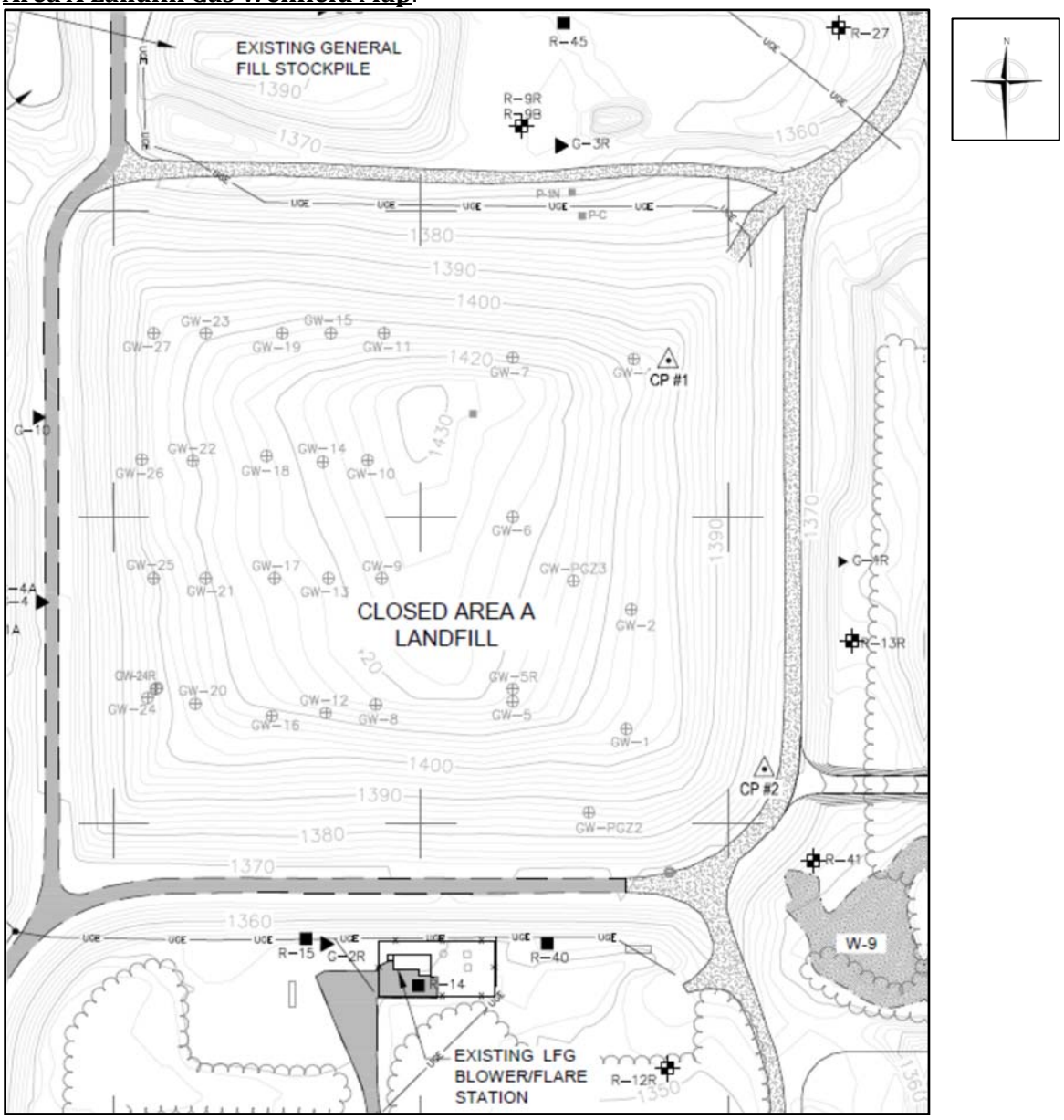
On August 24, 2015 MCSWD's environmental technician used a summa canister to collect a sample of landfill gas. The canister was shipped via express mail services to Air Technology Labs, Inc. in City of Industry, California for analyses of volatile organic compounds. The test method used was United States Environmental Protection Agency (EPA) test method TO-15, Determination of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters and Analyzed by Gas Chromatography/ Mass Spectrometry (GC/MS). Gas sampling results are summarized in the below table.

2015 Landfill Gas Sampling Results for VOCs

EPA Method TO15			
Date/Time Samples			8/24/2015 8:10am
Date/Time Analyzed			8/27/2015 9:31pm
Analyte	CAS Number	Result (ug/L)	Reporting Limit (ug/L)
Dichlorodifluoromethane (12)	75-71-8	2.6	0.14
Chloromethane	74-87-3	0.18	0.12
1,2-Cl-1,1,2,2-F ethane (114)	76-14-2	0.41	0.20
Vinyl Chloride	75-01-4	1.7	0.072
Bromomethane	74-83-9	0.18	0.11
Chloroethane	75-00-3	0.39	0.074
Trichlorofluoromethane (11)	75-69-4	0.56	0.16
1,1-Dichloroethene	75-35-4	ND	0.11
Carbon Disulfide	75-15-0	2.1	0.44
1,1,2-Cl 1,2,2-F ethane (113)	76-13-1	ND	0.22
Acetone	67-64-1	5.6	0.33
Methylene Chloride	75-09-2	0.10	0.098
t-1,2-Dichloroethene	156-60-5	0.17	0.11
1,1-Dichloroethane	75-34-3	0.22	0.11
Vinyl Acetate	108-05-4	ND	0.49
c-1,2-Dichloroethene	156-59-2	1.7	0.11
2-Butanone	78-93-3	6.5	0.083
t-Butyl Methyl Ether (MTBE)	1634-04-4	0.19	0.10
Chloroform	67-66-3	ND	0.14
1,1,1-Trichloroethane	71-55-6	ND	0.15
Carbon Tetrachloride	56-23-5	ND	0.18
Benzene	71-43-2	3.1	0.090
1,2-Dichloroethane	107-06-2	0.52	0.11
Trichloroethene	79-01-6	0.42	0.15
1,2-Dichloropropane	78-87-5	ND	0.13
Bromodichloromethane	75-27-4	ND	0.19
c-1,3-Dichloropropene	10061-01-5	ND	0.13
4-Methyl-2-Pentanone	108-10-1	3.1	0.12
Toluene	108-88-3	26	0.11
t-1,3-Dichloropropene	10061-02-6	ND	0.13
1,1,2-Trichloroethane	79-00-5	ND	0.15
Tetrachloroethene	127-18-4	0.77	0.19
2-Hexanone	591-78-6	ND	0.12
Dibromochloromethane	124-48-1	ND	0.24
1,2-Dibromoethane	106-93-4	ND	0.22
Chlorobenzene	108-90-7	0.39	0.13
Ethylbenzene	100-41-4	9.5	0.12
p,&m-Xylene	M/P-XYLENE	13	0.12
o-Xylene	95-47-6	3.5	0.12
Styrene	100-42-5	0.36	0.12
Bromoform	75-25-2	ND	0.29
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.39

Benzyl Chloride	100-44-7	ND	0.15
EPA Method TO15			
Date/Time Samples			8/24/2015 8:10am
Date/Time Analyzed			8/27/2015 9:31pm
Analyte	CAS Number	Result (ug/L)	Reporting Limit (ug/L)
4-Ethyl Toluene	622-96-8	0.54	0.14
1,3,5-Trimethylbenzene	108-67-8	ND	0.28
1,2,4-Trimethylbenzene	95-63-6	ND	0.28
1,3-Dichlorobenzene	541-73-1	ND	0.17
1,4-Dichlorobenzene	106-46-7	ND	0.17
1,2-Dichlorobenzene	95-50-1	ND	0.17
1,2,4-Trichlorobenzene	120-82-1	ND	0.42
Hexachlorobutadiene	87-68-3	ND	0.30

Area A Landfill Gas Wellfield Map:



Leachate Management:

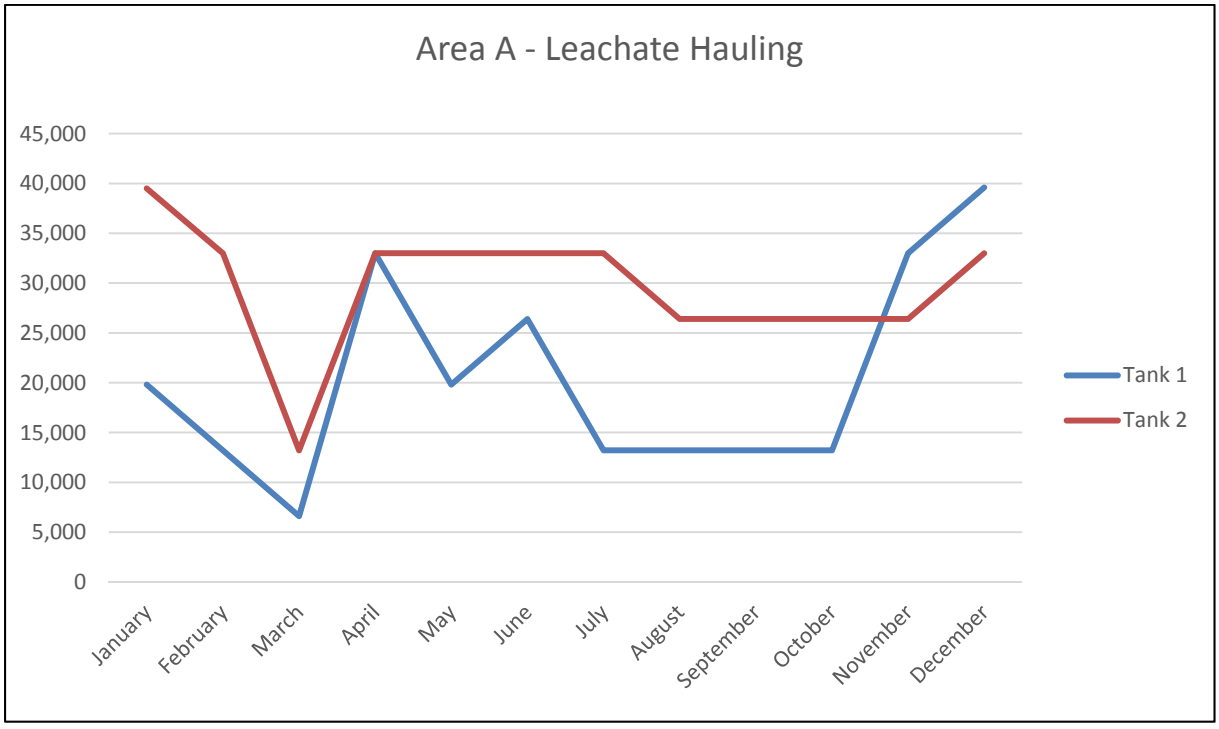
The Area A leachate collection system captures all liquids from the landfill and the liquids drain by gravity to the holding tank system. Leachate is collected through a series of perforated pipes and is delivered to one of two double-walled steel, underground storage tanks. Tank 1 has a 20,000-gallon capacity and Tank 2 has a 25,000-gallon tank.

Leachate tank levels are checked daily by the contract operator and throughout the week by the site facility supervisor and environmental technicians.

Preventative maintenance of the leachate storage and pumping system was conducted, as needed, by on-site operations contractor or other tank and pump specialists when required. Unplanned repairs were performed by the most available, qualified tank and pump specialists.

Total volume of leachate collected/transported/treated are as follows:

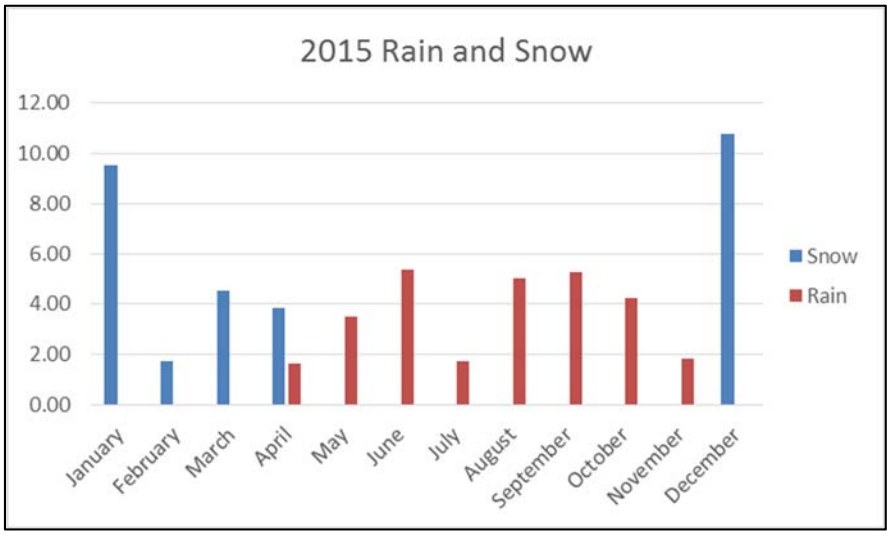
2015	Tank 1	Tank 2
January	19,800	39,500
February	13,200	33,000
March	6,600	13,200
April	33,000	33,000
May	19,800	33,000
June	26,400	33,000
July	13,200	33,000
August	13,200	26,400
September	13,200	26,400
October	13,200	26,400
November	33,000	26,400
December	39,600	33,000
Total	244,200	356,300

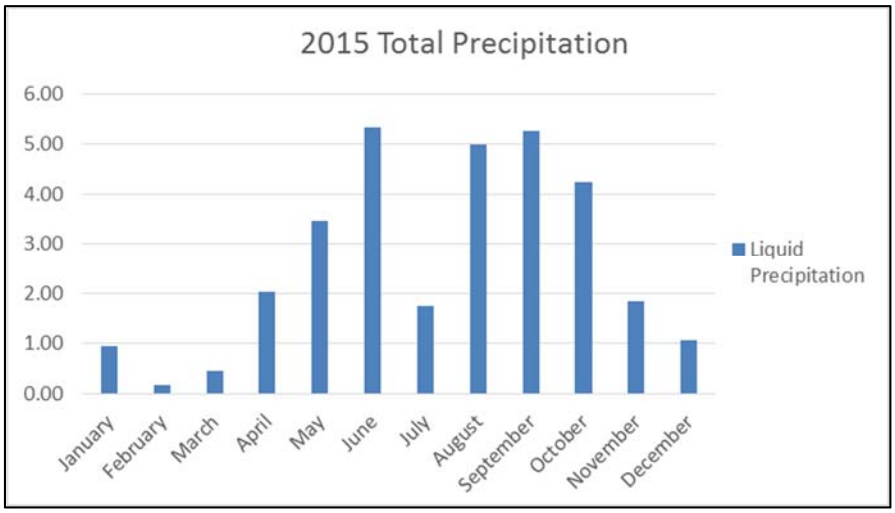


Precipitation:

2015 Precipitation Totals			
Month	Snow (inches)	Rain (inches)	Liquid Precipitation* (inches)
January	9.55		0.96
February	1.75		0.18
March	4.50		0.45
April	3.84	1.65	2.03
May		3.48	3.48
June		5.33	5.33
July		1.75	1.75
August		5.00	5.00
September		5.25	5.25
October		4.25	4.25
November		1.85	1.85
December	10.75		1.08
Total	30.39	28.55	31.59

**Snow converted to liquid precipitation by dividing by 10*





Leachate Collection Piping

On July 6, 2015 Northern Pipe Equipment, Inc. of Green Bay, Wisconsin, water jetted the Area A leachate lines with a total of 2,900 gallons of water. With the exception of access points 1 and 7, leachate pipelines were fully jetted. These two collection lines will be addressed in the next round of jetting in 2016. Jetting was accomplished by accessing pipes from both ends for cleaning to overlap in the center or jetting the full length from one access point. The results/findings are:

MARATHON COUNTY LANDFIL
LEACHATE PIPE CLEANOUT RECORDS

DATE: July, 6,2015
CONTRACTOR NAME: Northern Pipe Equipment, Inc.
CONTRACTOR PHONE: 920.468.7074
EQUIPMENT USED: #36 Vac-Con w/ 1,200 ft. 3/4" hose

AREA A

CLEANOUT ACCESS POINT	PIPE SIZE	PIPE LENGTH (FT)	FT. JETTED SOUTH	FT. JETTED NORTH	COMMENTS
1	8"	1180	285	582	Jetter stops ; Hard deposits on both sides
2	6"	1040	750	340	Jetter stops on South side ; North side no problems ; Achieved overlap
3	6"	1040	1040	0	Whole line from South ; No problems
4	8"	1180	925	355	Jetter stops on South side ; North side no problems ; Achieved overlap
5	6"	1040	825	315	Jetter stops on South side ; North side no problems ; Achieved overlap
6	6"	1040	600	540	Jetter stops on South side ; North side no problems ; Achieved overlap
7	8"	460	92	0	Jetter stops
Gas Condensate Line		280	280		-

Leachate Sampling

Leachate sampling and analytical analysis was conducted in April and October 2015 by Northern Lake Services (NLS). Sampling results of volatile organic compounds, submitted electronically to the WDNR Groundwater and Environmental Monitoring System (GEMS) database, show a wide variety of compounds present. Conductivity and pH values obtained are summarized below.

Leachate tank sampling conductivity results are as follows;

Tank 1

April	4290 umho/cm
October	5390 umho/cm

Tank 2

April	4520 umho/cm
October	5430 umho/cm

Analyses show leachate presents as slightly basic to neutral.

Tank 1

April	7.22 ph
October	7.30 ph

Tank 2

April	7.37 ph
October	7.43 ph

Leachate Level Monitoring

The reported leachate levels are as follows:

Area A - 2015	LHW1	LHW2	LHW3	LHW4D	LHW4M	LHW4S	P5*	P6*	P7*	P8*
Measured Pipe Length to Bottom 2007-8 (ft) (P)	56.26	58.53	63.7	67.5	47.65	33.6	67.7	52.25	68.8	59.8
Bottom of Pipe Elevation				1356	1375.8	1390				
Screen Length (ft)	20	20	20	1.5	1.5	1.5				
Date:	Depth to Liquid (ft)	Depth to Liquid (ft)	Depth to Liquid (ft)	Depth to Liquid (ft)	Depth to Liquid (ft)	Depth to Liquid (ft)	Depth to Liquid (ft)	Depth to Liquid (ft)	Depth to Liquid (ft)	Depth to Liquid (ft)
1/28/2015	35.3	34.5	44.5	45.3	38.9	Dry	Frozen	Frozen	Frozen	Frozen
2/16/2015	35.5	34.5	44.6	45.4	38.8	Dry	Frozen	Frozen	Frozen	Frozen
3/12/2015	37.8	36.1	48.1	45.7	41.2	Dry	Frozen	Frozen	Frozen	Frozen
4/22/2015	37.7	35.3	47.4	45.6	41.3	Dry	Frozen	Frozen	Frozen	Frozen
5/27/2015	37.6	34.7	46.3	45.4	41.5	Dry	Dry	Dry	66.6**	Dry
6/8/2015	37.5	34.5	46.1	45.2	41.4	Dry	Dry	Dry	66.6**	Dry
7/31/2015	36.4	34.4	43.6	45.5	41.6	Dry	Dry	Dry	Dry	Dry
8/26/2015	36.2	34.6	43.8	45.9	41.8	Dry	Dry	Dry	Dry	Dry
9/25/2015	36.3	35.2	44	46.2	42	Dry	Dry	Dry	Dry	Dry
10/26/2015	19.9	22.1	19.8	21.1	5.6	Dry	Dry	Dry	Dry	Dry
11/30/2015	35.8	34.5	43	45.6	41.8	Dry	Dry	Dry	Dry	Dry
12/2/2015	35.8	34.4	43	45.5	41.8	Dry	Dry	Dry	Dry	Dry

LHW - Leachate Head Well, monitoring pipe within Area A waste mass

*P's are monitoring pipes on the side slopes

**Due to point being located on a side slope the depth to liquid of 66.6' with a remaining 2.2' to bottom of pipe is not representative of the vertical depth. Depth of liquid when the side slope is accounted for is 0.7'

	1/28/2015	2/16/2015	3/12/2015	4/22/2015	5/27/2015	6/8/2015	7/31/2015	8/27/2015	9/25/2015	10/26/2015	11/30/2015	12/2/2015
SW1	18"	20"	27" of snow	32"	22"	23"	19"	17"	14"	4.8"	8.4"	9.6"
SW2	17"	18"	27" of snow	34"	38"	39"	16"	Dry at 10"	19"	Dry	21.6"	21.6"
SW3	19"	22"	33" of snow	33"	27"	27"	18"	16"	17"	9.6"	18"	18"

Lysimeters

Four lysimeters (LS-2, LS-3, LS-5 and LS-6) were constructed within the unsaturated zone under the Area A landfill. NLS monitored lysimeters in October 2015. These lysimeters were dry in April 2015 and not monitored. In October 2015, LS-2 and LS-6 were the only lysimeters that could be sampled that were not dry. Results of the sampling is provided below:

October 2015 Results:

ID/Date	Conductivity	pH	Gal. Pumped	Alkalinity (as CaCO)	COD	Chloride (as Cl)	Hardness	Nitrogen (NH3 as N)	Sodium (as Na)	Sulfate (as SO4)	VOCs (ug/L)	
Lysimeter 2												
October	484 umho/cm	7.25	1	93 mg/L	15 mg/L	82 mg/L	220 mg/L	.11 mg/L	5.2 mg/L	13 mg/L		
Lysimeter 6												
October	900 umho/cm	7.09	1	490 mg/L	25 mg/L	30 mg/L	480 mg/L	2.2 mg/L	14 mg/L	ND	DICHLOROMETHANE	TETRAHYDROFURAN
											1.3	110

Hydrogeological Conditions

The near-surface geology at this site consists of glacial sediments that were deposited in an ice marginal environment that led to the formation of an end moraine. Consequently, these deposits vary widely in terms of their grain-size distributions and sorting. On-site borings penetrated mostly gravelly, silty sands (classified as SM and SP-SM type soils), but zones of well-sorted sands (SP) and sandy, clayey silts (CL or CL-ML type soils) were also encountered. The thickness of glacial drift also varies widely, partly because the sediments were deposited in a moraine with hummocky topography, and partly because the underlying bedrock has more than 80 feet of local relief to its upper surface. Depth to bedrock (granitic gneiss, granite, and quartz monzonite) ranges from 35 to nearly 100 feet. (Sand Creek Consultant Report-Groundwater Flow and Plume Dynamics, 12/09)

Groundwater at the Area A locale occurs under water table conditions and is recharged by excess rainfall that infiltrates the land surface. Estimates of recharge near the site are on the order of 10 inches per year. The water table is generally less than 50 feet below grade, occurring within the glacial deposits. (Sand Creek Consultant Report-Groundwater Flow and Plume Dynamics, 12/09)

Groundwater Monitoring & Analysis

MCSWD has a total of 91 groundwater monitoring wells, with forty-two designated for Area A. The groundwater monitoring regimen was conducted according to the (modified and approved) February 2013 groundwater and leachate monitoring plan.

Per the approved monitoring plan, the groundwater wells within the plan were sampled semi-annually in April and October. Sampling and laboratory analysis was conducted by qualified personnel from NLS. Results revealed that the majority of monitoring wells have very good water quality and most even meet safe drinking water standards. The groundwater samples were analyzed to very low chemical concentrations with many found to be below the laboratory's limit of quantification (LOQ). The groundwater quality measurements were compared to NR 140 Groundwater PALs and ESs and site specific indicator PALs and ACLs provided in the approved monitoring plan.

Reporting values higher than these limits are reported as exceedances. As in past monitoring events at the Area A site, results of some wells exceeded the PAL and ES standards, particularly for volatile organic compounds (VOCs). In particular are those wells that have historically indicated contamination: R12R, R13R, R38, and R50P and more recently R47 and R66WT. Continued monitoring and trending will be necessary to track this. No action is planned or required at this time. Groundwater monitoring results and any exceedances were submitted by NLS to the WDNR's GEMS system via electronic format. Below is a summary of the exceedances from each semi-annual monitoring period.

April 2015 Sampling Exceedances:

Marathon County Solid Waste Department							
Area A Facility, #02892							
Date	Well #	Parameter	Units	Result	PAL	ES	Comments
4/1/2015	R12R	Tetrachloroethylene	Ug/L	1.0	0.5	5.0	NR140
4/1/2015	R12R	Trichloroethylene	Ug/L	0.96	0.5	5.0	NR140
4/1/2015	R13R	Tetrachloroethylene	Ug/L	5.0	0.5	5.0	NR140
4/1/2015	R13R	Trichloroethylene	Ug/L	7.8	0.5	5.0	NR140
4/1/2015	R13R	Vinyl Chloride	Ug/L	0.16	0.02	0.5	NR140
4/1/2015	R38	Tetrachloroethylene	Ug/L	1.1	0.5	5.0	NR140
4/1/2015	R38	Trichloroethylene	Ug/L	1.4	0.5	5.0	NR140
4/1/2015	R47	1,2-Dichloropropane	Ug/L	0.52	0.5	5.0	NR140
4/1/2015	R47	Tetrachloroethylene	Ug/L	1.1	0.5	5.0	NR140
4/1/2015	R47	Trichloroethylene	Ug/L	1.8	0.5	5.0	NR140
4/1/2015	R66WT	Tetrachloroethylene	Ug/L	0.54	0.5	5.0	NR140

October 2015 Sampling Exceedances:

Marathon County Solid Waste Department							
Area A Facility, #02892							
Date	Well #	Parameter	Units	Result	PAL	ES	Comments
10/1/2015	R12R	Tetrachloroethylene	Ug/L	0.95	0.5	5.0	NR140
10/1/2015	R12R	Trichloroethylene	Ug/L	0.74	0.5	5.0	NR140
10/1/2015	R13R	Tetrachloroethylene	Ug/L	3.5	0.5	5.0	NR140
10/1/2015	R13R	Trichloroethylene	Ug/L	7.3	0.5	5.0	NR140
10/1/2015	R13R	Vinyl Chloride	Ug/L	0.27	0.02	0.5	NR140
10/1/2015	R38	Tetrachloroethylene	Ug/L	1.1	0.5	5.0	NR140
10/1/2015	R38	Trichloroethylene	Ug/L	1.3	0.5	5.0	NR140
10/1/2015	R47	Tetrachloroethylene	Ug/L	1.1	0.5	5.0	NR140
10/1/2015	R47	Trichloroethylene	Ug/L	1.9	0.5	5.0	NR140
10/1/2015	R50P	Tetrachloroethylene	Ug/L	0.99	0.5	5.0	NR140
10/1/2015	R50P	Trichloroethylene	Ug/L	0.67	0.5	5.0	NR140
10/1/2015	R66WT	Tetrachloroethylene	Ug/L	0.61	0.5	5.0	NR140

Private Well Water Sampling

The private wells identified in the most recent approved monitoring plan (February 2013) identifies nine wells monitored semi-annually (April and October) and seven monitored annually (April) for specified parameters. Analytical results and explanations, where necessary, were reported to the private well owners. Results of the down-gradient wells having WDNR well ID numbers were submitted to the WDNR GEMS system via electronic format. The private water supply well samples analyzed in 2015 met the parameters identified in the site's monitoring plan for safe drinking water standards.

Since 1993, MCSWD has monitored private wells adjacent to and generally within about one mile to the southeast of the landfill property limits. MCSWD annually sends letters to approximately fifty landowners and nearby residents, offering to monitor their private water supply wells in autumn of each year. The Solid Waste Department notifies all eligible residents in advance of the monitoring event and schedules private well testing based on owner requests on a first come, first served basis. Not all residents accept the offer.

MCSWD's July 2004 "Private Well Monitoring Program and Contingency Plan for Alternative Water Supplies" explained that the private water supply wells located south to southeast of Area A will be sampled and tested for VOCs. MCSWD outlined a plan to take precautionary measures and to ensure safe drinking water is provided to homeowners in this group if, in the future, impacted groundwater from the landfill would cause a well's water to have total contaminants at a concentration half of the allowable drinking water maximum contaminant level. There are maximum contaminant levels for certain parameters tested that are allowed in typical public water supply systems. MCSWD has precautionary measures within the contingency plan that serve and protect the homeowners.