cornerstone
A TETRA TECH COMPANY

8413 Excelsior Drive, Suite 160, Madison, WI 53717
T 877.633.5520 | W www.cornerstoneeg.com

October 31, 2017

Ms. Valerie Joosten
Wisconsin Department of Natural Resources
Waste Management Engineer
2984 Shawano Avenue
Green Bay, WI 54313-6727

Re: Marathon County Solid Waste Landfill – Bluebird Ridge RDF
2016 Annual Solid Waste Report
WDNR License No. 4228, FID No. 337005680

Dear Ms. Joosten:

On behalf of the Marathon County Solid Waste Department (Marathon County) Cornerstone Environmental Group, LLC (Cornerstone) is herewith submitting a copy of the 2016 Annual Solid Waste Report for the Bluebird Ridge Recycling & Disposal Facility (BRRDF) of the Marathon County landfill. This Annual Solid Waste Report is being submitted in accordance with the approved plan of operation for BRRDF.

In accordance with your request, three (3) additional copies and the necessary electronic (CD burned) version are also being distributed to pertinent WDNR staff as noted below.

Should you have any questions or comments regarding this Annual Solid Waste Report do not hesitate to contact me at (630) 633-5849 or Ms. Meleesa Johnson at (715) 466-3101 ext 104.

Sincerely,

Cornerstone Environmental Group, LLC

C. Lee Daigle, P.E.
Senior Project Manager

Enclosure: Marathon County Bluebird Ridge RDF - 2016 Annual Solid Waste Report

cc: Marathon County Solid Waste Landfill (File Copies)
Nathan Coller – WDNR Spooner Service Center
Jill Schoen – WDNR Eau Claire Service Center

Marathon County Solid Waste Department
Bluebird Ridge Recycling & Disposal Facility
2016 ANNUAL REPORT

WDNR License No. 4228
FID 337005680

Marathon County Solid Waste Management Department
R18500 Highway 29
Ringle, WI 54471
Phone 715-446-3101
Director: x104
Operations Manager: x102
Business Office: x100
Environmental Technician: x101
Scale: x103

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

www.marathoncountysolidwaste.org

marathoncountysolidwaste

Staff, Consultants & Contractors

Marathon County Solid Waste Department Staff:

- Meleesa Johnson-Director
- David Hagenbucher-Operations Manager
- Jessica Knaup-Scale Operator
- Ron Smith-Environmental Technician
- Julie Groshek-Accounting Specialist
- Chris Wickman-Equipment Maintenance Specialist
- Kevin Steinke-Equipment Operator
- Eric Olson-Eqiupment Operator
- Dave Vitt-Equipment Operator
- Paul Swanwell-Temporary Intern
- Lindsey Carlson- Temporary Intern
- Lydia Campbell- Temporary Intern

Engineering Consultants:

- Mark Torresani
  Cornerstone Environmental Group, LLC
  8413 Excelsior Drive, Suite 160
  Madison, WI 53717

- Lee Daigle
  Cornerstone Environmental Group, LLC
  8413 Excelsior Drive, Suite 160
  Madison, WI 53717

- Cyndi Neitzel
  Cornerstone Environmental Group, LLC
  435 E Mill Street, Suite 15
  Plymouth, WI 53073

Contractors:

- CQM, Inc.
  2679 Continental Drive
  Green Bay, WI 54311
- Northern Lakes Service, Inc.
  400 North Lake Avenue
  Crandon, WI 54520
- Northern Pipe Equipment, Inc.
  1722 County Road QQ
  Green Bay, WI 54311
- Recycling Connections Corporation
  P.O. Box 91
  Stevens Point, WI 54481-0091
- Veolia ES-Technical Solutions
  W124 N9311 Boundary Road
  Menomonee Falls, WI 53051
- Lloyd Trucking
  P.O. Box 1731
  Wausau, WI 54402-1731
- Marathon County Forestry Department
  212 River Drive
  Wausau, WI 54403
- Raith Logging
  N9426 County Road B

Summit Lake, WI

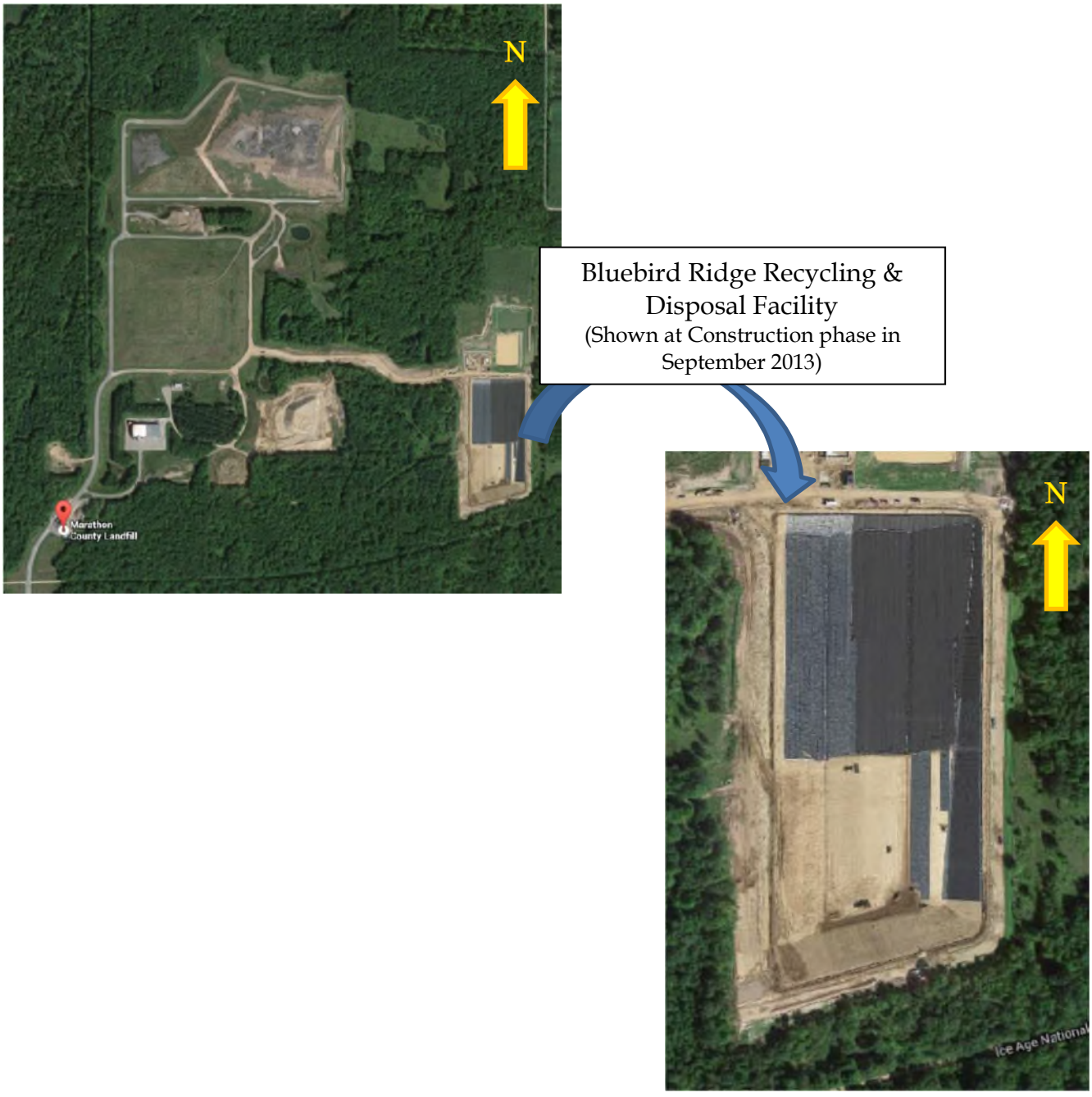
- Krueger & Stienfest INC
  539 Forrest Ave,
  Antigo, WI 54409
- Walt's Petroleum Service, Inc
  5207 E. Jelinek Avenue
  Schofield, WI 54476
- Layne Christensen Co.
  3200 Schofield Ave.
  Schofield, WI 54476
- River View Construction, Inc.
  4140 N. 6th Street
  Wausau, WI 54403
- QED Environmental Systems
  (Trinity Environmental Equipment)
  7632 Summerfield Drive
  Verona, WI 53593
- Scott's Enterprises
  R5338 Sahara Drive
  Ringle, WI 54471
- Horizon Construction and Exploration
  764 Tower Drive
  Fredonia, WI 53021
- Golder Associates Inc.
  2247 Fox Heights Lane
  Green Bay, WI 54304
- SEH
  10 North Bridge Street
  Chippewa Falls, WI 54729
- GCS (Global Containment Solutions)
  405 East Forest Street, Suite 110
  Oconomowoc, WI 53066
- Cornerstone Environmental Group, LLC
  8413 Excelsior Drive, Suite 160
  Madison, WI 53717
- E-Con Electric
  4610 Plover Rd
  PO Box 324
  Wisconsin Rapids, WI 54495-0324

Introduction

This document meets the annual reporting requirements of the Wisconsin Department of Natural Resources (DNR) January 31, 2013 Plan of Operation approval and the January 15, 2015 Plan Modification approval.

Background

Marathon County Solid Waste Department (MCSWD) owns, operates, and manages Bluebird Ridge Recycling and Disposal Facility (BRRDF), with MCSWD staff directing all facets of the operation. The facility opened in July 2014, with an approved capacity of 2,900,000 cubic yards. This landfill is situated on the southeast corner of the 532 acre site owned by the MCSWD and is one of three landfills located on the property. The property is located along the north side of Hwy 29, in the Town of Ringle, Wisconsin.



Summary of Landfill Activities in 2016

Disposal operations began on July 21, 2014. As of the end of December 2016, there remains an estimated waste capacity of 2,176,975 cubic yards. During 2016, approximately 210,210 tons of waste were disposed of at the BRRDF. Operational duties performed by the MCSWD personnel include, but are not limited to, complete site operations, administrative management, air permit compliance, gas system management, storm water management, and customer service. As needed, the county hired various contractors to perform specific tasks beyond the capabilities of the MCSWD staff (as noted above).

Cover materials and alternative daily cover (ADC) were used as the means to control odors. A gas collection system is pending installation.

Operations Summary

- Daily operations
  - Compact & cover operations
  - Supplemental cover added to control odors
  - Litter control-retained inmate labor to assist with this task
  - Plow roads
  - Grade roads
  - Water roads & also add calcium chloride for dust control
- Evaluated and approved special waste disposal requests for high volume industrial products, off-specification food additives, contaminated soils and other materials using approved special waste plan
- Conducted daily, monthly, annual environmental monitoring
- Conducted educational tours
- Continued work with Central WI Off-road Cycling Coalition, DNR and Ice Age Trail Alliance on off-road biking course development
- New yard area for dumpsters by the office/scale house

Construction Activities

Approximately 9.97 acres of Phase 3 and 4 composite liner was constructed in 2016. Construction began in February 2016 and was completed in August 2016. Located adjacent to existing Phases 1 and 2 to the east, the Phase 3 and 4 composite liner consisted of 4-feet of compacted liner quality clay, a 60-mil HDPE liner, a 12-oz/yd^2 non-woven geotextile fabric, 12-inch of granular blanket material, associated 6-inch HDPE collection piping, an 18-inch sideslope riser with discharge pump and a concrete sideslope riser vault located at the crest of the south slope. As part of the Phase 3 and 4 construction, the existing access road to BRRDF was widened by 15 feet. In addition, ditches and slopes created in this construction as well as stockpiles of removed overburden material were seeded/fertilized and mulched. The construction documentation report submitted to the WDNR was approved in a letter dated September 2, 2016.

Following approval, placement of a "fluff" layer began across the new cell base in order to protect the liner from puncture and the leachate drainage system from sedimentation. Preliminary waste inquiries were conducted at the scale, loads containing sharp objects, such as construction and demolition wastes or those containing sludge or contaminated soils were directed to the Phase 1 and 2 portion of BRRDF. Operations staff also conducted field inspections to identify any large sharp objects in loads and pulled the items from the waste stream.

Operations staff pushed waste across Phase 3 and 4 using a low-ground pressure dozer. Compactors were not used. Cover materials were placed using front-end loaders.

Following construction of the Phases 3 and 4 liner project, an 18-inch landfill gas system vacuum header pipe was installed from near the southeast corner of the Area A landfill extending to the north side of BRRDF terminating at the northwest edge of the Phase 3 and 4 liner. Designed with condensate knockouts and connections to the future BRRDF landfill gas collection system, the construction was suspended later in the year due to weather constraints. Continuation of this work recommenced in October 2017 and extended the landfill gas system with a 12-inch vacuum header pipe along the northern and eastern boundary of the BRRDF.

Ground Water Monitoring Well Abandonment

During April and May 2016 ground water monitoring wells R49, R49P, R55WT, R55P, R57, R58P, and R58WT were abandoned as part of the Phase 3 and 4 composite liner construction. A well abandonment documentation report was submitted to the WDNR in June 2016. A copy of the well abandonment documentation report was included with the Phase 3 and 4 composite liner construction documentation report.

Waste Disposal Activities

During 2016, approximately 210,210 tons of waste was accepted in BRRDF with a majority disposed in Phases 1 and 2. Included in this sum were the following waste categories (reported in tons):

- Category 1-Municipal Waste 154,232 tons
- Category 2-Utility Ash & Sludge 1,453 tons
- Category 3-Pulp/papermill mfg. waste 3,243 tons
- Category 6-All other wastes 14,696 tons
- Category 21-High Volume Waste Used As Daily Cover, Berms, Dike, Etc. 23,918 tons
- Category 25-Construction/demolition 12,660 tons
- Category 27-Waste Generated by a Nonprofit Organization 8 tons

Waste that was disposed of at the facility originated from the following counties:

- Eau Claire
- Clark
- Taylor
- Vilas
- Ashland
- Bayfield
- Oneida
- Langlade
- Menominee
- Portage
- Wood
- Shawano
- Marathon
- Waupaca
- Price
- Forest
- Chippewa

There were no issues or problems in handling the wastes delivered.

Special Wastes

BRRDF is licensed to accept waste what would be considered non-hazardous special wastes. This includes, but is not limited to, contaminated soils; petroleum contaminated soil; incinerator, boiler and other ash; industrial manufacturing process waste and sludge; waste water and water treatment plant sludge; large quantities of dead animal carcasses; street sweepings and car wash grit.

MCSWD pre-screens all special wastes via a Special Waste Profile form. Customers desiring to deliver non-standard wastes must complete the form and provide to it MCSWD staff for review and approval. The generator of waste, or their agent, must complete the form and also have a variety of select laboratory tests conducted on the special waste prior to a decision being made on acceptance. The MCSWD Special Waste Analytical Protocol and Acceptance Criteria delineates parameter thresholds the waste material must meet in order to qualify as a non-hazardous special waste. No special wastes are accepted without first completing this process. Records are retained on site. In 2016, the site had no non- approved wastes.

Special waste tonnages received at the site, provided in the tons reported to the state as identified above, included approximately 22,918 tons of reacted coal combustion bottom ash, 500 tons of street sweepings, and 500 tons of contaminated soil (C-Soil) all of which was used as alternative daily cover (ADC) material. No ADC was used on exterior side-slopes or within 100 feet of the limits of waste. Native soils were also used as cover material. In addition a total of approximately 60 tons of friable asbestos was also accepted in 2016.

Odor Monitoring Summary

During 2016 odors were noticed near drainage stone for the leachate drainage blanket. Odor complaints were received on November 7 and 14, 2016. These odors were addressed by adding additional soil cover material over the drainage stone.

Load Inspections

Load inspections were completed periodically, at least every 5,000 tons and for suspicious loads. Forms documenting load inspections are kept in the facility files.

Additional Waste & Recycling Services Information

The MCSWD offers a full range of solid waste and recycling services. During 2016, the following material were either separated for recycling from the waste stream by staff or source separated by the generator:

- Appliances
- Electronics
- Fluorescent lighting
- Household hazardous waste
- Lead-acid batteries
- Oil filters
- Rechargeable batteries
- Recyclable containers and papers
- Scrap metal
- Sharps
- Tires
- Waste anti-freeze
- Waste oil
- Shingles

In 2012 the MCSWD was granted, by the DNR, a NR502.05(3)(j) exemption for a short-term, non-containerized, waste storage facility for the collection and short-term storage of waste shingles. The shingle recycling drop-off opened in June 2012 and was permitted to receive both residential

and residential-like commercial shingle for recycling. Only clean shingles (free of debris and garbage-nails allowed) are accepted for recycling. Loads that do not meet the criteria are required to be landfilled.

In 2016, the shingle recycling program diverted 909 tons of shingles from landfill disposal. All shingles were taken to Pitlik & Wick in Eagle River, Wisconsin, where they were ground up and nails were removed via magnet. Ground shingles were mixed with asphalt.

Since the MCSWD does not host a yard material site, all yard materials, including grass, leaves and brush were referred to various municipal facilities that manage such items. Compost bins were also sold to those who wished to manage their yard materials on their properties.

MCSWD administers a multi-municipality street sweeping low hazard exemption beneficial reuse program. Participating municipalities are able to divert from landfilling the sand/grit collected after the winter season. Collected sweepings are used in municipal utility and public works projects. In 2016, this program diverted over 500 tons of sweepings and 500 tons of contaminated soils from landfill disposal.

In addition to the above noted materials, MCSWD underwrote the entire cost of the county's Medication Drop Box Program, at six local police departments, for unused/unwanted/outdated medications. MCSWD operated a household hazardous materials collection facility which provided service to Marathon county residents, farmers, and businesses on a fee-free system. Shawano, Lincoln, and Wood county residents, farmers, and businesses where provided this service on a fee-based system.

Landfill Maintenance

During 2016 the following site maintenance activities were completed:

- Regular inspections of leachate tank area and sump were conducted to check for potential leaks on a daily basis.
- Roadways were treated with calcium chloride as a means of dust control during July 2016.
- Plantings on the vegetative buffers along the southern and eastern boundaries were regularly checked for predation and water needs. Fencing was installed where needed to prevent destruction to plantings.
- Interns from UW Stevens Point installed nearly 200 plants along the Mountain Bay Trail, continuous monitoring and maintenance took place.
- Main stock piles were seeded by Scott's Enterprises
- The storm water and infiltration basin was inspected to ensure the integrity of overflow and slopes. Clay sediment influence water color for a period of time during construction of Phase 3 and 4.
- Storm water grates were cleared routinely and as needed of both windblown litter and sediment.
- Storm water culvert were jetted during leachate line jetting.
- Identified wetland areas, upkeep including silt fencing to delineate and periodic inspection. These areas were also maintained during the Phase 3 and 4 construction.
- Hydro seeded approximately 10 acres for erosion control.
- Maintained storm water system & biofilter.

Gas Collection System

The gas collection system is not required to be installed nor have any features been installed at BRRDF. Landfill gas emissions from BRRDF are regulated under and in accordance with Air Pollution Control Operation Permit 737092730-P20 (issued November 2, 2015).

Soil Gas Monitoring

During 2016 the soil gas probes were monitored quarterly for relative pressure, methane (CH4), oxygen (02), ambient air temperature, gas temperature, ground conditions, barometric pressure, and barometric pressure trend. In 2016, these monitoring results indicated no gas migration.

First Quarter Probe Data (January 5, 2016):

Gas Probe [Depth in feet]	Location	Methane (%CH4 by Vol.)	Oxygen (%O2 by Vol.)	Pressure (inch W.C.)	Notes:
WDNR Parameter #		85547	85550	46389	WDNR ID No.
BRRDF Probes	Lic. 4228				
GP101	N BRRDF	0	21.6	0.09	550
GP102	E BRRDF	0	22.7	0	551
GP103	E BRRDF	0	22.2	0	552
GP104	S BRRDF	0	21.1	0.01	553
GP105	S BRRDF	0	21.2	0	554
GP106	W BRRDF	0	22.3	-0.01	555

Second Quarter Probe Data (April 12, 2016):

Gas Probe [Depth in feet]	Location	Methane (%CH4 by Vol.)	Oxygen (%O2 by Vol.)	Pressure (inch W.C.)	Notes:
WDNR Parameter #		85547	85550	46389	WDNR ID No.
BRRDF Probes	Lic. 4228				
GP101	N BRRDF	0	22.8	-0.23	550
GP102	E BRRDF	0	22.9	0	551
GP103	E BRRDF	0	23	-0.02	552
GP104	S BRRDF	0	23	-0.01	553
GP105	S BRRDF	0	23	-0.19	554
GP106	W BRRDF	0	23.2	0	555

Third Quarter Probe Data (July 14, 2016):

Gas Probe [Depth in feet]	Location	Methane (%CH4 by Vol.)	Oxygen (%O2 by Vol.)	Pressure (inch W.C.)	Notes:
WDNR Parameter #		85547	85550	46389	WDNR ID No.
BRRDF Probes	Lic. 4228				
GP101	N BRRDF	0	20.9	-0.14	550
GP102	E BRRDF	0	20.9	0.02	551
GP103	E BRRDF	0	21	0	552
GP104	S BRRDF	0	21	0.01	553
GP105	S BRRDF	0	21.1	-0.16	554
GP106	W BRRDF	0	21	0	555

Fourth Quarter Probe Data (October 25, 2016):

Gas Probe [Depth in feet]	Location	Methane (%CH4 by Vol.)	Oxygen (%O2 by Vol.)	Pressure (inch W.C.)	Notes:
WDNR Parameter #		85547	85550	46389	WDNR ID No.
BRRDF Probes	Lic. 4228				
GP101	N BRRDF	0	22.4	-0.03	550
GP102	E BRRDF	0	20.6	0.01	551
GP103	E BRRDF	0	20.7	0	552
GP104	S BRRDF	0	20.8	0.01	553
GP105	S BRRDF	0	20.8	0	554
GP106	W BRRDF	0	20.9	-0.07	555

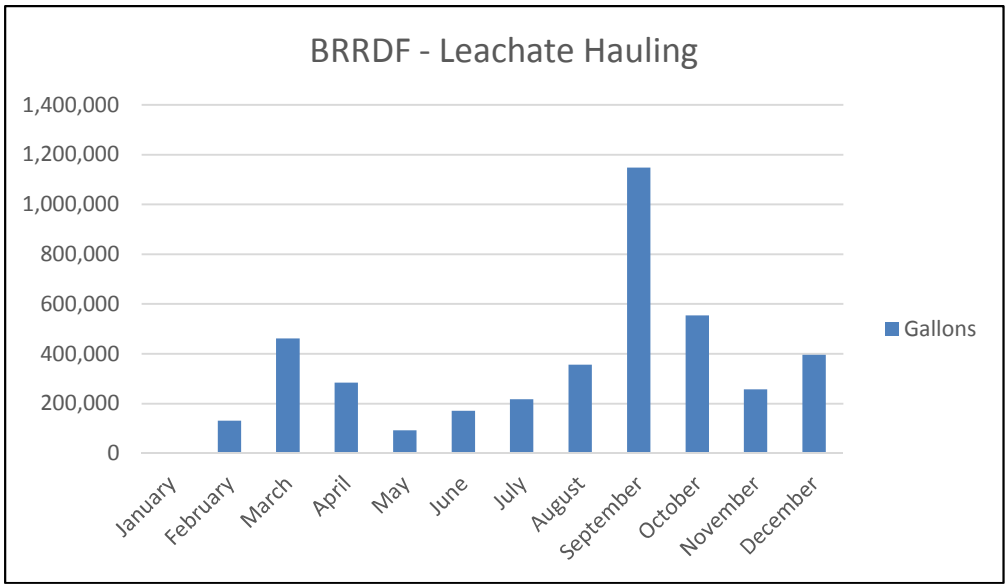
Leachate System Information:

Leachate is collected throughout a system of perforated piping laid in trenches at the base of the landfill. Leachate gathers in sumps at the base of side slope risers. A pump within the riser pipes transfers leachate through a forcemain system to an aboveground storage tank. Two of the proposed three sideslope riser pipes are operational (one for Phase 1 and 2 and one for Phase 3 and 4) and there is one yet to be constructed (Phase 5). Pumping from the side slope risers can be interrupted should the level sensor system inside the aboveground storage tank indicate the liquid has reached a specified level to ensure the tank does not overflow. The contracted hauler routinely visits the site to pump the stored leachate into a 6,600 gallon tanker truck. The leachate is then delivered to a licensed waste water treatment facility (WWTF).

Leachate collected in 2016 was transported to Domtar, Inc. WWTF in Rothschild, Wisconsin. Leachate is pumped into the waste water treatment facility and treated to ensure the effluent meets Wisconsin Pollutant Discharge Elimination System (WPDES) standards prior to discharge into the Wisconsin River.

The total volume of leachate collected/transported/treated in 2016 is as follows:

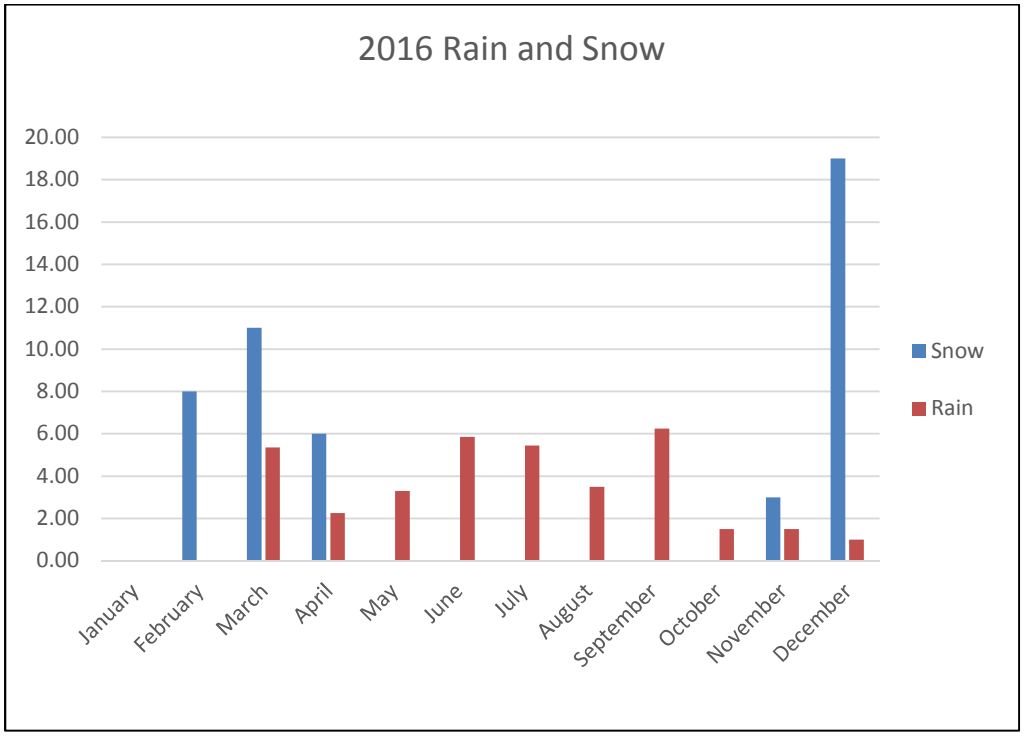
Month	Gallons
January	0
February	132,000
March	462,000
April	283,800
May	92,400
June	171,600
July	217,800
August	356,400
September	1,148,400
October	554,400
November	257,400
December	396,000
Total	4,072,200

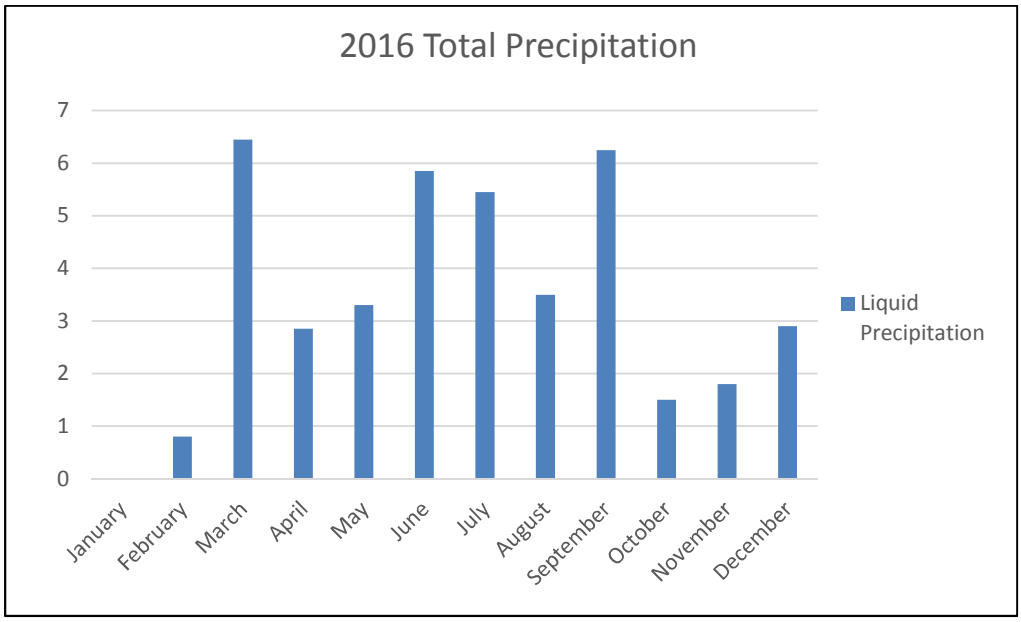


Precipitation:

2016 Precipitation Totals			
Month	Snow (inches)	Rain (inches)	Liquid Precipitation* (inches)
January			0.00
February	8.00		0.80
March	11.00	5.35	6.45
April	6.00	2.25	2.85
May		3.30	3.30
June		5.85	5.85
July		5.45	5.45
August		3.50	3.50
September		6.25	6.25
October		1.50	1.50
November	3.00	1.50	1.80
December	19.00	1.00	2.90
Total	47.00	35.95	40.65

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





Leachate Line Jetting:

On July 19 and 20, 2016 Northern Pipe Equipment, Inc. of Green Bay, Wisconsin, water jetted the BRRDF leachate lines with a total of 4,400 gallons of water. Jetting was accomplished by accessing pipes from both ends for cleaning to overlap in the center or jetting the full length from access at end. As part of the July leachate line jetting, lines installed as part of the Phase 3 and 4 construction were also televised. The results/findings follow:

NORTHERN PIPE EQUIPMENT, INC.
PROFESSIONAL PIPELINE CLEANING & INSPECTION

MARATHON COUNTY LANDFIL L
LEACHATE PIPE CLEANOUT RECORDS

DATE: July 19, 2016
CONTRACTOR NAME: Northern Pipe Equipment, Inc.
CONTRACTOR PHONE: 920-468-7074
EQUIPMENT USED: #36 Vac-Con w/ 1,200 ft. 3/4" hose

BLUE BIRD RIDGE

CLEANOUT ACCESS POINT	Line Name	PIPE SIZE	PIPE LENGTH (FT)	FT. JETTED NORTH	FT. JETTED SOUTH	COMMENTS
LH W4	West Line	6"	1070	110	1,000	Jetter stops on North side ; South side no problems ; Achieved overlap
North Side	Ease Line	6"	1020	800	270	Jetter stops on North side ; South side no problems ; Achieved overlap
West End	U Shape	6"	395	0	395	Good all the way

AMOUNT OF WATER USED: 1,500 Gallons of water

DATE: July 20, 2016
CONTRACTOR NAME: Northern Pipe Equipment, Inc.
CONTRACTOR PHONE: 920-468-7074
EQUIPMENT USED: #36 Vac-Con w/ 1,200 ft. 3/4" hose

BLUE BIRD RIDGE

CLEANOUT ACCESS POINT		PIPE SIZE	PIPE LENGTH (FT)	FT. JETTED NORTH	FT. JETTED SOUTH	COMMENTS
LCR8	LCR9	6"	1144	517	627	Line is good | Jet and TV
LCR12	LCR11	6"	1180	547	635	Line is good | Jet and TV
LCR7	LCR10	6"	650	404	276	Line is good | Jet and TV

AMOUNT OF WATER USED: 2,900 . Gallons of water

Leachate Head Well Monitoring

Leachate head wells are monitored by MCSWD staff on a quarterly basis. The site's monitoring results indicate that the leachate head wells were dry during 2016.

Leachate Sampling

Leachate sampling and laboratory analysis was conducted in April and October 2016. The analytical results indicate several volatile organic compounds were detected in the samples collected during 2016. The results are available on the WDNR Groundwater and Environmental Monitoring System (GEMS) database.

Leachate tank sampling conductivity results are as follows;

LST-101

April	8570 umhos/cm
October	5110 umhos/cm

Analyses show leachate presents as neutral to slightly basic.

LST-101

April	7.00 ph
October	7.12 ph

Leachate Force Main Pressure Testing and Sideslope Riser Pump Run Time Assessment

Leachate force main and pipe pressure testing for force main installed as part of the Phase 3 and 4 construction took place in April 13 and 14, 2016 as part of the construction activities. Pressure testing of the existing forcemain west, north and south of Phases 1 and 2 was performed at the same time. Testing was completed by Riverview Construction staff and MCSWD staff and the report is maintained in site files.

The run time meter calibration required in Condition 19 of the Plan of Operation is to address the pumps within the side slope riser. Both the Phase 1 and 2 pump and the Phase 3 and 4 cell pumps were new from the manufacturer in 2016 so calibration was not necessary for 2016.

Storm Water Management

The biofilter stormwater collection and infiltration system located north of Phases 1 and 2 was periodically checked and inspected for signs of failure, erosion and/or operational problems. The basin and infiltration basin preformed as designed and lost no structural integrity. A small temporary runoff basin exists in the southeast corner of future Phase 5. This basin is continually monitored to ensure it remains operational to discharge runoff from the west side of Phase 3 and 4 to the stormwater ditch located on the south side of the active site. This runoff eventually finds its way to the biofilter stormwater collection and infiltration system. No storm water left the site.

In accordance with Condition 21 of the Plan of Operation an annual stormwater inspection was performed. This included the outfall to the BioFilter and general inspection of ditches associated with BRRDF. This inspection is maintained in site files.

Environmental Monitoring

Condition 35 of the January 31, 2013 Plan of Operation Approval requires a three year assessment of the groundwater quality and other environmental monitoring data in the 2016 Annual Report. During 2017 MCSWD personnel inquired about the content of this report with the WDNR. It was

determined that an evaluation of the groundwater quality would be included in forthcoming BRRDF Expansion Feasibility Report. The content of the Assessment Report included with this Annual Report reflects the correspondence between the MCSWD and WDNR personnel. The Assessment Report was prepared by and/or under the direction of a Wisconsin Professional Geologist. Specific results for the 2016 monitoring event are summarized below. The Three Year Assessment Report is provided in Attachment 1.

Private Well Monitoring

Water supply wells as defined in the Plan of Operation Approval and located on properties adjacent to or in the vicinity of the landfill, were sampled in April and October. The collection of samples from these wells was performed in conjunction with the Area A private wells routine monitoring program. No exceedances of NR 140 Groundwater Quality Standards or NR 812 Drinking Water Standards were reported in the samples collected from the private wells. However, low-level (estimated between limit of quantitation and the limit of detection) detections of tetrachloroethene (PCE) were reported in samples collected from private well PW-68 during April and October 2016.

Ground Water Monitoring

Groundwater wells associated with BRRDF were sampled in April and October. The samples were analyzed by Northern Lake Service Laboratory. Exceedances in excess of well-specific Prevention Action Limits (PALs) and NR 140 PALs are summarized below.

Marathon County Solid Waste Department
2016 BRRDF Ground Water Well Exceedance Table

Date	Well #	Parameter	Units	Result	PAL	ES	ACL
4/12/2016	R50P	Trichloroethene	ug/L	0.62	0.5	5	
4/12/2016	R50P	Tetrachloroethene	ug/L	0.75	0.5	5	
4/14/2016	R59WT	Hardness	mg/L	230	230		
10/2/2016	R50P	Tetrachloroethene	ug/L	0.74	0.5	5	
10/4/2016	R59P	Hardness	mg/L	240	230		
10/4/2016	R59WT	Conductivity	umhos@25C	529	470		
10/4/2016	R59WT	Hardness	mg/L	280	230		

Trichloroethene and tetrachloroethene were reported above their respective NR140 PALs in samples collected from well R-50P. The detections of these constituents is attributable to the plume of impacted groundwater emanating from the vicinity of the Area A landfill. The indicator parameters hardness and specific conductance were reported above well specific PALs during 2016. Further discussions regarding the groundwater quality are provided in the Three Year Assessment Report (Attachment 1).

ATTACHMENT 1

Marathon County Solid Waste Department
Area A, Area B, and Bluebird Ridge RDF
GROUNDWATER ASSESSMENT (2014-2016)

BRRDF WDNR License No. 4228
BRRDF FID 337005680

Prepared for:
Marathon County Solid Waste Department
R18500 Highway 29
Ringle, WI 54471

Prepared by:
Cornerstone Environmental Group, LLC
8413 Excelsior Drive, Suite 160
Madison, WI 53717

October 2017

Background

The following provides a three year summary of groundwater quality conditions at the closed Area A Landfill, Area B Landfill, and Bluebird Ridge Recycling and Disposal Facility (BRRDF) Landfill, located in Marathon County, for the years 2014 through 2016. This document meets the three year groundwater assessment requirements of Condition no. 35 of the Wisconsin Department of Natural Resources (WDNR) January 31, 2013 Plan of Operation for BRRDF. The content of this report is also based on subsequent correspondence between Marathon County Solid Waste Department (MCSWD) personnel and the WDNR.

MCSWD owns, operates, and manages the closed Area A landfill, Area B landfill, and the BRRDF, with MCSWD staff directing all facets of the operation. Area A is a 27.3-acre closed landfill that accepted and disposed of waste from December 1980 until December 1993. Area B landfill is a 32-acre active landfill which opened in 1993 and is located north of Area A. The BRRDF opened in July 2014 and is situated on the southeast corner of the 532 acre site owned by the MCSWD. The MCSWD property is located along the north side of State Highway 29, in the Town of Ringle, Wisconsin.

Groundwater Monitoring & Analysis

In 2016 MCSWD had a total of 91 groundwater monitoring wells; 42 wells were designated for Area A, 25 for Area B, and 27 for the BRRDF. Some groundwater monitoring wells are designated for more than one area. The groundwater monitoring regimen for Area A and Area B were conducted according to the February 7, 2013 WDNR approved groundwater, lysimeter and leachate monitoring plans. The groundwater monitoring program for BRRDF was conducted according to the January 31, 2013 WDNR approved environmental monitoring plan. Per the approved monitoring plans, the groundwater wells are sampled semiannually in April and October. Sampling and laboratory analysis is conducted by personnel from Northern Lake Service (NLS) of Crandon, Wisconsin.

The analytical results were compared to NR 140 Groundwater Quality Standard Preventive Action Limits (PALs) and Enforcement Standards (ESs) and site-specific indicator PALs provided in the respective approved monitoring plans. Sampling results with concentrations at or above the NR 140 Groundwater Quality Standards or the Site-specific indicator PALs during the 2014 to 2016 period are summarized on Table 1 and Table 2, respectively. Groundwater monitoring results and exceedances were submitted electronically by NLS to the WDNR's Groundwater Environmental Monitoring System (GEMS) at the conclusion of each sampling period. The following is a summary of the groundwater quality exceedances reported at each respective landfill from 2014 to 2016.

Area A

Exceedances of the NR 140 Groundwater Quality Standards were reported for several volatile organic compounds (VOCs) in groundwater samples collected at Area A downgradient monitoring wells R12R, R13R, R38, R47, R48, R50P, and R66WT during the 2014 to 2016 period. The following VOCs were reported above their respective NR 140 PAL at the monitoring wells noted on Table 1: tetrachloroethene (PCE), trichloroethene (TCE), vinyl chloride (VC), 1,2-dichloropropane (1,2-DCP), and methylene chloride. Concentrations of PCE decreased while TCE remained relatively stable in samples collected from well R12R during 2014-2016. At well R13R, concentrations of PCE remained relatively stable and TCE concentrations decreased from 2014 to 2016, while vinyl chloride concentrations decreased to non-detectable levels in October 2016. The most elevated concentrations of these constituents on the MCSWD property are reported at this well. Concentrations of PCE and TCE in samples collected from well R-38 exhibited a slight decreasing

trend while concentrations for these constituents in samples collected from wells R-47 and R-50P were generally stable during the three year period. Low-level estimated concentrations of PCE were reported between the limit of detection and the limit of quantitation in samples collected at well R-66WT during the period which is consistent with historical data reported at this well. The groundwater quality exceedances are associated with a plume of chlorinated VOCs that extends from the eastern side the Area A landfill to the southeast toward well R-66WT where it generally dissipates. This plume of VOC impacted groundwater has been documented since the late 1980s and the margins of the plume appear to be generally stationary or receding based on the well-specific VOC groundwater trends and results at wells adjacent to the plume.

Area B

Groundwater quality in the vicinity of the Area B landfill generally remains consistent with historical data with the following exceptions. Exceedances of the NR 140 PAL were reported for nitrate + nitrite as nitrogen (N) in samples collected from downgradient wells R-26 and R-26A on one occasion and periodically at R-27 during the three year period. The concentrations of nitrate + nitrite as N at well R-26 have been stable the past 3 years after an increase in 2013; the concentrations at well R-26A have fluctuated but currently are near background levels; while concentrations at R-27 have exhibited a slight increasing trend since 2012. The nitrate + nitrite as N may be attributable to area agricultural practices or runoff from erosion control efforts that included seeding, fertilizing and mulching at and near the Area B landfill. Exceedances of the well specific standards for specific conductance and hardness were also reported in samples collected from downgradient well R-52 in October 2016. Both parameters have been exhibiting a gradual increasing trend since the early 2000's. The cause of these increases is uncertain at this time.

Bluebird Ridge RDF

As noted above under the Area A discussion, PCE and TCE were reported above NR 140 PAL in samples collected from piezometer R-50P during the three year period. The well is located to the southwest/sidegradient of the BRRDF and concentrations of these constituents are associated with the documented plume of chlorinated constituents that emanates from the area east of the Area A landfill. This well is sampled jointly for both the Area A landfill and the BRRDF.

Alkalinity, hardness, and specific conductance were also reported above well-specific standards in samples collected at wells R-70T; R-59WT and R-59P; and R-59WT, respectively during the period. The alkalinity exceedance in April 2014 at upgradient well R-70T appears to have been anomalous since subsequent concentrations of this constituent at this well are slightly greater than half the April 2014 level and consistent with levels reported prior to April 2014. The hardness concentrations and specific conductance readings at wells R-59WT and R-59P have generally been increasing since 2015. Well R-59WT is designated as the upgradient Subtitle D well for the BRRDF. The cause of the increase of these constituents is unclear at this time although concentrations of hardness and specific conductance readings at well R-13R are two to three times higher than the levels reported at R-59WT. Well R-59WT is situated on the opposite side of a groundwater mound that includes well R-13R and may be hydraulically downgradient of the area near R-13R. No VOCs have been detected in samples collected from well R-59WT and R-59P or well R-35 which is located between R-13R and R-59WT.

Groundwater Elevations and Flow Analysis

Groundwater elevations are measured across the site during the semiannual groundwater monitoring events. In general, the direction of shallow groundwater flow across the site is from the northwest to the southeast based on the October 2016 data. A northwest/southeast trending groundwater mound occurs along a bedrock ridge that extends from the eastern portion of the Area A landfill toward the northwestern edge of the BRRDF. Along this mound, the groundwater flows to the northeast (north of the mound) and to the southwest (south of the mound) before gradually turning to the east (north of the mound) and to the southeast (south of the mound). The 2016 flow direction is consistent with the groundwater flow directions determined for the 2009 Feasibility Report. Over the 2014-2016 period, the elevation measurements were consistent with historical data. The exceptions to this include, an abnormally high water level elevations measured at wells R7R and R11A in October 2016. These spurious readings may be attributed to field errors since prior and subsequent measurements to this date were consistent with each other.

Gas Migration Monitoring

A review of gas probe measurements collected quarterly during the three year period from 2014 through 2016 at the BRRDF, Area A and Area B, landfills indicate no evidence of gas migration based on the methane readings. Four low level methane detections (0.4% or lower by volume) were recorded at four separate probes in 2014 and 2105. The methane detections were unconfirmed in subsequent readings at each of the four probes.

Leachate Monitoring

The leachate monitoring regimen for Area A and Area B were conducted according to the February 7, 2013 approved environmental monitoring plan. The leachate monitoring program for BRRDF was conducted according to the January 31, 2013 approved environmental monitoring plan.

Summary and Recommendations

Most of the reported exceedances of the NR 140 Groundwater Quality Standards at the three landfills occur in samples collected from the Area A monitoring wells. The constituents are associated with the plume of chlorinated compound impacted groundwater that has been present since the late 1980s. The margins of the plume are stationary to receding based on PCE and TCE results at wells on the plume periphery. The overall general concentrations reported at wells within the core of the plume are stable to decreasing as well. Hardness and specific conductance are exhibiting an increasing trend at BRRDF upgradient well nest R-59WT/59P. The increase in concentrations at this well nest may be associated with the elevated readings for these parameters occurring upgradient of this well nest in the VOC plume. The nitrate+nitrite as N concentrations downgradient of the Area B landfill will continue to be monitored to further assess the current trends. Based on the current data collected through 2016, ongoing monitoring in accordance with each landfill's WDNR approved monitoring program is recommended. Additional analysis of the groundwater quality will be submitted within the BRRDF Expansion Feasibility Study Report.

CERTIFICATION of Attachment 1 - Three Year Assessment Report

I John C. Oswald, hereby certify that I am a licensed professional geologist in the State of Wisconsin in accordance with the requirements of ch. GHSS 2, Wis. Adm. Code; that the preparation of this document has not involved any unprofessional conduct as detailed in ch. GHSS 5, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 500 to 538, Wis. Adm. Code.

John C. Oswald, P.G. No. 1126-13

Signature

Operations Director/Senior Hydrogeologist

Table 1
Parameters that Exceed Current NR 140 Standards
Marathon County Solid Waste Department
Areas A, B, and Bluebird Ridge RDF
2014 - 2016

Parameter	Unit	NR 140 PAL	NR 140 ES	Well	Date	Result	Data Flags	Exceedence	Area Designation	Within DMZ
Chloride (dissolved)	(mg/L)	125	250	R-61WT	04/21/2014	140		PAL	A	N
Nitrate+Nitrite (dissolved)	(mg/L)	2	10	R-26	04/21/2014	2.1		PAL	B	Y
				R-26A	04/21/2014	2.3		PAL	B	Y
				R-27	04/22/2014	2.3		PAL	B	Y
				R-27	10/14/2014	2.2		PAL	B	Y
				R-27	04/14/2016	4.6		PAL	B	Y
				R-27	10/4/2016	2.2		PAL	B	Y
1,2-Dichloropropane	(ug/L)	0.5	5	R-47	04/14/2015	0.52		PAL	A	N
Methylene chloride	(ug/L)	0.5	5	R-30A	04/21/2014	1.0	J, BD, LC, CC, LB	PAL	B	Y
				R-39	10/15/2014	0.55	J, BD, LB	PAL	A	Y
Tetrachloroethene	(µg/L)	0.5	5	R-12R	04/22/2014	1.7		PAL	A	Y
				R-12R	10/15/2014	1.2		PAL	A	Y
				R-12R	04/14/2015	1.0		PAL	A	Y
				R-12R	10/7/2015	0.95		PAL	A	Y
				R-12R	04/14/2016	1.1		PAL	A	Y
				R-12R	10/4/2016	0.56	J	PAL	A	Y
				R-13R	04/22/2014	3.0		PAL	A	Y
				R-13R	10/14/2014	4.9		PAL	A	Y
				R-13R	04/14/2015	5.0		PAL	A	Y
				R-13R	10/7/2015	3.5		PAL	A	Y
				R-13R	04/14/2016	4.1		PAL	A	Y
				R-13R	10/3/2016	4.7		PAL	A	Y
				R-38	04/22/2014	1.3		PAL	A	Y
				R-38	10/15/2014	1.1		PAL	A	Y
				R-38	04/14/2015	1.1		PAL	A	Y
				R-38	10/8/2015	1.1		PAL	A	Y
				R-38	04/14/2016	1.0		PAL	A	Y
				R-38	10/4/2016	0.89		PAL	A	Y

Table 1
Parameters that Exceed Current NR 140 Standards
Marathon County Solid Waste Department
Areas A, B, and Bluebird Ridge RDF
2014 - 2016

Parameter	Unit	NR 140 PAL	NR 140 ES	Well	Date	Result	Data Flags	Exceedence	Area Designation	Within DMZ
Tetrachloroethene	(µg/L)	0.5	5	R-47	04/22/2014	0.84		PAL	A	N
				R-47	10/14/2014	0.83		PAL	A	N
				R-47	04/14/2015	1.1		PAL	A	N
				R-47	10/7/2015	1.1		PAL	A	N
				R-47	10/3/2016	0.87		PAL	A	N
				R-48	10/14/2014	0.71	J	PAL	A	N
				R-50P	04/21/2014	0.78		PAL	A, BRRDF	Y
				R-50P	10/13/2014	0.79		PAL	A, BRRDF	Y
				R-50P	10/6/2015	0.99		PAL	A, BRRDF	Y
				R-50P	04/12/2016	0.75		PAL	A, BRRDF	Y
				R-50P	10/2/2016	0.74		PAL	A, BRRDF	Y
				R-53	04/23/2014	0.55	J	PAL	BRRDF	Y
				R-66WT	10/13/2014	0.50		PAL	A	N
				R-66WT	04/13/2015	0.54	J	PAL	A	N
				R-66WT	10/6/2015	0.61	J	PAL	A	N
Trichloroethene	(µg/L)	0.5	5	R-12R	04/22/2014	0.9		PAL	A	Y
				R-12R	10/15/2014	0.96		PAL	A	Y
				R-12R	04/14/2015	0.96	J	PAL	A	Y
				R-12R	10/7/2015	0.74	LC	PAL	A	Y
				R-12R	04/14/2016	1.0	J	PAL	A	Y
				R-13R	04/22/2014	13		PAL	A	Y
				R-13R	10/14/2014	9.7		PAL	A	Y
				R-13R	04/14/2015	7.8		PAL	A	Y
				R-13R	10/7/2015	7.3		PAL	A	Y
				R-13R	04/14/2016	6.4		PAL	A	Y
				R-13R	10/3/2016	6.5		PAL	A	Y

Table 1
Parameters that Exceed Current NR 140 Standards
Marathon County Solid Waste Department
Areas A, B, and Bluebird Ridge RDF
2014 - 2016

Parameter	Unit	NR 140 PAL	NR 140 ES	Well	Date	Result	Data Flags	Exceedence	Area Designation	Within DMZ
Trichloroethene	(µg/L)	0.5	5	R-38	04/22/2014	1.4		PAL	A	Y
				R-38	10/15/2014	1.6		PAL	A	Y
				R-38	04/14/2015	1.4		PAL	A	Y
				R-38	10/8/2015	1.3	LC	PAL	A	Y
				R-38	04/14/2016	1.3		PAL	A	Y
				R-38	10/4/2016	1.1		PAL	A	Y
				R-47	04/22/2014	1.4		PAL	A	N
				R-47	10/14/2014	1.1		PAL	A	N
				R-47	04/14/2015	1.8		PAL	A	N
				R-47	10/7/2015	1.9		PAL	A	N
				R-47	04/13/2016	0.59	J	PAL	A	N
				R-47	10/3/2016	1.4		PAL	A	N
				R-48	10/14/2014	0.68	J	PAL	A	N
				R-50P	04/21/2014	0.66		PAL	A, BRRDF	Y
				R-50P	10/13/2014	0.58	J	PAL	A, BRRDF	Y
				R-50P	10/6/2015	0.67	LC	PAL	A, BRRDF	Y
				R-50P	04/12/2016	0.62		PAL	A, BRRDF	Y
Vinyl Chloride	(µg/L)	0.02	0.2	R-13R	04/22/2014	0.44	J	PAL	A	Y
				R-13R	10/14/2014	0.45	J	PAL	A	Y
				R-13R	04/14/2015	0.16	J	PAL	A	Y
				R-13R	10/7/2015	0.27	J	PAL	A	Y
				R-13R	04/14/2016	0.24	J	PAL	A	Y

Notes:

Prepared by: TD
Checked by: JO

1. J = Estimated concentration between the limit of detection and limit of quantitation.
   LB = Compound is suspected of being a laboratory contaminant.
   CC = Continuing calibration verification standard recovery was outside QC limits.
   LC = Laboratory control spike recovery was outside QC limits.
2. NR 140 PAL = Preventive Action Limit
3. NR 140 ES = Enforcement Standard
4. DMZ = Design Management Zone. Wells are located within 150 feet of landfill footprint. NR 140 ES does not apply within DMZ per NR 140.22(2)(b)(3).

Table 2
Parameters that Exceed Well Specific Standards
Marathon County Solid Waste Department
Areas A, B, and Bluebird Ridge RDF
2014 - 2016

Parameter	Unit	PAL	ACL	Well	Date	Result	Data Flags	Exceedence	Area Designation	Within DMZ
Alkalinity	(mg/L)	290	-	R-70WT	04/23/2014	350		PAL	BRRDF	N
Specific Conductance	(umhos@25C)	470	-	R-59WT	10/4/2016	529		PAL	BRRDF	N
		510		R-35	04/14/2016	510		PAL	A	Y
		540		R-52	10/4/2016	555		PAL	B	N
Hardness	(mg/L)	230	-	R-59WT	04/14/2016	230		PAL	BRRDF	N
		230		R-59WT	10/4/2016	280		PAL	BRRDF	N
		230		R-59P	10/4/2016	240		PAL	BRRDF	N
		290		R-52	10/4/2016	290		PAL	B	N

Notes:

Prepared by: TD

Checked by: JO

1. J = Estimated concentration between the limit of detection and limit of quantitation
2. PAL = Preventive Action Limit
3. ACL = Alternate Concentration Limit
4. DMZ = Design Management Zone. Wells are located within 150 feet of landfill footprint. NR 140 ES does not apply within DMZ per NR 140.22(2)(b)(3).