<u>Marathon County Solid Waste Department</u>
<u>Bluebird Ridge Recycling & Disposal Facility</u>
2021 ANNUAL REPORT

WDNR License No. 4228
FID 337005680

Marathon County Solid Waste Management Department
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- Marathon County Forestry Depart.
- Krueger & Stienfest, Inc
- Walt's Petroleum Service, Inc
- River View Construction, Inc.
- Oakridge Engineering
- QED Environmental Systems
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- Global Containment Systems GCS
- Golder Associates Inc.
- SEH Engineering
- E-Con Electrical, Inc.
- Valley Scale Service
- Van Ert Electrical Company
- Wisconsin Public Service

Introduction

This document is being submitted to the WDNR to meet the annual reporting requirements included in the Wisconsin Department of Natural Resources (DNR) January 31, 2013 Plan of Operation approval and the January 15, 2015; September 13, 2018; March 22, 2019; and June 19, 2019, Plan Modification approvals.

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 574-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.

Bluebird Ridge Recycling & Disposal Facility
(Shown at Construction phase in September 2013)

Summary of Landfill Activities in 2021

Disposal operations began on July 21, 2014. As of January 2022, the remaining estimated waste disposal capacity was 442,749 cubic yards. During 2021, approximately 251,128.67 tons of waste was 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, vegetation management, household hazardous waste diversion, 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 including alternative daily cover (ADC) were used as the means to control odors, reduce the risk of fires, and to create a suitable driving surface across the waste mass. Sludge from Linetec was approved as an ADC and construction and demolition (C&D) waste was approved for construction of roadways, access ramps, and wet weather pads within the limits of waste. Both of these methods worked well for their intended purpose. An additional report evaluating this Modification is to be submitted to WDNR for additional review.

On February 17th, 2020 MCSWD began filling the newly constructed Phase 5A expansion area. Filling began with the 10ft fluff layer, composed of only clean municipal solid waste. Loads were screened to ensure no bulky items were placed on the stone leachate drainage layer. Soils and ADC were also kept off the leachate drainage layer at least 10 ft.

In 2021, all 5 phases of BRRDF were brought up to an even elevation, and continuous lifts were built across all phases. A new access road was installed up the northern section of the site, and wraps around the east portion as it serpentines up the landfill at a 6% slope. 2021 consisted of a large amount of outside slope filling as the site continued to raise in elevation.

Operations Summary

- Daily operations
  - Safety and health management
  - Compaction & cover operations
  - Supplemental cover added to control odors
  - Litter and wind-blown debris control
  - Plowing roads
  - Grading roads
  - Water roads & also add calcium chloride for dust control
  - Vegetation management including screening
  - Intermediate cover placement and maintenance
  - Storm-water infrastructure maintenance and repair
- 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 both on and around the landfill
- Conducted educational tours, workshops, and events
- Continued work with Central WI Off-road Cycling Coalition, DNR, and Ice Age Trail Alliance on off-road biking course development
- New vehicle scale installed by WiScale (inbound and outbound)
- Licensed and approved Compost facility

Spring 2021 – access road construction

Waste Disposal Activities

During 2021, approximately 219,296.66 tons of waste was accepted in BRRDF and disposed in Phases 1 through 5. 42,109 tons of ash and soil were used for ADC and intermediate cover. Included in this sum were the following waste categories (reported in tons):

BBR 2021													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1 MSW	12805	11878.2	16363.57	18133.3	15434.5	18542.6	16749.9	15563.3	14931.3	14726.4	14750.2	13738.1	**183616.56**
2 Power sludge				94.15	173.62	95.36	18.7	99.76	328.34	288.06	367.71	135.2	**1600.90**
3 Pap Sludge	495.41	389.12	451.58	596.69	444.91	436.15	566.86	601.91	363.13	481.81	380.26	414.31	**5622.14**
4													
5 WWTP Sldg		17.98	55.11	271.68	549.88	311.38	631.7	116.24	28.29	36.68	65.37	75.87	**2160.18**
6 Ind and c soil	453.11	477.58	550.10	2167.74	1449.6		330.03	4837.16	444.82	412.54	875.75	602.45	**12600.88**
19 Reuse Demo						389.37	1843.18					26.2	**2258.75**
25 Demo	633.53	450.18	466.18	994.03	1036.71	2706.37	2261.92	412.09	436.71	530.7	827.46	663.66	**11419.54**
27 Non Profit			0.56			4.24	4.39		4.24	4.28			**17.71**
28													**0.00**
TOTAL	14387.1	13213.1	17887.10	22257.6	19089.3	22485.4	22406.7	21630.5	16536.9	16480.5	17266.8	15655.8	**219296.66**

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
- Lincoln
- Dunn

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

Litter control fencing utilized near active areas – fall 2021

Special Wastes

BRRDF is licensed to accept waste considered non-hazardous special waste. 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 dewatered 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 it to MCSWD staff for review and approval. The generator of waste, or their agent, must complete the form and 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 2021, the site had no non-approved wastes.

Approximately 43,964.82 tons of special waste were accepted into the BRRDF in 2021, which are included in the tons reported to the state, as identified above. The special waste accepted in BRRDF included the following waste categories (reported in tons):

2021 Special Waste

BRRDF MATERIAL	Tonnage
Ash from Power Generation	95.57
WPS Bottom Ash - ADC	20,725.90
Foundry Material	0
Sludges (WWTP and Papermill)	7,782.32
Industrial and Manufacturing Sludge	1,600.90
Friable asbestos	81.84
Construction and Demolition	13,678.29
TOTAL	43,964.82

Approximately 20,725.90 tons of WPS bottom ash were used as alternative daily cover (ADC) material. Other ADC consisted of Linetec sludge, street sweepings, and contaminated soils. No ADC was used on exterior side-slopes, within 10 feet of liner or within 100 feet of the limits of waste.

Daily and Intermediate Cover

Native soils were also used as cover material. No problems were encountered during 2021 with the use of special waste as ADC or C&D waste used in roadways, access ramps, and wet weather pads within the limits of waste.

Intermediate cover consisted of screening and hauling large quantities of material. Photos below detail the work involved to adequately install intermediate cover across large portions of exterior slopes.

Filling operations along north slope of BRRDF.

Screening soil for intermediate cover use

Soil placed on North and West slopes

Result of north slope after intermediate cover, compost, and seeding

Odor Monitoring Summary

Odor complaints in 2021 were received from a few separate residents as follows. Odors were addressed by on-site investigation each time one was received. A check of the system, along with a corrective action took place. Actions included additional soil cover, wellbore seals, surface emission monitoring, tuning wells to extract more gas where possible, well pumping, and installation of additional wells in areas of concern. See below details on all 2021 Gas Collection and Control System upgrades.

2021 experienced a larger amount of odor complaints compared to previous years. Heavy summer precipitiation added to the issue of off site odor migration. The site was proactive in implementing various control infrastructure as detailed below in the GCCS upgrades section. In addition, staff visited numerous residents to better identify the concerns. An odor misting system was also acquired to better control odors coming off the active area. The Department continued to implement best management practices across the entire site, being proactive and going beyond what is regulatorily required by the Plan of Operation.

Friday, March 19, 2021	Paula Zynda
Monday, March 29, 2021	Paula Zynda
Monday, April 5, 2021	Heather Maves
Monday, April 5, 2021	Ryan Heinrich
Tuesday, April 6, 2021	Paula Zynda
Thursday, April 8, 2021	Paula Zynda
Tuesday, August 10, 2021	Paula Zynda
Monday, August 23, 2021	Al C
Monday, August 23, 2021	Paula Zynda
Friday, August 27, 2021	Paula Zynda
Monday, August 30, 2021	Unknown
Wednesday, September 1, 2021	John Morien
Thursday, September 2, 2021	Paula Zynda
Saturday, September 4, 2021	Chris Kielman
Saturday, September 4, 2021	Mary
Saturday, September 4, 2021	Mark Kluck
Friday, September 10, 2021	Jason Grezenski
Wednesday, September 22, 2021	Unkown
Thursday, September 23, 2021	Chad Strelow
Friday, September 24, 2021	Roman Evgrebrect
Friday, September 24, 2021	Roman Evgrebrect
Tuesday, September 28, 2021	Paula Zynda
Wednesday, September 29, 2021	Iris Durrant
Friday, October 1, 2021	Paula Zynda
Sunday, October 3, 2021	Henry Heinrich
Monday, October 4, 2021	Darlene Antoniewicz
Thursday, October 7, 2021	Luke Antoniewicz
Friday, October 8, 2021	Paula Zynda (Twice)
Tuesday, October 12, 2021	Scott Schlund
Monday, October 18, 2021	Paula Zynda
Monday, October 18, 2021	Peggy Erdman

Friday, October 29, 2021	Paula Zynda
Tuesday, November 16, 2021	Paula Zynda
Tuesday, November 23, 2021	Paula Zynda
Monday, November 29, 2021	Paula Zynda
Tuesday, November 30, 2021	Michelle Gladowski
Thursday, December 2, 2021	Michelle Gladowski
Friday, December 3, 2021	Michelle Gladowski
Wednesday, December 8, 2021	Michelle Gladowski
Wednesday, December 8, 2021	Angie Hoffman
Wednesday, December 8, 2021	Paula Zynda
Thursday, December 9, 2021	Paula Zynda
Thursday, December 9, 2021	Unknown
Friday, December 10, 2021	Paula Zynda
Monday, December 13, 2021	Michelle Gladowski
Friday, December 17, 2021	Michelle Gladowski
Saturday, December 18, 2021	Leon Falkowski
Sunday, December 19, 2021	Michelle Gladowski
Thursday, December 23, 2021	Michelle Gladowski
Thursday, December 23, 2021	Troy Hartwig
Friday, December 24, 2021	Michelle Gladowski
Friday, December 24, 2021	Leon Falkowski
Saturday, December 25, 2021	Michelle Gladowski
Saturday, December 25, 2021	Paula Zynda
Saturday, December 25, 2021	Leon Falkowski
Sunday, December 26, 2021	Michelle Gladowski
Monday, December 27, 2021	Michelle Gladowski
Tuesday, December 28, 2021	Michelle Gladowski
Wednesday, December 29, 2021	Michelle Gladowski
Thursday, December 30, 2021	Michelle Gladowski
Friday, December 31, 2021	Michelle Gladowski

Misting system used near active areas to reduce odor.

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. Due to COVID-19 during 2021, load inspections were communicated from Operator to the Scale Master and documented on tickets.

Additional Waste & Recycling Services Information

The MCSWD offers a full range of solid waste and recycling services. During 2021, the following materials 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
- Yard waste
- Vinyl siding

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.

Recycling shingles hauled off site by Kafka Granite

In 2021, the shingle recycling program diverted 809 tons of shingles from landfill disposal. All shingles were taken to Kafka Granite in Mosinee, Wisconsin, where they were ground up and nails were removed via magnet. Ground shingles were mixed with asphalt.

MCSWD hosts a yard material site, and in 2020 a compost license was obtained. Yard waste accepted at BRRDF includes grass, leaves, and brush. At this time, MCSWD does not accept food. Incoming yard waste is placed in a pile located north of BRRDF and west of the BRRDF leachate storage tank. This is also where the new compost facility is located.

Marathon County Solid Waste Compost site location – north of BRRDF

The facility also installed a new scale as an upgrade to the site's operations. An outbound scale was installed on the west side of the office building. WiScale was the installer, and the project went well. The site now uses 2 scale, one inbound and one outbound.

Scale installation

MCSWD administers a multi-municipality street sweeping low hazard exemption beneficial reuse program. Participating municipalities can divert from landfilling the sand/grit collected after the winter season. Collected sweepings can be used in municipal utility and public works projects or reused by MCSWD as ADC. In 2021, these programs diverted soil, mulch, and street sweepings that were used as ADC or beneficial reuse materials for building infrastructure in the site.

In addition to the above-noted materials, MCSWD underwrote the entire cost of the county's Medication Drop Box Program, at eight 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 were provided this service on a fee-based system.

Organics Stability Plan

The composting operation and additional services coincide with the site's Organic Stability Plan. Please refer to Attachment H for an overview of this plan.

Landfill Maintenance

During 2021, the following site maintenance activities were completed:

- Regular inspections of leachate tank, loadout station area, and sump were conducted to check for potential leaks on a daily basis.
- Quarterly inspections of the leachate force-main and gas condensate secondary containment access points.
- Roadways were treated with calcium chloride as a means of dust control during May 2021.
- 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.
- The storm water and infiltration basin were inspected to ensure the integrity of overflow and slopes.
- Storm water grates were cleared routinely for both windblown litter and sediment.
- Storm water culverts were cleaned out during the annual leachate line jetting.
- Upkeep of silt fences around identified wetland areas and periodic inspection performed.
- Placed and seeded approximately 6 acres of intermediate cover for erosion control.
- Gas system penetration points filled with bentonite and capped with wellbore seals.
- Site-wide groundwater well maintenance and repairs.
- Construction of new access ramp up the north side of Phases 1-5.
- GCCS Expansion of BRRDF with 4 new horizontal wells in 2021.

Wind blown litter cleanup process March 2021.

Landfill Fire

In September of 2021, a landfill fire occurred on Bluebird Ridge Recycling and Disposal Facility. Fire response was done by site staff and the Ringle Fire Department. The fire was primary concentrated on the surface in a 100ft by 50ft area. The specific area was on the north side of Bluebird Ridge, and was the location that had been receiving "hand unload" materials from residential customers. The fire was quickly extinguished within 30 minutes of initial observation. Both soil and water were utilized in this response, and increased monitoring around this area, including gas well monitoring for temperatures, was performed. WDNR staff was notified about this event.

Cause of the fire is unknown. Cover materials in this area consisted of bark and sludge, which may have increased the chance of fire compared to a soil or ash. Fires occur quite regularly in the landfill, but operations staff are able to identify and extinguish quite easily. The majority of fire that are encountered are caused by electronic devices, specifically lithium ion batteries. Marathon County staff have worked with SWANA and AROW to better evaluate lithium ion battery fires in an attempt to move towards legislation that prohibits disposal of these items in MSW.

Fire response with additional water added after soil application.

Gas Collection System

An active landfill gas extraction system for BRRDF commenced in mid-May 2018. This expansion of the gas collection and control system (GCCS) ties into the existing GCCS for Area A and Area B landfills, which consists of gas collectors and transfer piping, a blower to move the gas collected, and end-use equipment (described below). The gas wells located in BRRDF currently include eight (8) vertical gas extraction wells, five (5) leachate cleanout riser wells, and five (5) horizontal wells, all connected via a sub-header system to the landfill gas main header pipe that services Area A and Area B landfills. The gas extracted from the landfill is transferred to the on-site landfill gas recovery building (located south of the Area A Landfill) via a header pipe to a landfill gas to energy plant or to a flare. Vacuum applied to the wellfield is regulated by the variable frequency drive (VFD) blower station that controls the GCCS. A map of the BRRDF component of the GCCS is provided in Attachment A.

In summer of 2021, MCSWD hired Perennial Energy to do a thorough inspection and analysis on the condition of the GCCS system blower building infrastructure once again. Perennial technicians evaluated the condition of the flare, the blower, and the various valves and controls in place. The system was found to be in good working condition, but there will be necessary upgrades in the near future, including a PLC upgrade on the SCADA system. Perrenial also did blower bearing replacement in 2021.

GCCS main blower bearings replaced.

Landfill gas emissions from the entire MCSWD property, including BRRDF, are regulated under and in accordance with Air Pollution Control Operation Permit 737092730-P20 (issued November 2, 2015).

Existing sensing devices measure gas flow rates, pressure, vacuum, and methane and oxygen concentrations. These sensors are located on the main header line pipe leading into the gas recovery building and include gas collected from Area A, Area B, and BRRDF landfills. Data is recorded and stored on a computerized data collection system. This data is used for operating and reporting purposes.

The Marathon County GCCS operated 97.39% of the year with approximately 8,531 hours of operation. The average aggregated flow rate for the site GCCS was approximately 991.32 standard cubic feet per minute (scfm). Methane and oxygen concentrations of landfill gas averaged, by volume, 51.2% for methane and 1.0% oxygen. Total gas collected from the site in 2021 was 521,423,435 standard cubic feet (scf). From the total gas collected at the site, 330,757,367 scf was used for production of electricity, and 190,666,065 scf was sent to the flare. The table below summarizes the aggregated flow, combustion location, and vacuum of the GCCS at the site.

Bluebird Ridge – Gas Well 216 north side of site (pumping setup)

2021 MARATHON COUNTY GCCS DATA (INCLUDES AREA A, AREA B & BRRDF)

Month	Total CFM	CFM Electric	CFM Flare
Jan	35,959,532	27,938,094	8,021,438
Feb	35,825,333	25,732,988	10,092,346
Mar	43,580,196	33,750,304	9,829,892
Apr	40,717,387	24,682,637	16,034,749
May	42,083,634	33,843,475	8,240,159
Jun	40,450,546	29,496,315	10,954,231
Jul	41,807,723	29,290,360	12,517,363
Aug	44,903,303	30,591,052	14,312,251
Sep	44,014,624	30,770,976	13,243,647
Oct	51,063,231	29,774,114	21,289,117
Nov	47,783,789	32,177,269	15,606,519
Dec	53,234,137	2,709,783	50,524,353
Totals	521,423,435	330,757,367	190,666,065

Below is a chart listing average monthly vacuum, methane (CH4), and oxygen (O2) concentrations of the site GCCS (combined Area A, Area B, and BRRDF landfill gas).

2021 GCCS Vacuum and Concentrations	Ave Vacuum (negative inches water column)	Ave CH4%	Ave O2%
January	26.25	50.3	1.1
February	26.50	49.6	1.3
March	25.80	50.8	1.1
April	26.40	51.9	1.0
May	25.90	51.6	1.1
June	26.40	52.4	0.9
July	24.50	53.7	0.5
August	24.30	52.5	0.8
September	24.90	50.5	0.8
October	25.00	48.7	0.9
November	26.10	51.5	1.0
December	26.00	50.5	1.0
Average	25.67	51.2	1.0

Gas System Outages

As indicated previously, the gas extraction system operated nearly continuously. Any shutdowns, whether for planned maintenance or unplanned events were reported to the WDNR Air Management staff. The January to June 2021 Semi-annual Report and July to December 2021 Semi-annual Report for the facility include descriptions of the startup, shutdown, and malfunction events associated with the GCCS, single control device, and the continuous monitoring system.

2021 GCCS Expansion

The Gas Collection Control System (GCCS) 2020 expansion consisted of 3 horizontal wells within the Phase 1 – 5 area of Bluebird Ridge Recycling and Disposal Facility, and an additional leachate cleanout riser. The wells were designed to capture maximum gas along the interior areas of the cell where waste grades were not yet to intermediate elevations.

The horizontal gas collection trenches consisted of a minimum of 24 inches of coverage. The cover included 12 inches of 1-inch to 3-inch non-calcareous stone directly above SDR-17 HDPE and a minimum of 12 inches of soil backfill with geotextile located 12 inches from final grade. The construction contractor performing the installation of the LFG collection piping was Riverview Construction. Construction Quality Assurance (CQA) was performed by Tetra Tech staff and Marathon County staff, under the direction of the certifying engineer.

Horizontal collection well installation north side of BRRDF.

Horizontal collection well installation along access ramp – north side of BRRDF.

Overall 2020 and 2021 GCCS Upgrades

Marathon County Solid Waste works to ensure the protection of human health and the environment at every level possible, and to take proactive measures to reduce landfill odor migration off site. At this time, our Bluebird Ridge landfill is the primary contributor to landfill gas generation composing over 60% of our overall volume. As of December 2021, 100% of the landfill gas infrastructure was installed ahead of DNR schedule, and 55% of the landfill gas extraction points are not required by State or Federal regulations, but were installed as proactive steps to ensure landfill odor was kept to a minimum.

- Fully compliant with all EPA and DNR regulations
- 8 of the 18 wells are regulatorily required – 10 of our wells were installed to better collect gas and eliminate odors.
- Implemented an aggressive action plan to resolve the problem, along with a full odor investigation to be included in annual report 2022.
- Started educational campaign to provide residents and neighbors with information
- FAQ page on website
- Provide residents with Hydrogen Sulfide detectors – to set at various locations to identify concentration levels migrating off site.
- Evaluate bids on odor vapor system
- Upgrades in 2020 and 2021
- 4 collection wells installed in 2021 - down to just a few complaints in the month of November 2021.
- Odor misting system used in above freezing temp
- 22% of landfill airspace is cover material
- Activel evaluating wet waste materials, and looking for ways to dry it out before it arrives
- Plan to put final cap on Area B in 2023, and also cap phase 1 and 2 of BRRDF in 2023.
- In 2022, the site will have dedicated well pumps in every gas well – not required by landfill regulation but helps increase efficiency
- Gas data reviewed by experts within 24 hours of gathering.
- Well Bore Seals installed as needed around Gas Wells on B and BBR – 10' x 10'
- 4 new vertical wells in 2020 1 year ahead of schedule for Best Management Practices and 2 Horizontal wells requested by Department and added by contractor – and 2 new cleanout riser extraction points.
- Daily and Intermediate Cover increases of nearly 1 foot across all intermediate cover
- Additional seed bed material utilized for enhance germination and growth for erosion prevention. Compost added to establish vegetation.
- Enhanced Cell design implementation utilizing full rain-flap technology to minimize drainage stone exposure at cell transitions
- GPS lift design to enhance storm-water drainage and leachate minimization, less factors for methane generation throughout the site.
- 2021 Dept staff installation of LFG horizontal T3 to further capture LFG
- Increases in GW valve positioning, orifice plate sizing and wellhead overall dimension.
- Extensive Intermediate Cover project on Area B for leachate and odor mitigation, enhanced storm-water reduction.
- Leachate line jetting and preventative maintenance on Area B to maintain constant vacuum sources across the hill.
- GW down well pumping structures inventoried, maintained and installed to maximize GW efficiency. Ongoing project for years to come.
- Sept. 2021 LFG T4 horizontal wells installed by contractor for odor mitigation purposes.
- Implementation of Geomembrane install on any SEM hits in addition to cover, increase in vacuum applications and bentonite
- November 2021 – installation of collection well along ramp. Hook up to cleanout riser on phase 5A.

Surface Emission Monitoring

Surface emission monitoring (SEM) of BRRDF was conducted quarterly in 2021. Any exceedences were immediately corrected and put back into compliance. For all SEM events, a flame ionization detector (FID) is used while MCSWD's environmental technician walked a serpentine pattern across the surface of the landfill. Results of the monitoring are provided in Attachment B.

Soil Gas Monitoring

During 2021, 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 2021, these monitoring results indicated no migration of landfill gas from BRRDF. During an inspection with WDNR, it was noted to make sure all Gas Probes are properly labeled and locked. MCSWD staff made sure this was completed in a timely manner.

First Quarter Probe Data (January 20, 2021):

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	20.5	0.32	550
GP102	E BRRDF	0	21	-0.02	551
GP103	E BRRDF	0	22	-0.03	552
GP104	S BRRDF	0	22.3	0	553
GP105	S BRRDF	0	21.2	0.36	554
GP106	W BRRDF	0	20.4	0.48	555

Second Quarter Probe Data (April 23, 2021):

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	18.2	0.14	550
GP102	E BRRDF	0	17.9	0	551
GP103	E BRRDF	0	18.5	-2.3	552
GP104	S BRRDF	0	19.3	0	553
GP105	S BRRDF	0	18.4	0.12	554
GP106	W BRRDF	0	18.2	NR	555

Third Quarter Probe Data (July 22, 2021):

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	17.9	0.09	550
GP102	E BRRDF	0	17.7	-0.04	551
GP103	E BRRDF	0	18.3	-0.02	552
GP104	S BRRDF	0	18.8	-0.01	553
GP105	S BRRDF	0	17.7	0.08	554
GP106	W BRRDF	0	18.1	0.08	555

Fourth Quarter Probe Data (November 18, 2021)

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	19.7	-0.12	550
GP102	E BRRDF	0	19.5	-0.02	551
GP103	E BRRDF	0	19.9	0	552
GP104	S BRRDF	0	21.2	-0.01	553
GP105	S BRRDF	0	18.9	-0.17	554
GP106	W BRRDF	0	19.8	-0.16	555

Gas Condensate Monitoring

Gas condensate generated at BRRDF is collected and transferred to the leachate force-main which is conveyed to the leachate storage tank for BRRDF. Gas condensate is monitored as part of the leachate storage tank requirements, as it combines with leachate in the tank.

2021 BBR Condensate Volume Pumped (Gallons)		
Month	CS-1	CS-2
Jan	1764	13440
Feb	756	16296
Mar	1428	23016
Apr	1512	18648
May	1596	12516
Jun	2100	14448
Jul	2436	12516
Aug	2436	12432
Sep	2352	14112
Oct	2940	14784
Nov	2184	15204
Dec	2436	17052
TOTALS	23940	184464

Landfill Gas Monitoring

Landfill gas emissions from BRRDF are regulated under and in accordance with Air Pollution Control Operation Permit 737092730-P20 (issued November 2, 2015). Monitoring results for 2021 are summarized in the table below.

The gas extraction wells are monitored monthly for gas temperature, percent oxygen, percent methane, header pressure, wellhead pressure, barometric pressure, barometric pressure trend, and gas flow rate. Results are reported semiannually to the WDNR Air Management staff. The January to June 2021 Semi-annual Report and July to December 2021 Semi-annual Report for the facility include the monthly monitoring results.

On October 25, 2021, MCSWD's environmental technician and Tetra Tech used a summa canister to collect a sample of landfill gas. The full canister was shipped via express mail services to Air Technology Labs, Inc. (ATL) 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). Results of the testing performed by ATL is provided as Attachment C to this annual report.

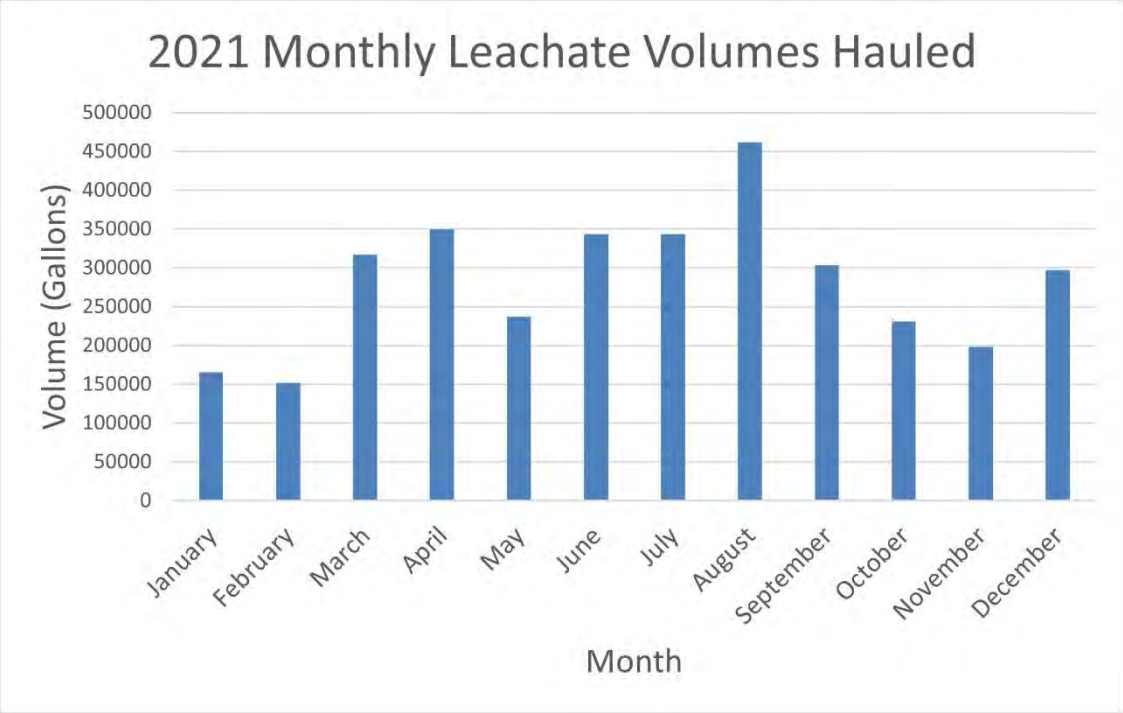
Leachate System Information:

Leachate is collected within the leachate management system that includes a granular drainage layer and perforated piping laid in gravel-filled trenches that drain to collection sumps. Leachate gathers in sumps in the low points of Phase 2, Phase 4, and Phase 5A. Each sump includes a pump and a force-main within a side slope riser. A pump within the riser pipes transfers leachate through a force-main system to an aboveground storage tank. Three side-slope riser pipes are constructed and operational (one for Phase 1 and 2, one for Phase 3 and 4, and one for Phase 5A). 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 2021 was transported to the following facilities: the Wausau Wastewater Treatment in Wausau, Wisconsin; the Plover Wastewater Treatment Plant; or the Stevens Point Wastewater Utility in Stevens Point, Wisconsin. Leachate is pumped into the WWTF and treated to ensure all effluent meets Wisconsin Pollutant Discharge Elimination System (WPDES) standards prior to discharge into the Wisconsin River. Preventative maintenance of the leachate storage and pumping system was conducted, as needed, by an 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. The total volume (gallons) of leachate collected/transported/treated in 2021 is as follows:

Leachate Volume (gallons) hauled off site:

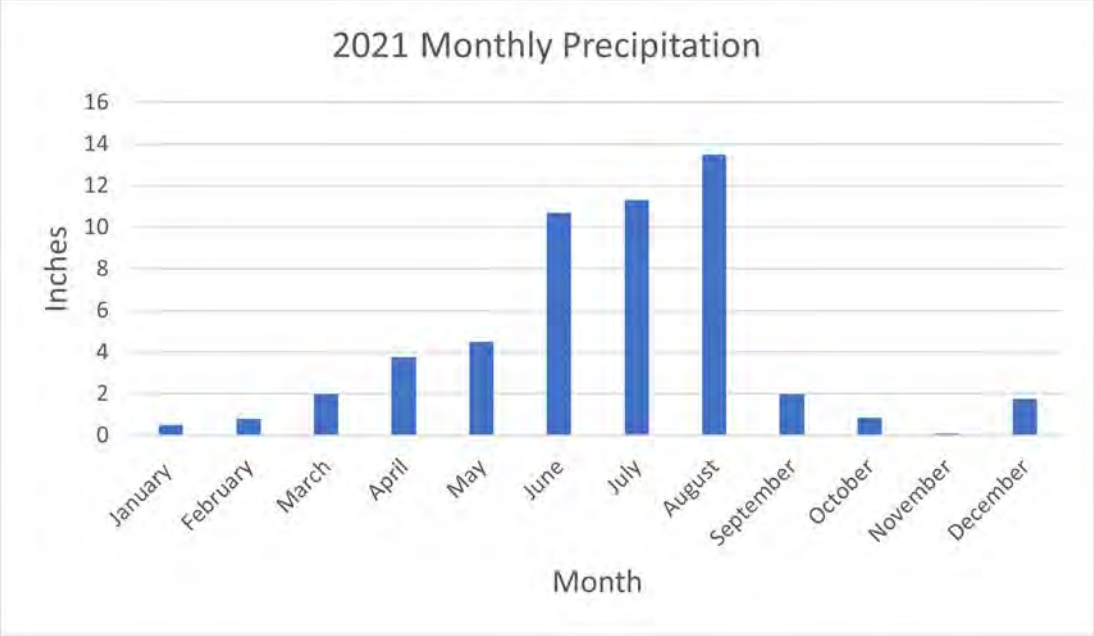
2021	LST-101
January	165000
February	151800
March	316800
April	349800
May	237600
June	343200
July	343200
August	462000
September	303600
October	231000
November	198000
December	297000
BBR total:	3,399,000



Precipitation:

Month	Inches
January	0.5
February	0.8
March	2
April	3.75
May	4.5
June	10.7
July	11.3
August	13.5
September	2.6
October	0.85
November	0.1
December	1.75
Total	51.75

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



Leachate Line Jetting

In June, 2021, Northern Pipe, Inc. of Green Bay, Wisconsin, water jetted the leachate lines of BRRDF. Jetting was accomplished by accessing each pipe at one end and jetting the full length of the pipe; overlap was done on the slopes. Each line was televised in 2018. No issues were reported. A total of 3,000 gallons were used during the jetting process. The report for BRRDF jetting and televising is provided as Attachment D.

Leachate Head Well Monitoring

Leachate head wells are monitored by MCSWD staff on a quarterly basis. The site's monitoring records indicate that the leachate head wells were mostly dry during 2021.

Marathon County Solid Waste									
Leachate Head Well Monitoring									
Bluebird Ridge- 4228	LLM 1	LLM 2	LLM 3	LLM 4	LLM 5	LLM 6	LLM 7	LLM 8	LLM 9
Pipe Length to Elbow (ft.)	86.36	106.56	50.63	51.11	105.64	113.94	67.88	97.11	unknown
Date	Depth to Liquid	Depth to Liquid	Depth to Liquid	Depth to Liquid	Depth to Liquid	Depth to Liquid	Depth to Liquid	Depth to Liquid	Depth to Liquid
March	Dry	Dry	Dry	Dry	Dry	Dry	Dry	94.6	Dry
June	Dry	Dry	Dry	Dry	Dry	Dry	Dry	1	Dry
September	Dry	0.5	Dry	0.5	0.25	Dry	Dry	Dry	Dry
December	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry

Leachate Sampling

Leachate sampling and analytical analysis of BRRDF LST-101 was conducted in April and October 2021 by Northern Lakes Services (NLS). VOCs and metals were sampled semi-annually and semi-volatile organics were sampled and tested in April only. Sampling results show a variety of compounds present that are consistent with previous sampling results. Full results are available on the WDNR Groundwater and Environmental Monitoring System (GEMS) database and are maintained in site files. Conductivity and pH values reported in 2021 are summarized below.

Leachate	2021	Conductivity	pH
		umho/cm	S.U.
LST-101	April	10000	7.64
	October	17400	8.07

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 bio-filter and infiltration basin performed as designed and lost no structural integrity. A small temporary runoff basin exists in the southwest corner of the cell. This basin is continually monitored to ensure it remains operational to discharge runoff, from the west side of Phase 5A to the stormwater ditch located on the south side of the active site. This runoff ultimately drains 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 in June, 2021. This included the outfall to the bio-filter and general inspection of ditches associated with BRRDF. This inspection and quarterly visual inspections are provided in Attachment E.

Operations of BRRDF – compost used for soil stabilization

Groundwater Monitoring & Analysis

Environmental monitoring at the BRRDF is conducted and reported as specified in the January 31, 2013 Plan of Operation Approval. An additional groundwater assessment will be completed in 2022 by Tetra Tech to provide a more thorough overview of the site's groundwater conditions. This will be submitted at a later time in 2022 evaluating concerns nitrate concerns at R27 and conductivity concerns at well nest 59s. Marathon County and Tetra Tech have been working closely with WDNR on these concerns and will have a report in 2022 detailing all related information.

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 were performed in conjunction with the Area A private wells routine monitoring program. Analytical results and explanations, where necessary, were reported to the private well owners. Results of the down-gradient wells with WDNR well ID numbers were submitted electronically to the WDNR's GEMS. The exceedance reports submitted to the WDNR for sampling events in April and October 2021 are provided in Attachment G.

No exceedances of NR 140 Groundwater Quality Standards or NR 812 Drinking Water Standards were reported in the samples collected from the private wells. The private water supply well samples analyzed in 2021 met the parameters identified in the site's monitoring plan for safe drinking water standards and no exceedances were recorded. During 2018, a low-level (estimated between the limit of quantitation and the limit of detection) detection of tetrachloroethene and acetone were reported in a sample collected from private well PW-68. This parameter was not detected in 2021 in either sampling month. Additionally, in 2018 a low-level detection of dichlorofluoromethane was reported in a sample collected from private well PW-27. PW-27 did not have any detects in 2021 in either sampling month.

MCSWD's July 2004 "Private Well Monitoring Program and Contingency Plan for Alternative Water Supplies" explained that 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. The maximum contaminant levels are allowed in drinking water for public water supply systems, so the county's contingency plan is even more protective of human health.

Groundwater Monitoring

Please refer to the 2017 – 2019 three-year groundwater assessment for more detailed information about site groundwater conditions and status. Groundwater wells associated with BRRDF were sampled in April and October. The samples were analyzed by Northern Lake Service Laboratory. Exceedances more than well-specific Prevention Action Limits (PALs) and NR 140 PALs are summarized below.

April 2021

Marathon County Solid Waste Mgmt Dept: BRRDF Groundwater Monitoring Wells											
Exceedances											
Lab ID	NLS Project	Date	License #	FID	Well Desc (Point ID)	Parameter	Units	Result	PAL/ACL	ES	Comments
721026460	364341	April 1 2021	04228	337005680	R59P (237)	Alkalinity	mg/L	420	230	-	well
721026460	364341	April 1 2021	04228	337005680	R59P (237)	Conductivity	umhos@25C	710	470	-	well
721026460	364341	April 1 2021	04228	337005680	R59P (237)	Hardness	mg/L	450	230	-	well
721026460	364341	April 1 2021	04228	337005680	R59WT (234)	Alkalinity	mg/L	470	230	-	well
721026460	364341	April 1 2021	04228	337005680	R59WT (234)	Conductivity	umhos@25C	790	470	-	well
721026460	364341	April 1 2021	04228	337005680	R59WT (234)	Hardness	mg/L	500	230	-	well

October 2021

Marathon County Solid Waste Mgmt Dept: BRRDF Groundwater Monitoring Wells											
Exceedances											
Lab ID	NLS Project	Date	License #	FID	Well Desc (Point ID)	Parameter	Units	Result	PAL/ACL	ES	Comments
721026460	375599	October 1 2021	4228	337005680	R54	Hardness	mg/L	310	290		well
721026460	375599	October 1 2021	4228	337005680	R59P (237)	Alkalinity	mg/L	400	230	-	well
721026460	375599	October 1 2021	4228	337005680	R59P (237)	Conductivity	umhos@25C	700	470	-	well
721026460	375599	October 1 2021	4228	337005680	R59P (237)	Hardness	mg/L	460	230	-	well
721026460	375599	October 1 2021	4228	337005680	R59WT (234)	Alkalinity	mg/L	430	230	-	well
721026460	375599	October 1 2021	4228	337005680	R59WT (234)	Conductivity	umhos@25C	750	470	-	well
721026460	375599	October 1 2021	4228	337005680	R59WT (234)	Hardness	mg/L	490	230	-	well

Indicator parameters which include alkalinity, hardness, and conductivity, were reported above well specific PALs at wells R59P and R59WT during 2021. The exceedance reports submitted to the WDNR for sampling events in April and October 2021 are provided in Attachment F.

Indicator parameters hardness, alkalinity, and specific conductance concentrations are exhibiting increasing trends at the BRRDF upgradient well nest R59WT/P. Wells upgradient of R59WT/P include the Area A Landfill wells R13R and R35. Well R35 has also reported well-specific exceedances for specific conductance with an increasing trend in specific conductance concentrations. Well R13R has recorded specific conductance between 1,310 to 1,410 umho/cm during the three-year period from 2017 to 2019. The increase in concentrations at the R59WT/P well nest may be associated with the elevated readings for these parameters occurring upgradient of this well nest in the VOC plume.

As indicated, Tetra Tech will be completing a more thorough evaluation of the site's groundwater condition in a report in 2022. This will be sent to WDNR when it is completed.