Soil Gas Monitoring Corrective Action Plan

Bridgeton Landfill

NOVEMBER 6, 2020
PROJECT NUMBER 209-4201603

PRESENTED TO

Bridgeton Landfill, LLC
13570 Saint Charles Rock Road
Bridgeton, MO 63044

SUBMITTED BY

Cornerstone Environmental Group, LLC
4200 Cantera Drive, Suite 102
Warrenville, IL 60555

P +1.877.294.9070
F +1.877.845.1456
tetratech.com

REPORT CERTIFICATION

The material and data in this report were prepared under the supervision and direction of the undersigned.

Thomas A. Bilgri — **11/6/2020**

Thomas A. Bilgri, P.E.
Manager – Biogas Engineering

Date

11/6/2020

Mark Torresani, P.E.
Certifying Engineer

Date

STATE OF MISSOURI
MARK J. TORRESANI
NUMBER E-2000164401
REGISTERED PROFESSIONAL ENGINEER
11/6/2020

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
BGS	Below Ground Surface
CAP	Corrective Action Plan
ø	Diameter
GCCS	Gas Collection and Control System
HDPE	High-Density Polyethylene
“WC	Inches of Water Column
IR	Investigation Report
LFG	Landfill Gas
MDNR	Missouri Department of Natural Resources
MGP	Methane Gas Policy
MSL	Mean Sea Level
SVE	Soil Vapor Extraction
TMP	Temporary Monitoring Probe
WMP	Waste Management Program

1.0 INTRODUCTION

This Corrective Action Plan (CAP) outlines mitigative measures to address the results of the soil gas investigation executed adjacent to the Bridgeton Landfill, as reported in the Soil Gas Monitoring Investigation Report submitted, via email on August 21, 2020 and via hard copy on August 24, 2020, to the Missouri Department of Natural Resources (MDNR) and St. Louis County (County). The Investigation Report (IR) was developed in accordance with the *MDNR Solid Waste Management Program Methane Gas Policy (2017), Section III.A (MGP)* and was approved by the MDNR on September 23, 2020, in a letter from Charlene S. Fitch, P.E. (Chief, Engineering Section) to Erin Fanning (Bridgeton Landfill Division Manager).

The Bridgeton Landfill is an inactive solid waste disposal facility that has experienced sub-surface landfill gas (LFG) movement, specifically in the vicinity of perimeter temporary monitoring probes TMP-1S, TMP-3S and TMP-3M.

2.0 EXISTING SITE CONDITIONS

The Bridgeton Landfill is located at 13570 St. Charles Rock Road, Bridgeton, Missouri. The municipal solid waste (MSW) landfill operating under MSW Permit 118912 and County Permit 0418, encompasses approximately 50 acres with approximately 240 feet below the ground surface. The waste is located in two distinct areas known as the North and South Quarries. Waste deposition ceased on December 31, 2004. See Appendix 1 for the Facility Plan.

The existing gas collection and control system (GCCS) has been constructed in all portions of the disposal area permitted under Solid Waste Permit 118912 and consists of vertical extraction wells and additional collection points installed within and adjacent to the landfill as remediation efforts connected via a combination of buried and exposed HDPE header and lateral piping and a condensate management system. LFG extracted via the GCCS is currently combusted at a centralized flare station.

The disposal area has installed a clay final cover system, and over the entire South Quarry Area and the majority of the North Quarry Area, an additional Ethylene Vinyl Alcohol (EVOH) cover has been installed. Subsequent earthen fill projects in the South Quarry Area have replaced approximately half of the installed EVOH cover. The combination of the GCCS and the final cover system serves to control both sub-surface lateral gas movement and landfill gas odors.

A series of perimeter gas monitoring probes and temporary monitoring probes have previously been installed to monitor the potential for LFG movement away from the limits of waste placement. The existing LFG monitoring locations in this portion of the site are shown in Appendix 2.

This CAP is specific to the conditions noted in temporary monitoring probes TMP-1S, TMP-3S and TMP-3M. Methane has previously been detected in temporary monitoring probes TMP-1S, TMP-3S and TMP-3M, and is assumed to be from LFG, though isotopic analyses have not been conducted to determine if there is a secondary or tertiary source of combustible gas local to these probes. These probes are located generally in the southwestern corner of the property, between the limits of waste placement and Boenker Lane. Modifications to the existing GCCS components, including the addition of collection points and the continued tuning of vacuum application to the existing GCCS, have not, to date, mitigated the presence of methane gas within probes TMP-1S, TMP-3S and TMP-3M.

There is currently no appearance of an imminent threat to the public or the environment from observed methane concentrations at the noted locations. Monitoring points between probes TMP-1S, TMP-3S and TMP-3M and potential off-site receptors indicates that methane is not moving extensively and appears to be generally confined to the area adjacent to probes TMP-1S, TMP-3S and TMP-3M.

3.0 MONITORING SUMMARY

3.1 MONITORING LOCATIONS AND CONSTRUCTION

An interim monitoring system was installed to define the pathway(s) that may be allowing LFG to travel from the waste mass to probes TMP-1S, TMP-3S and TMP-3M. These monitoring points were spaced through the area based upon the current understanding of the site geology, infrastructure and potential natural and man-made gas transmission pathways that may exist, in accordance with MGP Section III.2.a. A Site Plan delineating the interim monitoring points is provide as Appendix 3.

Boring logs indicate that the bedrock surface is approximately thirty-five feet below ground surface, with sand lenses layered with silt/clay layers observed. TMP-1S and TMP-3S were reportedly screened from about five feet below ground surface to the top of the bedrock surface, with TMP-3M's screen started at about the bedrock surface.

Construction records of the interim monitoring point installation are provided in the IR and are summarized as follows:

Table 1 - Monitoring Point Summary

Point ID	Ground Surface Elevation (MSL)	Approximate Screened Interval (BGS)
BRP1001S	460.39	13-23
BRP1001D	460.39	25-29
BRP1002S	46.012	16-20
BRP1002M	460.17	23-26.5
BRP1002D	460.19	28-29.2
BRP1003S	459.95	11.7-14.7
BRP1003D	460.13	18-20
BRP1004	458.2	25-35
BRP1005S	459.94	15.5-23
BRP1005M	460.07	25-30
BRP1005D	459.77	31-33
BRP1006S	456.49	14-19
BRP1006M	456.44	25-30
BRP1006D	456.34	31-33
BRP1007S	456.49	15.5-19
BRP1007M	456.73	22-30
BRP1007D	456.42	31.34
BRP1008S	456.16	22.5-30

BRP1008D	456.07	31.5-39
BRP1009S	455.73	11.5-19
BRP1009D	455.91	24-30.5
BRP1010S	456.88	9.5-19.5
BRP1010M	456.80	21.5-30
BRP1010D	456.81	31-31.5
BRP1011S	455.36	23.5-26
BRP1011M	455.32	26.5-36.5
BRP1011D	455.23	38-41.5
BRP1012S	455.03	11.5-16.5
BRP1012D	455.13	21.5-31.5
BRP1013S	454.23	13-15.5
BRP1013UM	454.18	18-27
BRP1013LM	454.15	28-34
BRP1013D	454.03	35-39
BRP1014S	453.19	10-15
BRP1014D	453.13	19-30.5

The initial boring at each location was advanced to the bedrock surface and logged to identify the local stratigraphy and potential monitoring zone elevations. The methane concentration in each of these initial borings was observed at five (5) foot intervals to denote elevations at which methane was present in the soil structure. A screened probe interval was installed at or near the interface with the bedrock layer and the overburden to determine whether soil gas may be moving along this discrete zone. Supplemental borings were installed adjacent to the initial boring, targeting elevations where high-permeable zones, such as sand and gravel seams, were observed since these strata are more preferential to gas transmission than silts and clays or where methane was detected in the initial boring.

A summary of the monitoring data previously provided to WMP, and included in the IR, indicated the likely pathway(s) for LFG movement along the corridor generally defined by probes:

- *BRP1007S and BRP1007M*
- *BRP1010M*
- *BRP1009D*
- *BRP1008S and BRP1008D*
- *BRP1011M and BRP1011D*

These points exhibited either a pressure greater than 5”WC or a methane concentration greater than 5%CH4 (by volume) at some point during the IR monitoring period.

Upon completion of the monitoring period, the interim monitoring points were decommissioned in accordance with 10 CSR 23-4 on July 24, 2020, as noted in the IR.

3.2 LOCAL GEOLOGY

The project area lies within Quaternary-age silt-capped alluvial deposits of interbedded clays and silts that generally coarsen downward to well-sorted sands and gravels. The alluvial deposits, sourced by the Missouri River, overlie Mississippian-age limestone bedrock that exhibits varying degrees of weathering at the contact surface. Quaternary terrace and loess deposits of predominantly silts and clayey silts are located at the higher elevations immediately southeast of the project area.

Perched groundwater occurs within the sands and gravels, and a considerable amount of groundwater is likely stored in the clays and silts. The less permeable clays and silts likely behave as lenticular, discontinuous aquitards that limit vertical groundwater flow between the coarser units. This hydrogeological environment formed the basis for the design/installation of multiple screened probes at the sampled locations.

The alluvial deposits sampled immediately prior to installations of the project probes have been divided into four general lithological units that overlie the weathered limestone. From the top down, the units have been designated, for the project, as the Upper Clay, the Upper Sand, the Lower Clay, and the Lower Sand. The Upper Clay is characterized primarily by deposits of soft to medium stiff silty clay with interbedded lenses of silt. The Upper Sand is characterized primarily by fine-grained sand and clayey silt; the Upper Sand unit is not present at all of the probe locations. The Lower Clay is characterized by a plastic clay unit that contains appreciable silt in its upper half. The Lower Clay abruptly contacts the Lower Sand unit beneath it. The Lower Sand unit is generally comprised of silty, fine- to medium-grained, dense, well-sorted sand with occasional bands of plastic clay.

A review of the local geologic conditions, including boring logs, was included in the IR.

4.0 PROPOSED ACTIONS

Based upon the data acquired during the monitoring period and a review of site conditions, it is proposed to install a Soil Vapor Extraction (SVE) system to directly target the permeable zones that appear most impacted by either induced positive pressure or elevated methane concentrations. By curtailing gas movement at these locations, it is projected that gas impacts on perimeter temporary monitoring probes TMP-1S, TMP-3S and TMP-3M will be mitigated.

The intent of the SVE system will be to provide controlled vacuum for active gas extraction to the permeable zones identified. Vacuum and gas flow will be adjusted as needed to remove gas from these permeable zones, before it has an opportunity to move into the vicinity of TMP-1S, TMP-3S and TMP-3M.

4.1 System Layout

The location of the proposed SVE wells is shown in Appendix 4 of this submittal. The wells are located in a grid pattern to impact perimeter temporary monitoring probes TMP-1S, TMP-3S and TMP-3M. Generally, three (3) SVE wells are proposed between the limits of waste placement and TMP-3S/3M. These wells are intended to provide a vacuum barrier between the limits of waste placement and the monitoring points. SVE wells are proposed near the location of interim monitoring points 1007 and 1010, points in the middle of the Project Area that were noted to have elevated methane and/or pressure readings in the IR, and two (2) SVE wells are proposed between the location of interim monitoring point 1009 and a line generally defined by TMP-1S, and interim monitoring points 1011 and 1008. These three latter wells are intended to evacuate the soil gas already present in the permeable lenses adjacent to TMP-1S, TMP-3S and TMP-3M. This alignment of extraction points provides a multi-layer system to remove soil gas from the Project Area and provide operational flexibility in addressing discrete portions of the Project Area.

4.2 Area of Influence

The approximate area of influence for the SVE wells is projected to be a radius of approximately 106 feet from the center of each well. However, the soil borings in the IR indicate multiple strata of differing soil types and permeabilities rather than monolithic soil columns. As such, a value of 50% of the calculated distance is used for the design, or approximately 50 feet. Design calculations are provided in Appendix 5.

The SVE wells are generally spaced between 50 feet and 70 feet apart, providing design overlap in order to account for interim soil structures and potentially saturated conditions that may be present between the SVE points or not identified through previous excavation activities. This methodology provides a more conservative design compared to utilizing the entire design radius as calculated.

4.3 Details of Construction

The SVE components will be constructed utilizing materials that are typical to LFG collection projects, including HDPE, PVC and stainless steel. Installed components may be modified to accommodate actual field conditions at the time of construction. Details for typical components are provided in Appendix 4.

4.3.1 Wells

The wells are proposed to be comprised of 6”ø SCH 40 PVC casing, set into a 12”ø -14”ø borehole. The lower section of the casing will be perforated (nominally 0.020 inch well screen) to allow the entry of soil gas into the SVE well, with the top section of the casing comprised of solid-wall pipe to minimize ambient air intrusion. The

borings will be progressed to bedrock or to the elevation of local strata that previously indicated methane concentrations or sustained positive pressure during the IR monitoring period. Once the boring depth has been achieved, the well casing will be installed, and the borehole backfilled with 1/4" – 3/8" (nominal) pea stone above the elevation of the perforated casing. The remainder of the borehole will be backfilled with bentonite and finished with a concrete cap. A steel protective casing will be installed around the exposed portion of the well casing. A variance to the requirement to secure the casing with a locking cap will be submitted under separate cover.

4.3.2 Wellheads

Each SVE well will be controlled by a valved wellhead, to provide control of vacuum application and gas flow, and provide a means to monitor the rate and quality of extracted gas flow. The wellheads will be typical for LFG applications and may be installed in either a vertical or horizontal orientation, depending upon field conditions. Materials of construction will typically be PVC, with other components of non-reactive materials.

4.3.3 Lateral Piping

Lateral piping will be comprised of SDR 17 HDPE or approved equivalent. SDR 17 HDPE is a material and grade that is well suited for LFG applications, durable and readily available for installation.

4.3.4 Condensate Management

Condensate generation within the SVE components is anticipated to be relatively minimal based on other, similar applications. The soil gas is typically removed at a temperature near ambient conditions, which minimizes the condensate formation process (which is largely temperature driven). Any condensate formed within the piping will be drained to a dedicated condensate sump and discharged via a pneumatic pump to the existing GCCS condensate management system.

4.3.5 Well Pumps

In the event that operational data deems that pumps in the SVE casings would be beneficial to operations, Bridgeton may elect to install pumps in select casings Well pumps utilized for this application will be similar in overall design and function to those already in use at this facility.

4.3.6 Gas Control

It is intended to initially utilize the existing GCCS as a source of vacuum for the SVE component and as a means of treating any soil gas recovered by the SVE. SVE gas will be combined with LFG and combusted at one of the existing LFG flares.

Once operational, Bridgeton will evaluate alternative control devices as a pilot project to determine the effectiveness of these systems. Based on the initial quantity and quality of the SVE gases Bridgeton will utilize spark flare(s) and/or an activated carbon canister system for control. Technical information for the existing Pure Air carbon treatment system is provided in Appendix 6. This unit or a similar technology will be evaluated during the 180-day pilot project period. During this period Bridgeton will evaluate the performance, effectiveness at controlling the collected gases, odor control and any public nuisances encountered.

Under separate cover an alternative control device pilot project request will be submitted to the County's Air Pollution Control for approval. Bridgeton will not proceed forward with the pilot project until these approvals have been obtained. The MDNR and County will be notified once the pilot project is initiated and of any deviations are anticipated.

Upon completion of the 180-day pilot project Bridgeton will submit a summary report to the MDNR and County outlining the procedures used during this project. This report will include an evaluation of the overall success of the project and any issues encountered during the pilot project period. If continued control is warranted the

preferred control device will be identified as well as backup device. In addition, a Permit to Construct/Operate from the County's Air Pollution Control will be obtained, if needed, to continue operation of the control device on a permanent basis.

5.0 SYSTEM OPERATIONS

5.1 Monitoring Procedures

The purpose of the SVE system is to remove methane from the local permeable strata, thereby removing the presence of methane above the LEL in perimeter temporary monitoring probes TMP-1S, TMP-3S and TMP-3M. Additionally, the SVE system is located entirely outside the limits of waste placement. As such, limiting the quality of extracted soil gas to minimize air intrusion is not a consideration for operations.

Soil gas will be extracted at a rate designed to evacuate methane from the targeted strata and to maintain that condition. The application of vacuum and relative rates of soil gas extraction will vary between the points and some points may influence the operation of others, depending upon the degree of interconnection between the local strata. Select SVE wells may be temporarily decommissioned if adjacent wells are capable of effectively controlling the sub-surface movement of soil gas.

The SVE will be monitored a minimum of once per week, in conjunction with the scheduled monitoring for the perimeter probes. Monitoring will be conducted by trained Bridgeton or contract staff, utilizing equipment currently employed for GCCS monitoring. The following parameters will be monitored:

- *Parameters*
  - *Initial Static Pressure*
  - *Sustained Static Pressure*
  - *Sustained Methane (CH_4) Concentration by Volume*
  - *Sustained Carbon Dioxide (CO_2) Concentration by Volume*
  - *Sustained Oxygen (O_2) Concentration by Volume*
  - *Sustained Balance Gas Concentration by Volume*
  - *Barometric Pressure*

5.2 SVE Modification

Two scenarios have been determined whereby the SVE system may require modification. Bridgeton will advise the MDNR and County if any subsequent modifications are proposed.

5.2.1 Additional SVE Wells

In the event that operation of the SVE wells does not adequately address methane concentrations at perimeter temporary monitoring probes TMP-1S, TMP-3S or TMP-3M, additional SVE points may be recommended. Such points would be designed based upon current field conditions, geologic information and monitoring data to enhance the operations of the existing SVE.

Construction of additional SVE wells, and their interconnection to the SVE system, would be consistent with the previously installed components. A Work Plan for the installation of additional SVE wells will be prepared and submitted for approval prior to construction.

5.2.2 Decommissioning SVE Wells

In the event that compliance at perimeter temporary monitoring probes TMP-1S, TMP-3S or TMP-3M can be achieved and/or maintained without the use of select SVE wells, Bridgeton may elect to decommission wells that are no longer deemed necessary. All Decommissioning Procedures will be conducted in accordance with Bridgeton's approved Operations, Maintenance and Monitoring (OM&M) Plan.

6.0 SUBMITTALS

6.1 SOIL GAS CORRECTIVE ACTION PLAN

The Soil Gas Corrective Action Plan has been prepared in accordance with MGP Section IV.B.3. Upon review of this plan by the MDNR, and concurrence proposed methodology included in this report, Bridgeton Landfill, LLC will engage an appropriate contractor and complete the installation of the proposed mitigative measures.

6.2 SCHEDULE

Upon approval of this CAP by WMP, Bridgeton Landfill, LLC will schedule the delivery of materials and a qualified contractor(s) to initiate the installation of the proposed SVE system. Construction is anticipated to begin within 90 days of the receipt of CAP approval. Upon completion of CAP system construction, Bridgeton will conduct a six-month Observation Period followed by a Corrective Action Summary Report, in accordance with MGP Section IV.C.

Proposed Day	Action	Actual Date
1	Begin monitoring point construction	4/24/2020
5	Complete monitoring point construction	5/14/2020
5	Begin monitoring	5/19/2020
45	Complete monitoring	7/22/2020
60	Complete removal of monitoring points	7/24/2020
90	Submit Methane Gas Investigation Report to WMP	8/21/2020
TBD	Receipt of WMP Approval of Investigation Report	9/23/2020
45 days after WMP approval of IR	Submit Corrective Action Plan to WMP	11/7/2020
90 days after WMP approval of CAP	Initiation of Construction	TBD
Six (6) months after completion of CAP construction	Corrective Action Observation Period	TBD
30 days after Observation Period	Corrective Action Summary Report	TBD

Additional activities regarding these mitigation activities, including the progress of construction, will be documented in the Quarterly LCAP reports.

7.0 LIMITATIONS

The work product included in the attached was undertaken in full conformity with generally accepted professional consulting principles and practices and to the fullest extent as allowed by law we expressly disclaim all warranties, express or implied, including warranties of merchantability or fitness for a particular purpose. The work product was completed in full conformity with the contract with our client and this document is solely for the use and reliance of our client (unless previously agreed upon that a third party could rely on the work product) and any reliance on this work product by an unapproved outside party is at such party's risk.

The work product herein (including opinions, conclusions, suggestions, etc.) was prepared based on the situations and circumstances as found at the time, location, scope and goal of our performance and thus should be relied upon and used by our client recognizing these considerations and limitations. Cornerstone Environmental Group, LLC shall not be liable for the consequences of any change in environmental standards, practices, or regulations following the completion of our work and there is no warrant to the veracity of information provided by third parties, or the partial utilization of this work product.

APPENDIX 1

FACILITY PLAN

LEGEND

Symbol	Description
	SOLID WASTE BOUNDARY
Q	QUARRY WALL
OU1	WEST LAKE AREA 1
OU2	WEST LAKE AREA 2
GMP-4	GAS MONITORING PROBE
TMP-1S,3M,3D	TEMPORARY GAS MONITORING PROBE
PZ-204-AS	PIEZOMETER MONITORING WELL
GEW-38	GAS EXTRACTION WELL
ITS1	INTERCEPTOR TRENCH SUMP
SEW-63	SURFACE EXTRACTION WELL
PEW-20	PERIMETER GAS EXTRACTION WELL
	LFG ISOLATION VALVE
	LEACHATE ISOLATION VALVE
	FLOW METER
	GRIT CHAMBER
	LIFT STATION
CT-1	CONDENSATE SUMP
CT/HC-1	CONDENSATE TRAP/HEADER CONNECTION SUMP
LS-1 LS-6	LEACHATE COLLECTION SUMP
HZ-1	HORIZONTAL COLLECTION SUMP
PS-15	PERIMETER SUMP
LCS-2D	LEACHATE COLLECTION SUMP
SC-B1	SURFACE COLLECTOR
TMP-9	TEMPERATURE MONITORING PROBE
GC-3	SUBSURFACE RCP WELLS
ET-2	TRENCH SUMP
IT-7	INTERCEPTION TRENCH RISER
PL-7	PERIMETER LEACHATE SUMP
	WELL HEAD RISER
WB-1	WELL BORE BOOT
TS-1	TRENCH SUMP
OL-12	OVER LINER TIE IN POINT
	GAS INTERCEPTOR WELL
GIW-4	GAS INTERCEPTOR WELL/HEAT EXTRACTION POINT
CO	CLEAN OUT
GEW-38(S)	GAS EXTRACTION WELL WITH 4" STINGER
GEW-38	EXTRACTION POINT - ABANDONED
GEW-38	EXTRACTION POINT - TEMPORARILY DECOMMISSIONED
CS-1	CONTAINMENT SUMP PUMP STATIION FOR TOE STRIP DRAIN
	DOWNSLOPE STRIP DRAIN COLLECTOR 6" RISER STUB
1	QUADRANT #
	POWER PANEL
	QUARRY WALL
L	LEACHATE COLLECTION PIPING
L	DUAL CONTAINED LCS FORCEMAIN (SIZE VARIES)
L	DUAL CONTAINED PERIMETER FORCEMAIN (SIZE VARIES)
L	LEACHATE COLLECTION PIPING (SIZE VARIES)
6TD	TOE DRAIN
6GU	4" PERFORATED TRENCH DRAIN
	BUBBLE SUCKER
2A	AIR LINE
2AU	AIR LINE (PRESSURIZED BELOW GROUND)
6GU	BURIED LFG COLLECTION PIPING (SIZE VARIES)
2G	2" ABOVE GROUND LFG COLLECTION LATERAL PIPING
4G	4" ABOVE GROUND LFG COLLECTION LATERAL PIPING
6G	6" ABOVE GROUND LFG COLLECTION LATERAL PIPING
8G	8" ABOVE GROUND LFG COLLECTION LATERAL PIPING
10G	10" ABOVE GROUND LFG COLLECTION LATERAL PIPING
12G	12" ABOVE GROUND LFG COLLECTION LATERAL PIPING
18G	18" ABOVE GROUND LFG COLLECTION HEADER PIPING
24G	24" ABOVE GROUND LFG COLLECTION LATERAL PIPING
A/FM	2" PRESSURIZED AIR / 2" FORCEMAIN IN COMMON TRENCH
E	ABOVEGROUND ELECTRIC LINE
OHW	OVERHEAD ELECTRIC LINE
UE	UNDERGROUND ELECTRIC LINE
SAN	SANITARY SEWER
FM	MSD DISCHARGE FORCEMAIN
W	WATERMAIN
NGAS	NATURAL GAS LINE
FO	FIBER OPTIC LINE
T	TELEPHONE
X	FENCE LINE
4G	INTERCEPTOR TRENCH
	HEAT EXTRACTION EFFLUENT PIPING
	HEAT EXTRACTION INFLUENT PIPING
	WORK PLAN AREA

0 200 400 Feet

SCALE - 1" = 200'

NOTES:
- AERIAL TOPOGRAPHY PROVIDED BY COOPER AERIAL SURVEYS CO. AND IS DATED DECEMBER 12, 2018

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PREPARED BY	PROJECT	PREPARED FOR		DRAWING #
FEEZOR ENGINEERING, INC. Engineering for a Better World 3377 Hollenberg Dr, Bridgeton, MO 63044, Ph: 217-483-3118 Missouri State Certificate Of Authority #: E-200912211	BRIDGETON LANDFILL SOIL GAS MONITORING WORK PLAN BRIDGETON, ST. LOUIS COUNTY, MO	BRIDGETON LANDFILL, LLC. 13570 ST. CHARLES ROCK ROAD BRIDGETON, MISSOURI 63044	DECEMBER 2019 DESIGNED BY: AMR APPROVED BY: DRF	001

DRAWING TITLE

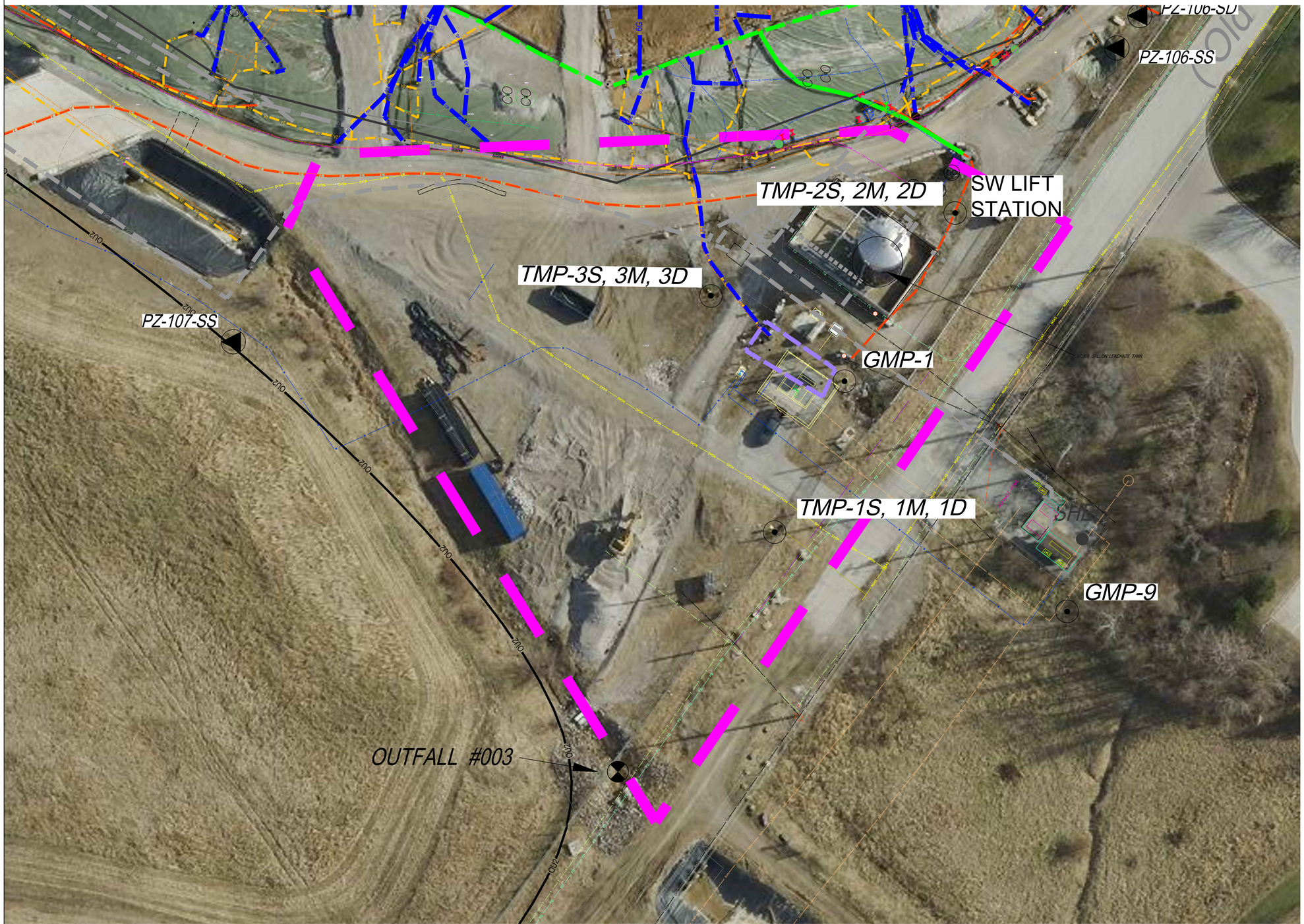
FACILITY PLAN

REVISIONS:	DATE	DSN.	APV.

PROJECT NUMBER: BT-129-19 FILE PATH: C:\Users\arobe\Dropbox (Feezor Engineering)\Bridgeton\100-149\BT-131 (2017 Surveying and Autocadd Support)\2019\19 - Soil Gas Work Plan Figures

APPENDIX 2

WORK PLAN AREA



LEGEND

- SOLID WASTE BOUNDARY
- QUARRY WALL
- WEST LAKE AREA 1
- WEST LAKE AREA 2
- GMP-4 — GAS MONITORING PROBE
- TMP-1S,3M,3D — TEMPORARY GAS MONITORING PROBE
- PZ-204-AS — PIEZOMETER MONITORING WELL
- GEW-38 — GAS EXTRACTION WELL
- ITS1 — INTERCEPTOR TRENCH SUMP
- SEW-63 — SURFACE EXTRACTION WELL
- PEW-20 — PERIMETER GAS EXTRACTION WELL
- LFG ISOLATION VALVE
- LEACHATE ISOLATION VALVE
- FLOW METER
- GRIT CHAMBER
- LIFT STATION
- CT-1 — CONDENSATE SUMP
- CTHC-1 — CONDENSATE TRAP/HEADER CONNECTION SUMP
- LS-1 / LS-6 — LEACHATE COLLECTION SUMP
- HS-1 — HORIZONTAL COLLECTION SUMP
- PS-15 — PERIMETER SUMP
- LCS-2D — LEACHATE COLLECTION SUMP
- SC-61 — SURFACE COLLECTOR
- TMP-9 — TEMPERATURE MONITORING PROBE
- GC-3 — SUBSURFACE RCP WELLS
- IT-2 — TRENCH SUMP
- IT-7 — INTERCEPTION TRENCH RISER
- PI-7 — PERIMETER LEACHATE SUMP
- WELL HEAD RISER
- RB-1 — WELL BORE BOOT
- TS-1 — TRENCH SUMP
- OL-12 — OVER LINER TIE IN POINT
- GAS INTERCEPTOR WELL
- GIW-4 — GAS INTERCEPTOR WELL/HEAT EXTRACTION POINT
- CO — CLEAN OUT
- GEW-38(S) — GAS EXTRACTION WELL WITH 4" STINGER
- GEW-38 — EXTRACTION POINT - ABANDONED
- GEW-38 — EXTRACTION POINT - TEMPORARILY DECOMMISSIONED
- CS-1 — CONTAINMENT SUMP PUMP STATIION FOR TOE STRIP DRAIN
- DOWNSLOPE STRIP DRAIN COLLECTOR 6" RISER STUB
- QUADRANT #
- POWER PANEL
- QUARRY WALL
- LEACHATE COLLECTION PIPING
- DUAL CONTAINED LCS FORCEMAIN (SIZE VARIES)
- DUAL CONTAINED PERIMETER FORCEMAIN (SIZE VARIES)
- LEACHATE COLLECTION PIPING (SIZE VARIES)
- 6TD — TOE DRAIN
- 6GU — 6GU — 4" PERFORATED TRENCH DRAIN
- BUBBLE SUCKER
- 2A — AIR LINE
- 2AU — AIR LINE (PRESSURIZED BELOW GROUND)
- BURIED LFG COLLECTION PIPING (SIZE VARIES)
- 2G — 2" ABOVE GROUND LFG COLLECTION LATERAL PIPING
- 4G — 4" ABOVE GROUND LFG COLLECTION LATERAL PIPING
- 6G — 6" ABOVE GROUND LFG COLLECTION LATERAL PIPING
- 8G — 8" ABOVE GROUND LFG COLLECTION LATERAL PIPING
- 10G — 10" ABOVE GROUND LFG COLLECTION LATERAL PIPING
- 12G — 12" ABOVE GROUND LFG COLLECTION LATERAL PIPING
- 18G — 18" ABOVE GROUND LFG COLLECTION HEADER PIPING
- 24G — 24" ABOVE GROUND LFG COLLECTION LATERAL PIPING
- A/FM — 2" PRESSURIZED AIR / 2" FORCEMAIN IN COMMON TRENCH
- E — ABOVEGROUND ELECTRIC LINE
- OHP — OVERHEAD ELECTRIC LINE
- UE — UNDERGROUND ELECTRIC LINE
- SANITARY SEWER
- MSD DISCHARGE FORCEMAIN
- W — WATERMAIN
- NGAS — NATURAL GAS LINE
- FO — FIBER OPTIC LINE
- TELEPHONE
- X — FENCE LINE
- 4G — INTERCEPTOR TRENCH
- HEAT EXTRACTION EFFLUENT PIPING
- HEAT EXTRACTION INFLUENT PIPING
- WORK PLAN AREA
- 1001 — PROPOSED GEOPROBE LOCATION

0 20 40 Feet

SCALE - 1" = 20'

NOTES:

- AERIAL TOPOGRAPHY PROVIDED BY COOPER AERIAL SURVEYS CO. AND IS DATED DECEMBER 12, 2018

PREPARED BY
FEEZOR ENGINEERING, INC.
Engineering for a Better World
3377 Hollenberg Dr. Bridgeton, MO 63044. Ph: 217-483-3118
Missouri State Certificate Of Authority #: E-2009122213

PROJECT
BRIDGETON LANDFILL
SOIL GAS MONITORING WORK PLAN
BRIDGETON, ST. LOUIS COUNTY, MO

PREPARED FOR
BRIDGETON LANDFILL, LLC,
13570 ST. CHARLES ROCK ROAD
BRIDGETON, MISSOURI 63044

DECEMBER 2019
DESIGNED BY: AMR
APPROVED BY: DRF

DRAWING #
002

REVISIONS:	DATE	DSN.	APV.

DRAWING TITLE
WORK PLAN AREA

PROJECT NUMBER: BT-129-19 | FILE PATH: C:\Users\amiller\Dropbox (Feezor Engineering)\Bridgeton\10>14\BT\131 (2017 Surveying and Autocadd Support)\2019\19 - Soil Gas Work Plan Figures