

**WASTE SEPARATION EVALUATION REPORT**

**WEST LAKE LANDFILL SUPERFUND SITE  
OPERABLE UNIT 2 (OU-2)  
BRIDGETON, MISSOURI**

**Prepared For:**



**BRIDGETON LANDFILL, LLC**

**Prepared By:**

**CIVIL & ENVIRONMENTAL CONSULTANTS, INC.  
PHOENIX, ARIZONA**

**CEC Project 191-750**

**July 10, 2020**



**Civil & Environmental Consultants, Inc.**

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## 1.0 INTRODUCTION

Civil & Environmental Consultants, Inc. (CEC) is submitting this Waste Separation Evaluation Report (Report) to summarize the results of the Waste Separation Evaluation recently performed at the West Lake Landfill Superfund Site Operable Unit 2 (OU-2). A Waste Separation Evaluation was initially requested by the United States Environmental Protection Agency (USEPA) in a March 14, 2019 Letter,<sup>(1)</sup> which specifically stated:

*“As you may recall, the draft OU2 RD Work Plan was previously submitted to the EPA in December of 2008 to address remedy implementation at the Inactive Sanitary Landfill portion of OU2, however, the draft work plan was not finalized or approved by the EPA. Since submittal of the original draft OU2 RD Work Plan, the Bridgeton Landfill portion of OU2 has experienced a subsurface heating event. The OU2 RD Work Plan should be updated to ensure the work plan properly accounts for this condition. The updated OU2 RD Work Plan should also provide an overview of the approach to implement the OU2 remedy at the other OU2 areas (Closed Demolition Landfill and Bridgeton Landfill) per the requirements of the state's solid waste program as described in the 2008 OU2 Record of Decision. Further, the other Operable Units at this Superfund Site are in various stages of addressing contamination identified in those units, which may affect the approach for remedy design at OU2. These new items that should be discussed in the OU2 RD Work Plan generally include the following:*

- *Effects, if any, on the OU2 remedy design due to the on-going subsurface heating event or a potential subsurface heating event in the future.”*

Further, in Comments<sup>(2)</sup> from the USEPA to Bridgeton Landfill LLC, the USEPA requested input to address the following:

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<sup>(1)</sup> Letter - United States Environmental Protection Agency, Region 7; “Re: Operable Unit 2 Remedial Design Work Plan Update,” dated March 14, 2019.

<sup>(2)</sup> Letter - United States Environmental Protection Agency, Region 7; “Comments on the Remedial Design Work Plan West Lake Landfill Site Operable Unit 2 (OU-2), Bridgeton Missouri, Dated June 11, 2019,” dated September 12, 2019.

- 1) *The separation distance and nature of the materials described to be between the two landfill cells;*
- 2) *Site-specific features of the Inactive Sanitary Landfill; such as the geo-physical setting, age of waste, thickness of waste, and other relevant items; and*
- 3) *Determine whether any of the design elements for the Inactive Sanitary Landfill need to be modified to address a SSR.”*

Further, in Comments<sup>(3)</sup> from the USEPA to Bridgeton Landfill LLC, the USEPA specified the following in relation to the waste separation borings:

*“A minimum of three soil borings shall be installed, and the sampled subsurface material inspected by qualified personnel. Revise the work plan to include a summary discussion of this work element and a new figure with at least three proposed soil borings locations. The soil borings must be appropriately spaced between portions of the Inactive Sanitary Landfill and the South Quarry of Bridgeton Landfill. The locations of the soil borings should avoid existing site infrastructure.”*

As such, as described in the Remedial Design Work Plan (RD Work Plan) approved by the USEPA on May 8, 2020, a Waste Separation Evaluation was performed to determine if the Subsurface Reaction (SSR), currently occurring in the South Quarry portion of Bridgeton Landfill, could migrate through a “separation” area between the Bridgeton Landfill and the Inactive Sanitary Landfill (ISL).

This Report summarizes CEC’s findings from the waste separation evaluation, and addresses the specific EPA requests identified above. The remainder of this report is structured as follows:

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<sup>(3)</sup> Letter - United States Environmental Protection Agency, Region 7; “Comments on the Remedial Design Work Plan (2<sup>nd</sup> Draft) West Lake Landfill Site Operable Unit 2 (OU-2), Bridgeton Missouri, Dated October 15, 2019,” dated December 20, 2019.

- Section 2.0 provides background requirements;
- Section 3.0 describes field observations;
- Section 4.0 describes a review of historical photographs;
- Section 5.0 provides a discussion on the migration of elevated temperatures;
- Section 6.0 provides conclusions; and
- Section 7.0 provides closing remarks.

Additionally, this Report includes the following appendices:

- Appendix A – Photographs from the Field Investigation;
- Appendix B – Boring Logs; and
- Appendix C – Figures.

## 2.0 BACKGROUND

### 2.1 EXISTING CONDITIONS AT OU-2

The USEPA placed the West Lake Landfill on the National Priorities List on August 30, 1990. USEPA has since designated three (3) operable units (OUs) at the site. OU-1 consists of two areas of the landfill and adjacent areas which have been shown to contain radiologically impacted material (RIM). OU-2 consists of the other landfill areas without RIM. OU-3 includes site-wide groundwater.

As described on page 3 of the Record of Decision for OU-2, dated July 2008, OU-2 includes three (3) various waste disposal areas not impacted by radionuclides [i.e., the Closed Demolition Landfill, the Inactive Sanitary Landfill (ISL), and the Former Active Sanitary Landfill (Bridgeton Landfill)]. The Bridgeton Landfill is further divided into South and North Quarry areas. The intent of this Waste Separation Evaluation Report is to evaluate the “separation” area between the ISL and the Bridgeton Landfill, and further, if the potential exists for a SSR to migrate through this “separation” area.

#### 2.1.1 Subsurface Reaction

An SSR resulting in increased temperatures, pyrolysis of the waste mass, and settlement of the landfill surface has been identified as being present in the Bridgeton Landfill. The SSR has been occurring since December 2010, originating on the northeastern side of the South Quarry. Elevated temperatures, pyrolysis, and increased settlement rates associated with this SSR continue to occur at the Bridgeton Landfill today, though the effects have significantly diminished over time. The SSR has migrated in a counterclockwise direction, past the ISL, with the highest temperatures currently located in the southeastern corner of the South Quarry area of the Bridgeton Landfill.

## **2.2 WORK PLAN REQUIREMENTS**

As outlined in the May 2020 revised West Lake Landfill Superfund Site OU-2 RD Work Plan, the waste separation evaluation is to be comprised of a minimum of three (3) borings to characterize the “separation” area between the ISL and the South Quarry portion of the Bridgeton Landfill. The findings of the soil boring investigation are to be used to evaluate whether a SSR could migrate through the “separation” area between the South Quarry and ISL. In addition to the field investigation, historical waste placement will be evaluated by performing a review of historical aerial photographs to determine if waste placement has occurred in the “separation” area.

## 3.0 FIELD OBSERVATIONS

### 3.1 PREVIOUS FIELD INVESTIGATIONS (AQUATERRA REPORT)

In September 2010, a Report<sup>(4)</sup> was prepared by Aquaterra Environmental Solutions (Aquaterra) to summarize efforts performed to identify the waste boundary for each disposal cell. Activities completed as part of the Aquaterra report include an investigation of the permitted waste unit boundaries, interviews with site personnel, and reviews of historical aerial surveys.

As part of the investigation of permitted waste unit boundaries, Aquaterra conducted a field investigation of the Bridgeton Landfill. Points along the waste boundaries were surveyed on 50-foot spaced intervals. Aquaterra used a mini excavator to determine the extent of waste placement. If waste was encountered, excavation continued outward from the initial location until no more waste was encountered. Waste boundaries identified during the study for the Bridgeton Landfill are included on Figure 1 included in Appendix C of this Report. On Figure 1, the Bridgeton Landfill is delineated by a green line and the ISL is delineated by an orange line.

### 3.2 FIELD WORK

The waste separation demonstration performed by CEC consisted of drilling three (3) borings in the area located between the ISL and South Quarry portion of the Bridgeton Landfill. The boring locations were located as far east as possible without impacting the existing Bridgeton Landfill infrastructure (per the RDWP and USEPA comment<sup>(5)</sup>), such as existing drainage channels, underground piping, and cover systems. As a result, it was necessary to place the borings within the waste boundary for the ISL, previously defined in the Aquaterra Report. Refer to Figure 1 of Appendix C for the location of the three (3) waste separation borings.

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<sup>(4)</sup> “Waste Limits Investigation Summary Report, Bridgeton Landfill, LLC, Bridgeton Landfill, St. Louis County, Missouri;” prepared by Aquaterra Environmental Solutions; dated July 2011.

<sup>(5)</sup> Letter - United States Environmental Protection Agency, Region 7; “Comments on the Remedial Design Work Plan (2<sup>nd</sup> Draft) West Lake Landfill Site Operable Unit 2 (OU-2), Bridgeton Missouri, Dated October 15, 2019,” dated December 20, 2019.

A CEC field representative was on-site from June 8 through June 12, 2020 during the drilling project to observe and document activities associated with the waste separation borings, which were performed by HD Sonic Drilling. Each boring was advanced via a truck-mounted sonic drilling rig using 4-inch diameter sonic tooling. Sonic drilling was performed until the boring reached bedrock, at which point rock coring was performed for an additional 5 feet to confirm that bedrock was encountered and not a cobble or boulder. Materials gathered during sonic drilling were returned to the surface, where the CEC field representative visually inspected the materials. Returned materials were inspected for the presence or absence of municipal solid waste (MSW) and classified using typical soil descriptions per ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures) to describe texture and grain size. See Appendix A for photographs taken during the waste separation investigation. See Appendix B for boring logs documenting CEC field representative observations made during the boring efforts.

A description of materials observed in the Waste Separation Boreholes is included below:

- BOREHOLE BH-1
  - No MSW materials were observed.
  - Layers of clays, silts, and sands were observed from 0 to 44 feet below ground surface (bgs).
  - Bedrock was encountered at 44 feet bgs.
  
- BOREHOLE BH-2
  - From 0 to 11 feet bgs, varying layers of silt materials were observed.
  - From 11 to 26 feet bgs, predominantly soil mixed with some plastic, wood, metal, springs, and fiberglass were observed.
  - Below 26 feet bgs, soil materials including layers of clay, silt, and sand were observed.
  - Bedrock was encountered at 51 feet bgs.

- BOREHOLE BH-3
  - From 0 to 9 feet bgs, layers of silt and clay were observed.
  - From 9 to 29 feet bgs, predominantly soil mixed with some plastic, paper, wood, metal, and glass were observed.
  - Below 29 feet bgs, layers of clays, silts, and sands were observed.
  - Bedrock was encountered at a depth of 51 feet bgs.

As noted above, the borings were located within the waste boundaries of the ISL, as delineated in the Aquaterra Report, but as far east as possible without impacting existing site infrastructure. Even though these borings were within the waste boundary, minimal waste materials were found. As such, waste materials observed were potentially from waste placement near the limits of waste (i.e., wind-blown waste, limited waste quantities mistakenly pushed outside of limits, etc.). CEC bases this observation on the absence of continuous columns observed during the waste separation borings.

The CEC field representative returned to the borehole locations to perform liquid level measurements at approximate 24-hour and 48-hour periods after the boreholes were completed. Observed water level depths are included on the boring logs. Water levels were observed in the boreholes, however, these liquids observed were most likely from the coring process and are not representative of subsurface leachate levels. Immediately after measuring the 48-hour liquid level, each borehole was plugged in accordance with the Missouri Department of Natural Resources (MDNR) 10 CSR 23-6.050 policy.

#### 4.0 REVIEW OF HISTORICAL PHOTOGRAPHS

CEC performed a review of historical photographs and aerial imagery previously included as Appendix O from the Remedial Investigation Addendum.<sup>(5)</sup> Aerial imagery of the site that included the “separation” area between the South Quarry Portion of the Bridgeton Landfill and the ISL from September 7, 1953 through February 10, 2001 were reviewed for evidence of historical waste placement. More specifically, aerial imagery was reviewed for the following dates:

- September 7, 1953;
- May 13, 1958;
- July 26, 1979;
- March 7, 1982;
- April 16, 1985;
- March 28, 1993;
- February 5, 1995;
- February 24, 1997;
- February 24, 1998;
- March 1, 1999;
- March 17, 2000; and
- February 10, 2001.

Based upon this review, CEC could not identify any discernable waste placement in the “separation” area between the South Quarry Portion of the Bridgeton Landfill and the ISL.

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<sup>(5)</sup> “Remedial Investigation Addendum; West Lake Landfill; Operable Unit 1;” prepared for Waste Lake OU-1 Respondents Group, prepared by Engineering Management Support, Inc., dated January 25, 2018.

## 5.0 POTENTIAL MIGRATION OF ELEVATED TEMPERATURES

CEC requested input from Feezor Engineering, Inc. (Feezor), and specifically Daniel R. Feezor, P.E. and Peter J. Carey, P.E. the relevant subject matter experts for the Bridgeton Landfill SSR. The intent of this coordination was to discuss the potential for the current or any future SSR in the Bridgeton Landfill to migrate through the “separation” area to the ISL. In general, Feezor identified the following fundamental elements are required for the reaction to occur and for the associated advancement of any heating fronts:

- A substrate that will support exothermic reactions. In this instance, solid waste may serve as this substrate.
- Suitable thermal mass. Effectively, the heat gain produced via the exothermic reactions must be greater than the effective heat loss in the reaction area for the reaction to be sustained or advance.
- A vehicle or medium supporting energy (heat) transfer. In the Bridgeton Landfill, heat transfer is believed to occur principally through movement of heated liquids or steam through waste within the reaction area.

Additionally, based on past experience at the site and observations from waste separation borings (CEC prepared boring logs included as Appendix B to this Report), Feezor offered the following observations.

- Based on review of logs associated with boreholes advanced in the “separation” area, the majority of material appears to be soil fill and minor quantities of solid waste dispersed throughout discrete intervals overlying alluvial deposits. The minor quantity of solid waste intermixed with soil layers is not sufficient to provide an adequate substrate for a sustainable exothermic reaction. In addition, there was no evidence of pyrolysis of the waste within the soil column.

- The relatively shallow position of waste materials logged indicate that generation of suitable thermal mass, given the presence of a proximate ambient air heat sink, is unlikely even if a suitable volume of substrate was available.
- Based upon historical tracking and review of the Bridgeton Landfill settlement (a distinct feature of the reaction) the reaction into the “separation” area did not occur when conditions were the most conducive (when the reaction was nearest the “separation” area). In addition, the measured effects of the reaction within the South Quarry area of the Bridgeton Landfill has diminished over time. Therefore, it is reasonable to conclude that the initiation or advancement of a reaction into the “separation” area will not occur in the future.
- Upon review of the boring logs, the material does not appear to provide a substrate to support exothermic reactions. The apparent lithology of the “separation” area, as defined by the boring logs presents conditions which would be unsuitable for heat gain and therefore not be conducive for the sustained or advancing reactions.

Based on these observations, Feezor concluded the following:

- There is no evidence that any heat related migration has occurred or is occurring between the Bridgeton Landfill and ISL via the “separation” area, and
- Conditions within this area are not representative of those required for initiation, sustenance and advancement of reaction heating fronts as they are understood to exist with the Bridgeton Landfill.

## 6.0 CONCLUSIONS

Based on results from the field investigation performed by CEC, review of available historical aerial photographs, and conclusions made by Feezor regarding the potential for migration of heat associated with the SSR, CEC offers the following conclusions:

- Three (3) soil borings were performed in the “separation” area between the South Quarry portion of the Bridgeton Landfill and the ISL with an effort to identify subsurface materials while avoiding existing site infrastructure. The sampled subsurface materials showed a majority of soil materials with some waste materials mixed for Boreholes BH-2 and BH-3. Additionally, there was no evidence of previous or existing pyrolysis occurring in the area.
- The location of waste materials identified (i.e., within 30 feet of the ground surface) is not conducive to support or allow a SSR to pass through the “separation” area.
- The SSR has previously progressed past the “separation” area and the SSR did not pass through the “separation” area when conditions were the most conducive.
- The apparent lithology of the “separation” area presents conditions which would be unsuitable for heat gain and therefore would not be conducive for sustaining or advancing a reaction.
- Based on the above, CEC believes there is no potential for the current or any future SSR to migrate through the “separation” area between the South Quarry and ISL. As such, the OU-2 remedy design does not need to include any additional allowances for the on-going SSR or a potential SSR in the future.

## **7.0 CLOSING REMARKS**

The services provided for this project were performed with the care and skill ordinarily exercised by reputable members of the profession practicing under similar conditions at the same time and the same or similar locality. No warranty, expressed or implied, is made or intended by rendition of these consulting services or by furnishing oral or written reports of the findings made. This Report has been prepared for exclusive use by Bridgeton Landfill, LLC.

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**APPENDIX A**

**PHOTOGRAPHS FROM FIELD INVESTIGATION**

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**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 1**  
**Sonic drill rig performing waste separation borings.**



**PHOTOGRAPH NO. 2**  
**Borings were located as far east as possible,  
without impacting existing site infrastructure.**

**APPENDIX A  
PHOTOGRAPHS**

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**PHOTOGRAPHIC LOG FOR BOREHOLE BH-1**

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**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 3  
Materials returned from 0 feet to 5 feet in Borehole BH-1.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 4**  
**Returned materials from 5 feet to 10 feet in Borehole BH-1.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 5**  
**Materials returned from 10 feet to 18 feet in Borehole BH-1.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 6**  
**Returned materials from 18 feet to 28 feet in Borehole BH-1.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 7**  
**Materials returned from 28 feet to 38 feet in Borehole BH-1.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 8**  
**Materials returned from 38 feet to 43 feet in Borehole BH-1.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 9**  
**Rock core from 43 feet to 48 feet in Borehole BH-1.**

**APPENDIX A  
PHOTOGRAPHS**

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**PHOTOGRAPHIC LOG FOR BOREHOLE BH-2**

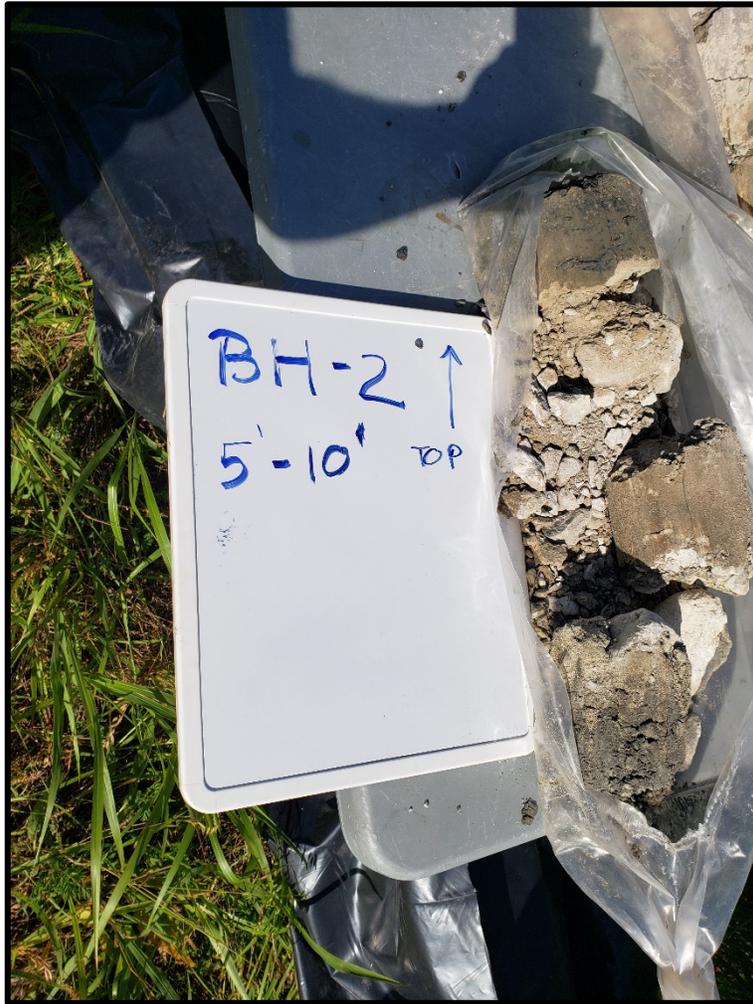
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**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 10**  
**Returned materials from 0 feet to 5 feet in Borehole BH-2.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 11**  
**Returned materials from 5 feet to 10 feet in Borehole BH-2.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 12**  
**Soil mixed with waste identified from 10 feet to 18 feet in Borehole BH-2.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 13**  
**Soil mixed with waste identified from 18 feet to 28 feet in Borehole BH-2.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 14**  
**Soil mixed with waste identified from 18 feet to 28 feet in Borehole BH-2.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 15**  
**Returned materials from 28 feet to 38 feet in Borehole BH-2.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 16**  
**Returned materials from 28 feet to 38 feet in Borehole BH-2.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 17**  
**Returned materials from 38 feet to 48 feet in Borehole BH-2.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 18**  
**Rock core from 50 feet to 55 feet in Borehole BH-2.**

**APPENDIX A  
PHOTOGRAPHS**

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**PHOTOGRAPHIC LOG FOR BOREHOLE BH-3**

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**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 19**  
**Materials returned from 0 feet to 5 feet in Borehole BH-3.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 20**  
**Materials returned from 5 feet to 10 feet in Borehole BH-3.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 21**  
**Soil mixed with waste identified from 10 feet to 17 feet in Borehole BH-3.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 22**  
**Soil mixed with waste identified from 17 feet to 27 feet in Borehole BH-3.**

**APPENDIX A  
PHOTOGRAPHS**



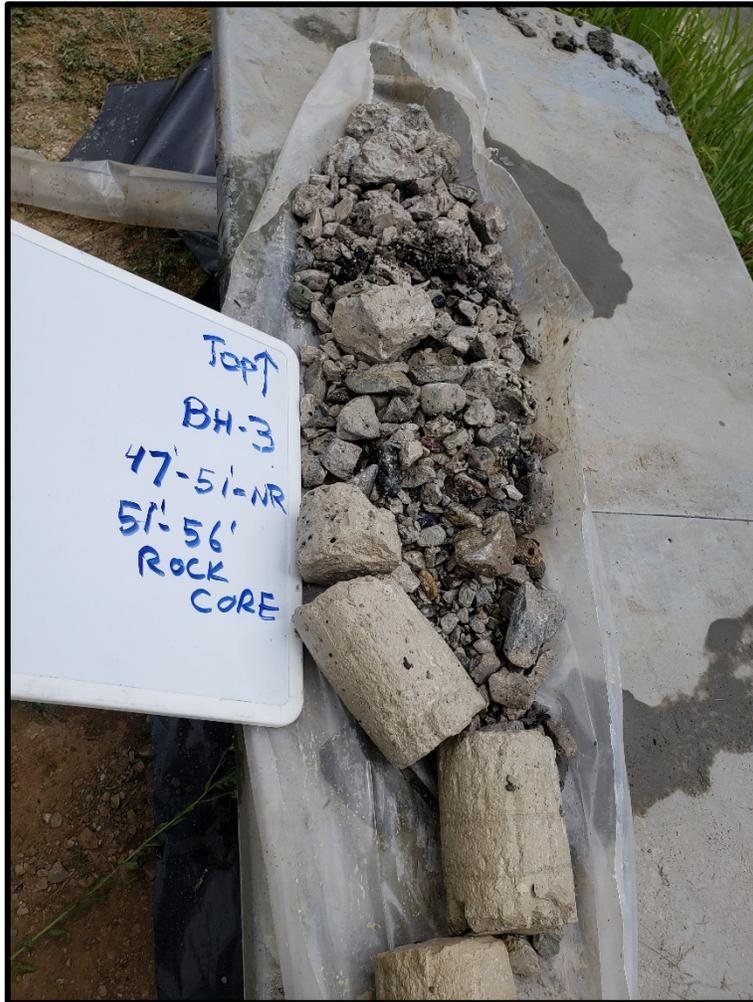
**PHOTOGRAPH NO. 23**  
**Materials returned from 27 feet to 37 feet in Borehole BH-3.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 24**  
**Materials returned from 37 feet to 47 feet in Borehole BH-3.**

**APPENDIX A  
PHOTOGRAPHS**



**PHOTOGRAPH NO. 25**  
**Rock core from 51 feet to 56 feet in Borehole BH-3.**

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**APPENDIX B**  
**BORING LOGS**

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Civil & Environmental Consultants, Inc.  
 333 Baldwin Road  
 Pittsburgh, PA 15205

# BORING NUMBER BH-1

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<b>CLIENT</b> <u>Bridgeton Landfill, LLC</u>	<b>PROJECT NAME</b> <u>West Lake OU-2</u>
<b>PROJECT NUMBER</b> <u>191-750</u>	<b>PROJECT LOCATION</b> <u>Bridgeton, MO</u>
<b>DATE STARTED</b> <u>6/9/20</u> <b>COMPLETED</b> <u>6/9/20</u>	<b>GROUND ELEVATION</b> <u>460.23 ft</u> <b>BACKFILL</b> <u>Open</u>
<b>SOIL SAMPLING CONTRACTOR</b> <u>HD Sonic Drilling</u>	<b>WATER LEVELS:</b>
<b>SOIL SAMPLING METHOD</b> <u>Sonic Drilling</u>	<b>AT END OF SOIL SAMPLING</b> <u>---</u>
<b>CEC REP</b> <u>BG</u> <b>CHECKED BY</b> <u>TDM</u>	▼ <b>AT END OF CORING</b> <u>7.3 ft / Elev 452.9 ft (24 hours after)</u>
<b>NOTES</b> <u>Waste Separation Demonstration Boring</u>	▼ <b>48hrs AFTER DRILLING</b> <u>7.1 ft / Elev 453.2 ft / Left open</u>

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲						
							20	40	60	80			
460		GRAVEL, with Brown Silty CLAY (CL), Dry to Moist, Medium-Stiff	0										
				☞ GB 1	(60)								
455		Greenish Grey SILT (ML), Moist, Soft, Petroleum Odor	5										
	▼			☞ GB 2	(80)								
450		Greenish Grey SILT (ML), Wet, Soft, Some SAND	10										
445			15	☞ GB 3	(75)								
440		Greenish Grey CLAY (CH), Wet, Medium-Stiff	20										
				☞ GB 4	(70)								
435		Greenish Grey SILT (ML), Wet, Soft	25										
		Greenish Grey SILT (ML), Wet, Soft with SAND (SM), Wet, Loose, Fine-Grained	30	☞									

CEC CUSTOM LOG 191-750 BRIDGETON LF BORING LOGS.GPJ CEC.GDT 7/9/20

(Continued Next Page)



Civil & Environmental Consultants, Inc.  
 333 Baldwin Road  
 Pittsburgh, PA 15205

# BORING NUMBER BH-1

CLIENT Bridgeton Landfill, LLC

PROJECT NAME West Lake OU-2

PROJECT NUMBER 191-750

PROJECT LOCATION Bridgeton, MO

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲			
							20	40	60	80
							PL	MC	LL	
							20	40	60	80
							☐ FINES CONTENT (%) ☐			
							20	40	60	80
430			30							
		Greenish Grey CLAY (CH), Wet, Medium-Stiff,								
		Greenish Grey CLAY (CH), Wet, Medium-Stiff with SAND (SM), Wet, Loose, Fine-Grained								
425			35	GB 5	(70)					
		Grey SAND (SM), Wet, Loose, Fine-Grained								
420			40	GB 6	(90)					
		Greenish Grey CLAY (CH), Wet, Stiff								
		LIMESTONE								
415			45	GB 7	(90)					
		Bottom of boring at 48.0 feet.								

CEC CUSTOM LOG 191-750 BRIDGETON LF BORING LOGS.GPJ CEC.GDT 7/9/20



Civil & Environmental Consultants, Inc.  
 333 Baldwin Road  
 Pittsburgh, PA 15205

# BORING NUMBER BH-2

PAGE 1 OF 2

**CLIENT** Bridgeton Landfill, LLC **PROJECT NAME** West Lake OU-2  
**PROJECT NUMBER** 191-750 **PROJECT LOCATION** Bridgeton, MO  
**DATE STARTED** 6/10/20 **COMPLETED** 6/10/20 **GROUND ELEVATION** 462.02 ft **BACKFILL** Open  
**SOIL SAMPLING CONTRACTOR** HD Sonic Drilling **WATER LEVELS:**  
**SOIL SAMPLING METHOD** Sonic Drilling **AT END OF SOIL SAMPLING** ---  
**CEC REP** BG **CHECKED BY** TDM **AT END OF CORING** 9.1 ft / Elev 453.0 ft (24 hours after)  
**NOTES** Waste Separation Demonstration Boring **48hrs AFTER DRILLING** 9.1 ft / Elev 453.0 ft / Left open

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲							
							20	40	60	80				
460		GRAVEL with Brown SILT (ML), Dry, Medium-Stiff	0											
				GB 1	(60)									
		Greenish Grey SILT (ML), Moist, Medium-Stiff mixed with Waste	5											
		Brown SILT (ML), Dry, Medium-Stiff with Gravel and Cobbles												
455				GB 2	(25)									
		Dark Greenish Grey SILT (ML), Wet, Soft mixed with Waste	10											
450				GB 3	(20)									
		Dark Greenish Grey SILT (ML), Wet, Soft mixed with Waste	15											
445				GB 4	(60)									
		Dark Greenish Grey SILT (ML), Wet, Soft mixed with Waste	20											
440														
		Dark Greenish Grey CLAY (CH), Wet, Stiff	25											
435		Greenish Grey SILT (ML), Wet, Soft												
			30											

CEC CUSTOM LOG 191-750 BRIDGETON LF BORING LOGS.GPJ CEC.GDT 7/9/20

(Continued Next Page)



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# BORING NUMBER BH-2

CLIENT Bridgeton Landfill, LLC

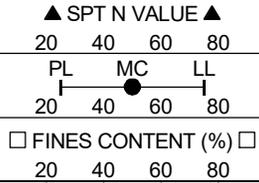
PROJECT NAME West Lake OU-2

PROJECT NUMBER 191-750

PROJECT LOCATION Bridgeton, MO

CEC CUSTOM LOG 191-750 BRIDGETON LF BORING LOGS.GPJ CEC.GDT 7/9/20

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲							
							20	40	60	80				
430		Greenish Grey SILT (ML), Wet, Soft ( <i>continued</i> )	30											
			35	GB 5	(80)									
425		Greenish Grey SILT (ML) Wet, Soft with some SAND (SM), Fine-Grained												
		Greenish Grey CLAY (CH), Wet, Stiff												
420		Greenish Grey SILT (ML), Wet, Soft	40											
		Greenish Grey CLAY (CH), Wet, Stiff	45	GB 6	(80)									
415		Greyish Brown SAND (SM), Soft, Fine-Grained												
		NO RECOVERY	50	GB 7	(0)									
410		Limestone		GB 8	(80)									
		Bottom of boring at 55.0 feet.	55											





Civil & Environmental Consultants, Inc.  
 333 Baldwin Road  
 Pittsburgh, PA 15205

# BORING NUMBER BH-3

**CLIENT** Bridgeton Landfill, LLC **PROJECT NAME** West Lake OU-2  
**PROJECT NUMBER** 191-750 **PROJECT LOCATION** Bridgeton, MO  
**DATE STARTED** 6/10/20 **COMPLETED** 6/10/20 **GROUND ELEVATION** 455.22 ft **BACKFILL** Open  
**SOIL SAMPLING CONTRACTOR** HD Sonic Drilling **WATER LEVELS:**  
**SOIL SAMPLING METHOD** Sonic Drilling **AT END OF SOIL SAMPLING** ---  
**CEC REP** BG **CHECKED BY** TDM **AT END OF CORING** 9.8 ft / Elev 445.4 ft (24 hours after)  
**NOTES** Waste Separation Demonstration Boring **48hrs AFTER DRILLING** 10.2 ft / Elev 445.0 ft / Left open

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲						
							20	40	60	80			
455		GRAVEL with SILT (ML), Dry, Medium-Stiff	0										
		Brown CLAY (CL), Moist, Medium-Stiff											
		Greenish Grey SILT (ML), Moist, Soft		GB 1	(100)								
450		GRAVEL	5										
		Dark Greenish Grey SILT (ML), Dry, Medium-Stiff											
		REFUSE (Plastic, Paper, Saturated Wood, Metal)		GB 2	(30)								
445		GRAVEL	10										
		Greenish Grey SILT (ML), Moist, Soft, mixed with Waste											
440		Greenish Grey SILT (ML), Moist, Soft, mixed with Waste	15	GB 3	(70)								
		Greenish Grey SILT (ML), Moist, Soft, mixed with Waste											
435		Greenish Grey SILT (ML), Moist, Soft, mixed with Waste	20										
		Greenish Grey CLAY (CH), Wet, Stiff, mixed with Waste		GB 4	(60)								
430		Greenish Grey CLAY (CH), Wet, Stiff, mixed with Waste	25										
		Greenish Grey SILT (ML), Wet, Soft											
		Greenish Grey SILT (ML), Wet, Soft	30										

CEC CUSTOM LOG 191-750 BRIDGETON LF BORING LOGS.GPJ CEC.GDT 7/9/20

(Continued Next Page)



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PROJECT NAME West Lake OU-2

PROJECT NUMBER 191-750

PROJECT LOCATION Bridgeton, MO

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲							
							20	40	60	80				
425		Greenish Grey SILT (ML), Wet, Soft ( <i>continued</i> )	30											
		Greenish Grey CLAY (CH), Wet, Stiff												
		Greenish Grey SAND (SM), Soft, Fine-Grained		GB 5	(80)									
420		Greenish Grey CLAY (CH), Wet, Stiff	35											
		Greenish Grey SAND (SM) Wet, Soft, Fine-Grained												
415		Greenish Grey CLAY (CH), Wet, Stiff	40											
		Greenish Grey SAND (SM), Wet, Soft, Fine-Grained		GB 6	(80)									
410		NO RECOVERY	45											
405		Limestone	50	GB 7	(0)									
				GB 8	(75)									
400		Bottom of boring at 56.0 feet.	55											

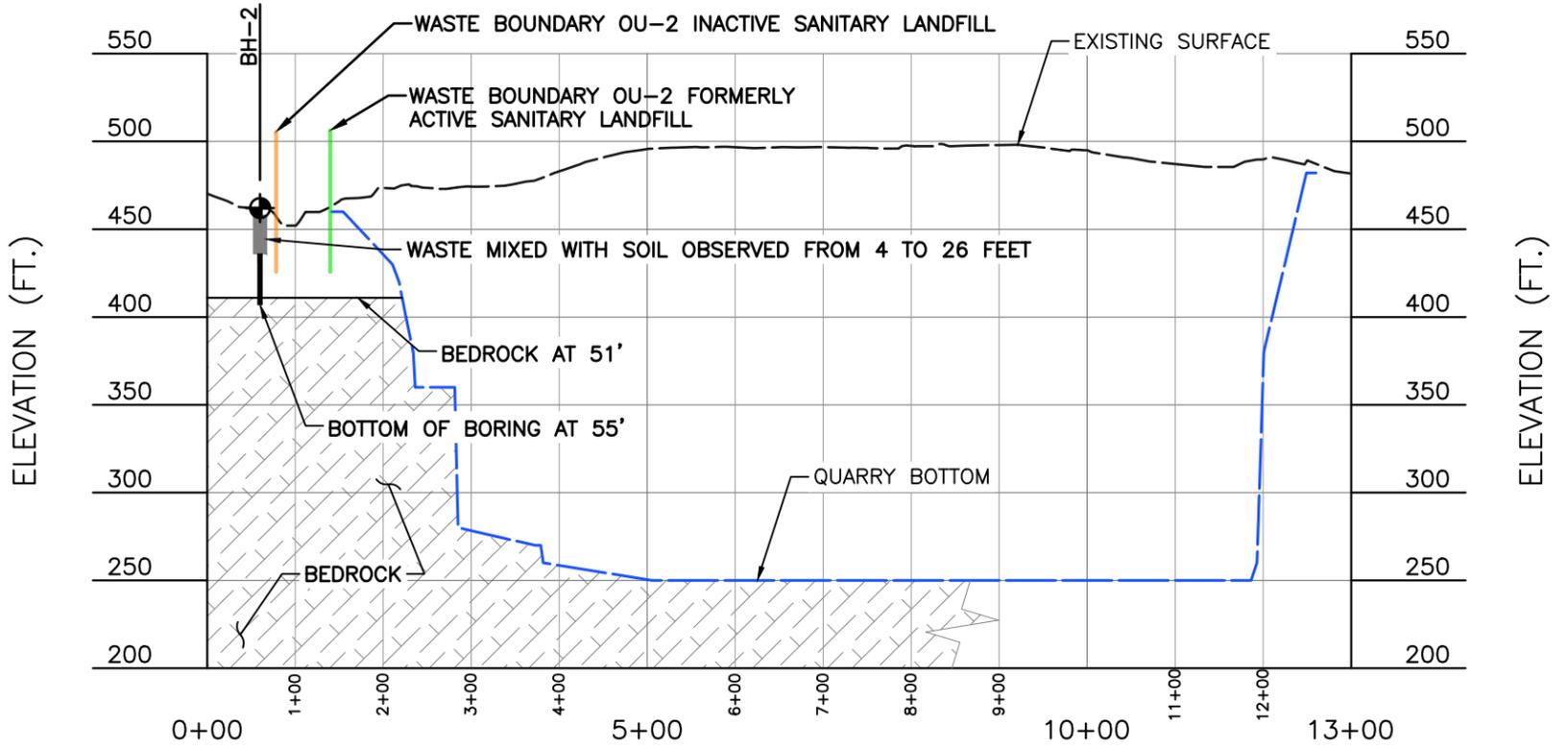
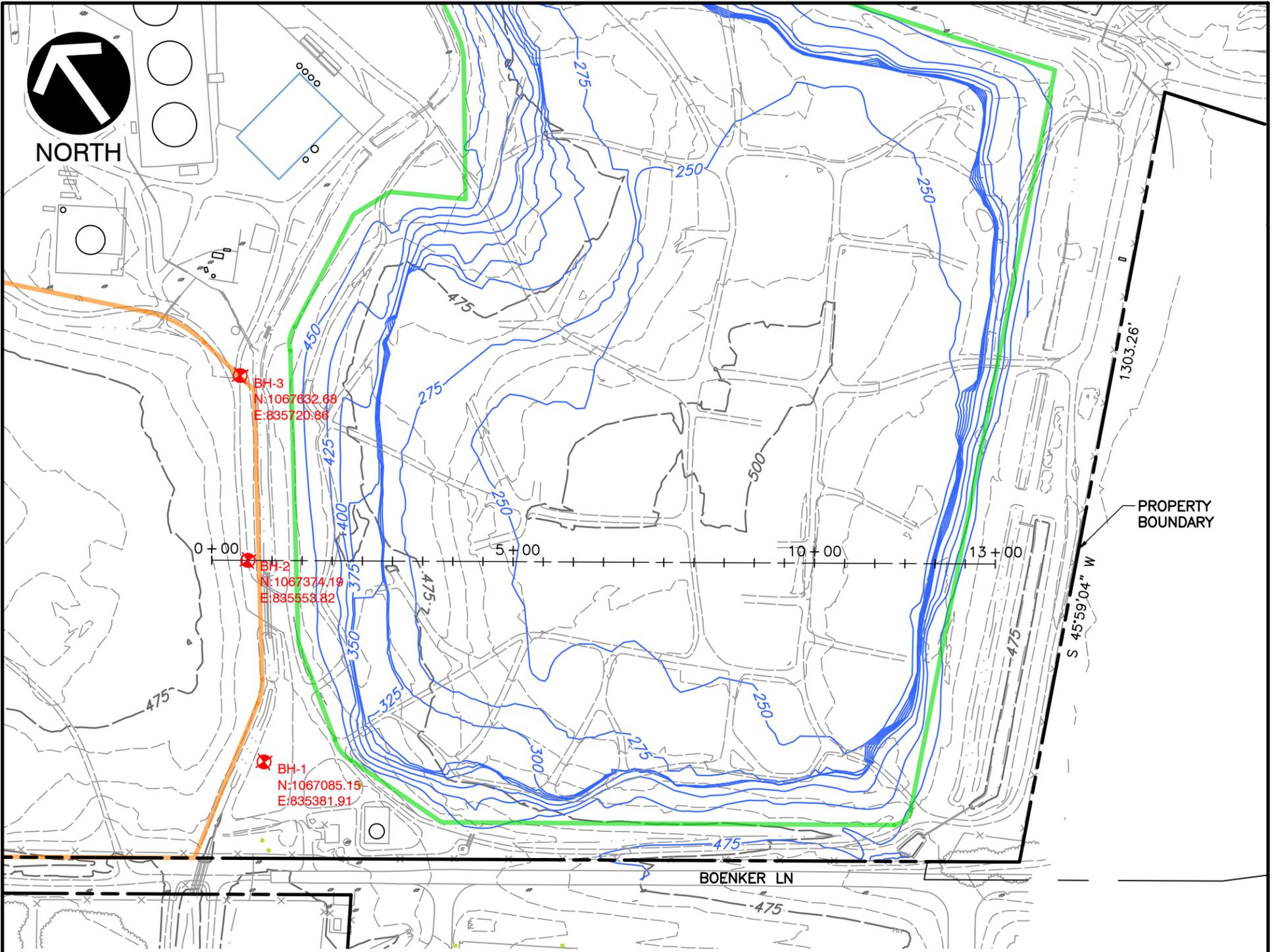
CEC CUSTOM LOG 191-750 BRIDGETON LF BORING LOGS.GPJ CEC.GDT 7/9/20

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**APPENDIX C**

**FIGURE**

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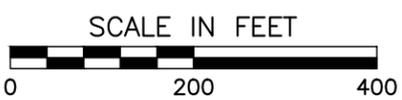
**BORING-2 PROFILE**

SCALE H:1"=200'; V:1"=100'

**LEGEND**

- WASTE BOUNDARY OU-2 INACTIVE SANITARY LANDFILL
- WASTE BOUNDARY OU-2 FORMERLY ACTIVE SANITARY LANDFILL
- 500 - EXISTING CONTOUR MAJOR
- - - EXISTING CONTOUR MINOR
- 275 - QUARRY CONTOUR MAJOR
- ★ BH-# BOREHOLES

\*HAND SIGNATURE ON FILE



 <b>Civil &amp; Environmental Consultants, Inc.</b> 3000 Little Hills Expressway · Suite 102 · St. Charles, MO 63301 314-656-4566 · 866-250-3679 www.cecinc.com		WESTLAKE LANDFILL OU-2 13570 ST. CHARLES ROCK RD BRIDGETON, MO 63044 ST. LOUIS COUNTY	
DRAWN BY: MRV DATE: JUNE 2020		CHECKED BY: KTK DWG SCALE: 1"=200'	
APPROVED BY: TDM*		FIGURE NO.: <b>1</b>	
PROJECT NO: 191-750			